Measuring System Implementation

The following introduces system implementation principles showing how measurement results from various Mitutoyo measuring instruments are recorded and used for quality control purposes.

### Implementation Step 1

#### Recording and storing measurement results

- **Eliminating writing by hand**
  - Prints out measurement data easily, providing the statistical calculation function.
  - Digimatic Mini-Processor DP-1VR (A-12)

- **To input data to a PC**
  - A keyboard signal conversion type input tool can input measurement data directly into spreadsheet software such as Excel.
  - USB Input Tool Direct: USB-ITN (A-6)
    - USB-ITN allows multichannel measurement by combination with USB-PAK.
  - Input tool series (A-4)
  - Multiplexer MUX-10F (A-13)

- **To perform wireless communication**
  - USB-FSWs + for foot switches (A-8)

### Implementation Step 2

#### Using dedicated inspection and quality control software

- **Creating Inspection Certificate**
  - A form is created easily with Excel.
  - USB-ITPAK (A-6)

- **Performing statistical process control**
  - Displays in real time GO/NG judgment, process capability, control chart, etc.
  - MeasurLink Real-Time PLUS (A-16)
Centralizing and analyzing measurement results

- Networking quality control data gathered from various locations

The control department can monitor the results from measurement rooms and the shop floor, perform statistical analysis of cumulative data, and issue data forms.

A-16

In-plant LAN

Centralizes the inspection results.
Input Tool series
SERIES 264 — Digimatic Gage / PC Data Input Device

FEATURES

• The input tool is an interface that converts measurement data to keyboard signals for sending to a PC, enabling you to easily input data from a Mitutoyo measuring instrument, equipped with Digimatic output, directly to cells in off-the-shelf spreadsheet software such as Excel.

• USB, RS-232C and PS/2 versions are available to cater for the various PC input requirements.

• Measurements can be made even more conveniently by using the optional foot switch instead of the data switch on the instrument.
Connection Configuration

USB keyboard signal conversion model

RS-232C conversion input tool

One-channel Digimatic input:

* When using an optional Gage Selector 3 (refer to page A-8), up to three measuring gages can be connected. Input selection is performed with a manual switch. Multiple 264-012 input tools can be connected to a PC with an off-the-shelf USB hub. Simultaneous input is not supported. For cables used to connect measuring gages to the input tool, refer to page A-20.

Refer to the Input Tools leaflet (E4250) for more details.
USB Input Tool Direct: USB-ITN
SERIES 264 — Digimatic Gage / PC Data Input Device

FEATURES
• Our USB Input Tool Direct has been streamlined into a range of dedicated models for each type of measuring instrument.
• In the same way as the existing model, IT-012U, measurement data can be input to Excel, Notepad, and other programs just by connecting the input tool to a computer.

The input tool has been streamlined by incorporating the USB function into the cable

The input tool directly connects the measuring instrument to a USB port on a computer

The values displayed on the measuring instrument can be sent to the computer just by pressing the data switch.

Because the input tool is automatically recognized as an *HID keyboard device (a standard Windows driver) just by connecting it to a USB port, no special software is required.

Patent pending (Japan)

*HID (Human Interface Device)

Data collection can start immediately after connecting the measuring instrument to a computer

Measure the amount displayed on the measuring instrument:

This is the same result as that of typing numbers using the keyboard and then pressing Enter.

USB-ITPAK usage environment

Technical Data
Output specifications: USB 2.0 or 1.1
Communication speed: 12 Mbps (full speed)
Power supply: USB bus power
Weight: 59g
USB 2.0 certification obtained
Complies with the EU EMC Directive
Illustration (Example: USB-ITN-A)
*Refer to page A-20 for Order No. of the Digimatic gages.

Note: It is recommended to use a commercially available USB hub that has USB certification.

USB foot switch adapter: USB-FSW

No.06ADV384 Total length: 160 mm

Major specifications
The foot switch function can be specified with USB-ITPAK and used accordingly.

1. Data control: Data Request, Data Cancellation, and Data Skip
2. Inputting any string: Examples - pass, fail, OK, NG

External appearance of USB-FSW

Input tool:

The USB plug is connected to a computer.

The USB-ITPAK and USB-FSW options are required (see page opposite). If not using optional software the IT-012U input tool can be used with a foot switch.

USB-ITN types
Each type of USB-ITN has a unique plug to fit the instrument it is designed for (figures A to G on the left). Just select the type that fits your measuring instrument (USB-ITN-A, USB-ITN-B, ...). Detailed specifications, such as part numbers, are shown on page A-20.

The Digimatic plug is connected to the measuring instrument.

Cable length: 2 m

USB connector (A plug)

Foot switch (Optional) No.937179T (Cable length: 2m)

Illustration (Example: USB-ITN-A)

*Refer to page A-20 for Order No. of the Digimatic gages.

Note: It is recommended to use a commercially available USB hub that has USB certification.

USB connector (A plug)

Note: It is recommended to use a commercially available USB hub that has USB certification.
Using USB-ITN in Combination with the Optional Spreadsheet Software

Although measurement data can be simply loaded directly into an Excel spreadsheet just by connecting the instrument and input tool to a computer, using the optional USB-ITPAK software enables time-saving operations and procedures that significantly improve reliability and efficiency.

Measurement data collection software: USB-ITPAK

This setup and data collection software is used to input data from one or more measuring instruments (connected by way of USB-ITN) to any Excel sheet. (This software package cannot be used with IT-012U.)

**Major features**
- Excel input settings: The input destination (a workbook, sheet, or cell), cell-fill direction (right or down), cell-fill interval, and other settings can be specified.
- Measurement method selection: Any of the following three methods can be selected: Sequential measurement, batch measurement, or individual measurement. (For details, see the measurement examples.)
- Data input control: Data can be requested, canceled, or skipped by using mouse buttons, function keys, or foot switch.
- Character string input by the USB foot switch adapter, USB-FSW: Any previously specified character string can be input using the foot switch. Examples: pass or fail
- Number of units that can be connected (total number for both USB-ITN and USB-FSW): Up to 20 units can be connected for Windows Vista or Windows 7, and up to 100 units can be connected for Windows 2000 or Windows XP. However, the above numbers might be less depending on the system configuration.
- Data importation time: About 0.2 to 0.3 seconds per unit. However, this value differs depending on the connected measuring instruments and measurement environment.
- Driver software: The VCP (virtual COM port) drivers for USB-ITN and USB-FSW are individually recognized using a built-in COM number.

These types of measurement are made possible by using the USB-ITPAK optional software

**Sequential measurement**

For this measurement method, one or more measuring instruments (connected by way of USB-ITN) are used to sequentially input one data item at a time according to a procedure stored in advance.

1. A micrometer is used to measure the external diameters X and Y of five workpieces.
2. A caliper is used to measure the length H of five workpieces.
3. The workpieces are visually examined for problems such as damage and discoloration, and then OK or NG (not okay) is input.

**Measurement example**

Measure outside diameter at positions X / Y and length H of 5 workpieces sequentially. Finally, perform GO/NG judgment for the external view (scratches, color shading, etc.) by visual check (see figure at left).

**Individual measurement**

For this measurement method, multiple operators make random measurements, and then data is input from the corresponding measuring instruments (by way of USB-ITN) according to individually specified input procedures.

**Measurement example**

Dividing six workpieces into two groups of three, one of which is measured by each of two operators (parallel work)
**U-WAVE**  
**Measurement Data Wireless Communication System**

The U-WAVE system enables easy wireless data communication from a measuring tool to a PC using the Digimatic protocol. Measurement workability is improved by eliminating the long and cumbersome data cables usually required and the user-friendly interface allows data to be loaded into any software product that accepts keyboard input, such as Excel® or Notepad.

Requests data from U-WAVE-T and loads it onto a PC via a USB connection  
*Specifications of U-WAVEPAK (setup software)*

Before using U-WAVEPAK for the first time after purchase, IDs, frequencies, and other settings must be made. The data interface function allows measurement data to be loaded into a PC in Excel, Notepad or other software file.*

(1) Install the  
(2) Initial setup procedure  
(3) Install the dedicated USB driver and virtual COM driver.  
(4) Set IDs and frequencies for U-WAVE-R and U-WAVE-T with U-WAVEPAK.  
(5) Press the DATA button of U-WAVE-T once to write settings into U-WAVE-T. Once this procedure has been performed when using U-WAVE-T for the first time, settings are then stored in the main unit memory.

**Specifications of wireless communication**

- Wireless standards: Conform to IEEE802.15.4  
- Wireless communication distance: Approx. 20 m (within visible range)  
- Wireless communication speed: 250 kbps  
- Transmission output: 1 mV (0 dBm) or less  
- Modulation method: DS-SS (direct sequence spread spectrum) Resistant to interfering signal or noise  
- Communication frequency: 2.4 GHz band (ISM band: universal frequency)  
- Used band: 15 channels (2.405 to 2.475GHz at intervals of 5MHz) The noise search function can avoid interference with other communication devices.

**Conformity standards**

<table>
<thead>
<tr>
<th>Conformity standards</th>
<th>European conformity standards</th>
<th>Japanese conformity standards</th>
<th>U.S.A. conformity standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 50371:2002</td>
<td>EN 300 440-2 V1.1.2</td>
<td>EN 50371:2002</td>
<td>47 CFR Part 15 (Subpart C)</td>
</tr>
<tr>
<td>EN 300 440-4 V1.1.2</td>
<td>EN 301 489-01 V1.6.1</td>
<td>EN 301 489-03 V1.4.1</td>
<td>47 CFR Part 15 (Subpart B)</td>
</tr>
<tr>
<td>EN 300 440-1 V1.3.1</td>
<td></td>
<td></td>
<td>Canada conformity standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RSS-210 (Issue 7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RSS-Gen (Issue 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mexican conformity standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>COFETEL DEL 13 DE MARZO DE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>506</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brazilian conformity standards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Resolution 442 and Resolution 506</td>
</tr>
</tbody>
</table>

**Order No.:**  
- 02AZD880E: Brazil  
- 02AZD880D: Mexico (Available for only products labeled with a wireless accreditation label for Mexico)  
- 02AZD810D: Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada  
- 02AZD810E: Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada

Refer to the Input Tools leaflet (E4250) for more details.
(2) U-WAVE-T
Transmits measurement data to U-WAVE-R. Select IP67 or buzzer model, according to your application. U-WAVE-R can be connected to Digimatic gages by dedicated cable for U-WAVE-T (option).

<table>
<thead>
<tr>
<th>Model No.</th>
<th>U-WAVE-T (IP67 model)</th>
<th>U-WAVE-T (buzzer model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>02ADZ730D</td>
<td>02AZD880</td>
</tr>
<tr>
<td>Protection Rating</td>
<td>IP67</td>
<td>–</td>
</tr>
<tr>
<td>Data reception indication</td>
<td>LEDs</td>
<td>Buzzer and LEDs</td>
</tr>
<tr>
<td>Power supply</td>
<td>Lithium battery CR2032×1</td>
<td>–</td>
</tr>
<tr>
<td>Battery life</td>
<td>Approx. 400,000 transmissions</td>
<td>–</td>
</tr>
<tr>
<td>External dimensions</td>
<td>44 x 29.6 x 18.5mm</td>
<td>–</td>
</tr>
<tr>
<td>Mass</td>
<td>23g</td>
<td>–</td>
</tr>
</tbody>
</table>

IP67 type
Highly resistant to dust and water ingress

Buzzer indicates receipt of data

LED ON
(OK: Green NG: Red)

Receipt of data can be checked by buzzer and LED (common specification)

Foot switch (Optional)
Order No. 937179T

(3) U-WAVE-T

■ Two Types of Connecting Cable
A much-needed foot switch type connecting cable (lower drawing at right) has been provided in addition to the conventional type (upper drawing at right) of connecting cable between the U-WAVE-T unit and a measuring tool. Identify the connector type compatible with your measuring tool in the following table listing 7 types (A to G), and select either the standard type or foot switch type cable according to the purpose. The table also lists wired-type connecting cables with the same connector as those 7 types on each measuring tool. Specify those cables as required.

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard type</th>
<th>Foot switch type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Order No.</td>
<td>Order No.</td>
</tr>
<tr>
<td>A</td>
<td>02AZD790A</td>
<td>02AZE140A</td>
</tr>
<tr>
<td>B</td>
<td>02AZD790B</td>
<td>02AZE140B</td>
</tr>
<tr>
<td>C</td>
<td>02AZD790C</td>
<td>02AZE140C</td>
</tr>
<tr>
<td>D</td>
<td>02AZD790D</td>
<td>02AZE140D</td>
</tr>
<tr>
<td>E</td>
<td>02AZD790E</td>
<td>02AZE140E</td>
</tr>
<tr>
<td>F</td>
<td>02AZD790F</td>
<td>02AZE140F</td>
</tr>
<tr>
<td>G</td>
<td>02AZD790G</td>
<td>02AZE140G</td>
</tr>
</tbody>
</table>

Digimatic cable connectors

Foot switch (Optional)
Order No. 937179T

Fasten the connector to U-WAVE-T with two SCREWS.
U-WAVE-T Instration Kit

A plastic mounting plate is provided to enable the U-WAVE-T unit and measuring tool to be held together by means of adhesive-backed hook and eye fasteners. This method makes attaching/detaching the tool and U-WAVE-T unit quick and convenient. Batteries can be replaced without needing to detach the tool.

Mounting Drawing

- Detachable fasteners: 2 pieces (mirror-imaged)
- Mounting screws: 4 pieces (including 2 spares)
- Unit: mm
- Connecting cable

* To avoid damaging the threaded holes in the plastic body of the U-WAVE-T unit, the mounting screws should be tightened only just sufficiently to grip. Repeated removal of these screws should also be avoided for the same reason.

** In order to avoid loss of adhesion, do not allow oil or coolant to come into contact with the bonding surfaces of the detachable fasteners.

The Mounting Plate in Use

SuperCaliper CD67-S15PM

QuantuMike MDE-25MJ

Digimatic Indicator ID-C112XB

Example of a custom-order – Support of data request from a PC (Event Drive mode)

This custom-ordered Event Drive enables data requests from the PC end. This system is effective if no operator is in attendance at a measuring tool or if the tool is installed at an inaccessible site. (Data acquisition from a measuring tool such as a Digimatic indicator mounted on a machine or a jig.)

Precautions

1. About battery life:
   The battery lifespan in the Event Drive mode is shorter than that in the Normal mode (button-drive). Change to the Normal (button-drive) mode after every measurement to extend the battery life span.

2. If using multiple measuring tools:
   If multiple U-WAVE-T units are connected to one U-WAVE-R unit in the Event Drive mode, a communication error could result due to conflict between the signals when data is transmitted simultaneously from the U-WAVE-T units since they use the same frequency. To avoid any transmission conflict, shift the timing of each measurement or provide enough U-WAVE-R units (a maximum of 16 units are connectable) for each measuring tool and set different frequencies (15 channels).
**Inspection Table Creation Program — MeasureReport V4.1**

MeasureReport calls inspection information that has been registered as a master in advance, inputs data from U-WAVE (or other software) to the data input sheet, checks it against the set standard values, and indicates the GO/NG judgment result with a cell color (red: NG, blue: OK). This program creates, prints, and saves the inspection table using the inspection format created in Excel after saving data.

### Measurement Data Input Screen

<table>
<thead>
<tr>
<th>Measured item group 1</th>
<th>Measured item group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured item 1</td>
<td>Measured item 2</td>
</tr>
<tr>
<td>Measured item 3</td>
<td>Measured item 4</td>
</tr>
<tr>
<td>Measured item 5</td>
<td>Measured item 6</td>
</tr>
</tbody>
</table>

Note: Measurement is performed from Digimatic gage A to B. Random measurement between A and B is not supported.

Mitutoyo application software supports the U-WAVE data cancellation function. (By holding data switch 2 seconds or longer, the previously loaded data item is canceled and the system awaits re-input of data.) Only the previously entered data item can be canceled.

### Measurement Data Network System — MeasurLink V6.1 Real-Time PLUS

When data is input, MeasurLink displays a variety of statistical processing results including GO/NG judgment, process capability, Xbar-R control chart and histogram on the screen in real time.

For details, refer to MeasurLink Catalog No. E4297.

#### Measurement Data Input Screen

- Measuring tool A ID=00
- Measuring tool B ID=01
- Measuring tool C ID=99

Mitutoyo application software supports the U-WAVE data cancellation function. (By holding data switch 2 seconds or longer, the previously loaded data item is canceled and the system awaits re-input of data.) Only the previously entered data item can be canceled.

### Standing details can be freely selected.

- **Character information (item information and calculation result)**
  - Item name, measured value, error value, upper/lower limits, Cp, Cpk, Pp, Ppk, standard deviation, average, maximum value, minimum value, defect rate, etc. (All selectable)

- **Chart display (control charts, etc.)**
  - Xbar-R control chart, Xbar-S control chart, X-Rs control chart, histogram, tear chart, run chart, pre-control chart, statistics, etc. (All selectable)

- **Color-coding of judgment of GO/NG results**
  - The color of the outer frame of the call-out corresponds to the GO/NG result.
  - Green: OK, Yellow: Close to out-of-tolerance, Red: Out-of-tolerance

Note: Data cancellation cannot be performed if the input destination software does not support cancel code (99).
** FEATURES

- This is a palm-sized printer used to print measurement data from Digimatic gages or to perform statistical analysis.
- The versatile DP1-VR printer not only prints measurement data, but performs a variety of statistical analyses, draws histograms and D charts and also to performs complicated operations for X bar R control charts.
- Equipped with RS-232C output and GO/NG judgment output as standard functions, this processor ensures high reliability as an advanced quality inspection machine.
- The line thermal printer enables fast and quiet printing.

** Technical Data

- Printing method: Thermal line printer
- Printing dot: 384 dot (8 dots/mm)
- Printing speed: 6.5mm/s (using AC adapter)
- Printing paper: 48m
- Printing time: Approx. 6500 lines for large characters
- Approx. 12000 lines for normal characters
- Processing capacity: 9999 data items (mode 1/2/3)
  100000 data items (mode 0)
- Printing data: Measurement data, GO/NG judgment, No. of data, Max/min value, Range, Average, Standard deviation, No. of defective, Fraction defective, Process capability index, Histogram, D-chart, Control chart generation for X bar and control limit data, date and time
- Output function: Output the measurement data (RS232C) or GO/NG judgment
- Input timer: 0.25s, 1s, 5s, 30s, 1min, 30min, 60min
- Power: AC adapter 6V
- Electric battery: LR6 (alkaline), Ni-Mh (AA size)
- Battery life: 10 years (clock battery), 10000 lines (1600mA 1time/5 sec. using a nickel hydrofluoric battery)
- Dimensions: (W x D x H): 94 x 201 x 75.2mm
- Mass: 390g

** Optional Accessories

- 09EA004*: RS-232C changing cable (1m, 9 pin)
- 965516*: GO/NG judgment cable
- 937179*: Foot switch

* The RS-232C cable and GO/NG judgment cable cannot be used at the same time.

Refer to the DP1-VR leaflet (E4209) for more details.
Multiplexer MUX-10F
SERIES 264 — Digimatic/RS-232C Interface Unit

FEATURES
- A measurement data transfer device, multiplexer MUX-10F converts incoming Digimatic output measurement data to RS-232C and outputs it to an external device such as a PC.
- Up to four measuring instruments with the Digimatic output feature can be connected.

Technical Data
- Data input port: 4 channels for Digimatic gages
- Data output: Via RS-232C interface
- Data output format: RS-232C (D-SUB 9P in connector)
- Data transmission method: Half-duplex transmission
- Data transmission code: ASCII/JIS
- Data length: 8 bits
- Start bit: 1 bit
- Stop bit: 1 bit
- Parity check: Non
- Synchronizing method: Start-stop system
- Data transmission speed: 300bps, 600bps, 1200bps, 2400bps, 9600bps, 19200bps
- Power supply: AC adapter
- Dimensions (W x D x H): 91.4 x 92.5 x 50.4mm

Optional Accessory
937179T: Foot switch

Usage Example
Data input using the data switch on the Digimatic gage
- If the digimatic gage has a data switch, data is sent to the MUX-10 from the gage, converted to RS-232C and sent out.

Data input using the load switch
- If the digimatic gage does not have a data switch or when simultaneous measurements are performed, the MUX-10 load switch is used to poll data from the measuring gage(s) selected by the tool selection switch(s), converted to RS-232C, and sent out.
- If multiple measuring gages are selected by the tool selection switch, data is input in the order of channels 1 through 4.
- Optional foot switch (937179T) is available for quick data entry.

Data input using the external commands
- Data from a specified measuring gage connected to MUX-10F can be polled (ch 1 - 4) by inputting a command at the PC.

<table>
<thead>
<tr>
<th>Command (ASCII)</th>
<th>Transfer channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (ASCII corde31) CR</td>
<td>1</td>
</tr>
<tr>
<td>2 (ASCII corde32) CR</td>
<td>2</td>
</tr>
<tr>
<td>3 (ASCII corde33) CR</td>
<td>3</td>
</tr>
<tr>
<td>4 (ASCII corde34) CR</td>
<td>4</td>
</tr>
<tr>
<td>A (ASCII corde41) CR</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>B (ASCII corde42) CR</td>
<td>1, 2, 4</td>
</tr>
<tr>
<td>C (ASCII corde43) CR</td>
<td>1, 3, 4</td>
</tr>
<tr>
<td>D (ASCII corde44) CR</td>
<td>2, 3, 4</td>
</tr>
<tr>
<td>E (ASCII corde45) CR</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>F (ASCII corde46) CR</td>
<td>1, 1, 2</td>
</tr>
<tr>
<td>G (ASCII corde47) CR</td>
<td>1, 3</td>
</tr>
<tr>
<td>H (ASCII corde48) CR</td>
<td>1, 4</td>
</tr>
<tr>
<td>I (ASCII corde49) CR</td>
<td>2, 3</td>
</tr>
<tr>
<td>J (ASCII corde50) CR</td>
<td>2, 4</td>
</tr>
<tr>
<td>K (ASCII corde51) CR</td>
<td>3, 4</td>
</tr>
</tbody>
</table>
Gage Selector 3
3-channel Switching Box for Data Transmission

FEATURES
• 3 Digimatic gages can be connected.
• The channel switch is used to specify gage selection for data output.

Order No.
939039

Technical Data
Connection: Up to three gages
Signal: Digimatic code format
Connection: Bidirectional
External dimensions (W x D x H): 100 x 70 x 33mm

Examples of Connections
EC Counter
SERIES 542 — Low-cost, Assembly Type Display Unit

FEATURES
• Compact panel mounting type and DIN size. It can be easily incorporated into each system.

Order No.
542-007*
*To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for EK, No suffix is required for JIS/100V

Technical Data
Compatible gage: LGD, LGS
Resolution: 0.001mm, 0.01mm
No. of gage inputs: 1
Display: 6-digit LED and a negative (-) sign
Function: Preset
GO/NG judgment
Output (open-collector): 3-step limit signal, Normal signal
External control: Preset, Data hold
Power supply: Via AC adaptor
Dimensions (W x D x H): 96 x 48 x 84.6mm

DIMENSION

Unit: mm

542-007
MeasurLink
Measurement Data Network System

MeasurLink® software is developed in the U.S., the birthplace of SPC, by Mitutoyo America and incorporates years of industry expertise. Manufacturing globally has become borderless with an increasing number of companies, including Japanese manufacturing, doing business abroad. Adoption of certified ISO9000-based quality control standards, such as QS-9000 in the automobile industry in the U.S., is becoming a requirement, a trend that is expected to spread to other industries as well. In Japan today, most systems utilize inspection certificates, but process control will be required in more cases in the adoption of international standard certificates.

Preventive control via real-time control chart
Real-time control charts are utilized to find abnormalities at an early stage in the production run and so effectively prevent defects from occurring.

Abnoramlities are found based on signs on the control chart
Out-of-control, run, trend, etc.

Expansion to the measurement network system
MeasurLink® supports anything from stand-alone, small-scale systems to large-scale systems utilizing a PC network environment. Expansion from a stand-alone installation to a network system can easily be performed, allowing a gradual upgrade from a single test operation in one section to a full-scale operation.

Centralized measurement data management by networking

Program configuration of MeasurLink

Recommended operating environments

<table>
<thead>
<tr>
<th>OS</th>
<th>Windows2000 SP3 or higher/WindowsXP SP2 or higher/WindowsVista/Windows7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>Sybase SQL Anywhere*</td>
</tr>
<tr>
<td>CPU</td>
<td>X86: 1GHz or more</td>
</tr>
<tr>
<td>Memory</td>
<td>1GB or more RAM</td>
</tr>
<tr>
<td>Hard disk</td>
<td>2GB or more</td>
</tr>
<tr>
<td>Display</td>
<td>SVGA or more</td>
</tr>
<tr>
<td>Others</td>
<td>CD-ROM drive, keyboard, mouse**</td>
</tr>
</tbody>
</table>

* If used in a network, it is necessary to purchase the database license according to the number of servers and clients.
** If used in a network, the parts comprising the network environments such as LAN card, LAN cables and hub are required.

Recommended software

- MeasureReport (for inspection report creation)

MeasurLink Real-Time PLU for Digimatic instruments
- STATMeasure PLUS for measuring system products
- MeasurLink Gage R&R (for gage R&R calculation)
- MeasurLink Gage Management (for calibration history management)

Note: Database software is separately required for network construction.

Related Software

- MeasureReport (for inspection report creation)
- Microsoft Excel® (sold separately)
MeasurLink Real-Time PLUS (for Digimatic instruments)
MeasurLink Real-Time PLUS transmits measurement data in real time from measuring tools with Digimatic output with RS-232C communication via the interface.

STATMeasure PLUS (for measuring instrument products)
STATMeasure PLUS, which resides on the data processing PC, transmits measurement data in real time when the measurement program is executed with inter-program communication (DDE communication).

Real-time process control
Result of statistical analysis
The content of the measurement item balloon display can be configured as desired.

Character information (item information calculation result)
Item name, measured value, error value, upper/lower limits, Cp, Cpk, Pp, Ppk, standard deviation, average, maximum value, minimum value, defect rate, etc. (All selectable.)

Chart display (control charts, etc.)
X-bar-R control chart, Xbar-S control chart, X-Rs control chart, histogram, tear chart, run chart, pre-control chart, statistical, etc. (All selectable.)

Color-coding of judgment of GO/NG results
The color of the outer frame of the call-out corresponds to the GO/NG result.

Report output
Results of statistical processing can be output in various types of report.

Measurement item report

Statistical analysis result display
Wide range of statistical analysis/display functions provides results according to characteristics and purposes.

Individual item chart
• Xbar-R control chart (a)
• Xbar-S control chart
• X-Rs control chart
• EWMA control chart
• Histogram (b)
• Run chart (c)
• Pre-control chart (d)
• Tear chart (e)

All item chart
• Multivariate control chart (f)
• Column indicator (g)
• All item Cpk sheet (h)
• Multivariate defect ratio (bar graph)
• Manager display
  (4 columns x 3 rows)
  (Histogram, meter, box and whiskers plot, Cpk)

Measured value
• Measured value data sheet
  (Individual item n count x sub Gr)
• Part data sheet

Statistics
• Maximum value
• Minimum value
• Average
• Standard deviation S, Rbar/d2
• Process capability
  Cp, Cpk, Pp, Ppk
• Defect ratio
  Average ±3s / 4s / 6s etc.

File output
Results for the specified inspection lot (data, graph, calculation result, etc.) can be output to files in Excel format. (1 sheet is created for each item.)

You can easily extract the necessary results and provide them to any department not using MeasurLink. Other file output formats, such as text file and MeasurLink’s dedicated format, are also available.

Select from 10 types of charts (image capture), control charts, and histograms
For statistical processing results, you can select from 30 items such as average, maximum, minimum, Cp, and Cpk.

Measurement data and measurement date/time

*By using the optional MeasureReport package, you can create inspection tables in a format previously defined using Excel.
Optional Software

MeasurLink Process Manager — Process Monitoring Program
• This program can monitor each inspection process state on the network even in the QC office.
• This program quickly notifies the administrator of a problem that occurs in a process with the alarm function.

MeasurLink Process Analyzer — Process Analysis Program
• This program supports verification of problems through various analyses according to historical information (such as environment, time, machine tool, and operator) about parts and processes using the database in which data has been acquired and accumulated by MeasurLink SPC.
• This program enables differential analysis under a specific condition with the filter function and grasp of long-term trend with the combination function.

MeasurLink Gage R&R — Gage R&R Assessment Program
• This program can perform gage R&R assessment as required by QS-9000 in a straightforward manner.

(1) Selection of evaluation methods
(2) Selection of evaluation conditions
(3) Input of measurement data

Analysis chart display
(1) Gage R&R
(2) EV (Equipment Variable)
(3) AV (Assessor Variable)
(4) PV (Part Variable)
Analysis charts (5 types)

Report output of evaluation results

MeasurLink Gage Management — Calibration History Management Program
• This program allows records to be kept of each measuring instrument’s calibration history in order to support proper calibration management. A powerful search function aids effective monitoring of all relevant data.

Powerful search function using an optional item (e.g. next calibration date) as a keyword

Refer to the MeasurLink leaflet (E4297) for more details.
**FEAURES**

- Data from a measurement result file generated with a CMM, vision measuring machine or other machine can be output to an inspection table generated with Excel. Data from multiple measuring machines can be combined into a single inspection table (up to 200 measurement items).
- An inspection table can be generated by inputting data from the measuring gage with the digimatic output feature via the interface. Calculation results of optical measuring machine, QM-Data200 and the counter values for the X-axis and Y-axis output through RS-232C can be processed in the same way.
- An original Excel form can be generated by using an attached sample form as a template and making simple editing (such as copy and paste).
- The computation function is available for tolerance judgment, workpiece judgment, statistical calculation and other types of processing at inspection table generation time.

**Order No. Available tool / machine**

- 02ARA760B Coordinate Measuring Machines
- 02ARA781B Vision Measuring Systems
- 02ARA782B Spin Arms
- 02ARA783B Surftest / Formtracer / Contrace / Roundtest
- 02ARA784B Digimatic Small Tools (Caliper / Micrometer / Indicator etc)

---

**Data Conversion Program into inspection Certificates in Excel Format**

**MR-Measurlink export program**

Converts selected data from the database collected by MeasurLink and outputs it to a file, starts up Excel and executes macro processing.

- ODBC database file whose data was collected by MeasurLink
- After the part ID and lot number (date/time) are specified, file conversion is performed to create an Excel file.

**Inspection table creation macro program**

Based on the data file created, the inspection table creation macro adds OK/NG judgment and statistical calculation results by macro processing, and displays them in Excel inspection table format.

- Creation of a new format file
- You can create your original format easily by editing the attached sample format file.
- Workpiece shape display
- The workpiece shape file used in the data acquisition of MeasurLink is automatically displayed.
- Design/tolerance values
- The design and tolerance values registered in MeasurLink are used as they are.
- Error value display
- Errors in the design values can be displayed.
- NG marking
- You can add any mark in front of NG data.
- Workpiece judgment
- OK/NG judgment is performed by work. (OK/NG is displayed.)
- Statistical calculation
- Desired calculation results can be displayed from 15 types of statistical items.

**Excel starts up.**

**Macro is executed.**

**Note:** Items in parentheses indicate the Excel functions or calculation methods used.

**Online RS232C**

- Multiplexer MUX-10F
- Input Tool
- QM-Data
- Linear Height

**Offline File conversion**

- Coordinate Measuring Machine
- Vision Measuring System

**Online Digimatic**

- Digimatic gages

---

*For file conversion, up to 200 items are convertible.*

---

**FEATURES**

- Data from a measurement result file generated with a CMM, vision measuring machine or other machine can be output to an inspection table generated with Excel. Data from multiple measuring machines can be combined into a single inspection table (up to 200 measurement items).
- An inspection table can be generated by inputting data from the measuring gage with the digimatic output feature via the interface. Calculation results of optical measuring machine, QM-Data200 and the counter values for the X-axis and Y-axis output through RS-232C can be processed in the same way.
- An original Excel form can be generated by using an attached sample form as a template and making simple editing (such as copy and paste).
- The computation function is available for tolerance judgment, workpiece judgment, statistical calculation and other types of processing at inspection table generation time.
## Main Digimatic gage (classified as type A to type G by connector shape) and connecting cable
(including cable incorporating type USB input tool direct).

### (1) When connected with IT-012U/IT-007R/IT-005D/DP-1VR/MUX-10F/Counter, etc. [Order No. list of the connecting cable]

Select a connecting cable from table below to fit the connector (A to G).

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Model No.</th>
<th>Instrument models that do not have a data switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>05CZA624</td>
<td>05CZA662</td>
<td>(D) Digimatic Micrometer/Quantumite/Micrometer</td>
</tr>
<tr>
<td>05CZA625</td>
<td>05CZA663</td>
<td>(E) Digimatic Caliper/Depth Gage/Scale Unit</td>
</tr>
<tr>
<td>05CZA624</td>
<td>05CZA662</td>
<td>(F) Digimatic Carbon Fiber/Scale Unit/Caliper</td>
</tr>
<tr>
<td>05CZA625</td>
<td>05CZA663</td>
<td>(G) Digimatic Thickness Gage/Scale Unit/Caliper</td>
</tr>
</tbody>
</table>

### (2) When connected with USB input tool direct USB-ITN [Order No. list of the USB-ITN]

Select a USB input tool direct from table below to fit the connector (A to G).

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Model No.</th>
<th>Instrument models that incorporate a data switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>06ADV380A</td>
<td>05CZA624</td>
<td>(A) Digimatic Caliper/Depth Gage/Scale Unit</td>
</tr>
<tr>
<td>06ADV380B</td>
<td>05CZA625</td>
<td>(B) Digimatic Carbon Fiber/Scale Unit/Caliper</td>
</tr>
<tr>
<td>06ADV380C</td>
<td>05CZA624</td>
<td>(C) Digimatic Thickness Gage/Scale Unit/Caliper</td>
</tr>
<tr>
<td>06ADV380D</td>
<td>05CZA625</td>
<td>(D) Digimatic Micrometer/Quantumite/Micrometer</td>
</tr>
<tr>
<td>06ADV380E</td>
<td>05CZA624</td>
<td>(E) Digimatic Caliper/Depth Gage/Scale Unit</td>
</tr>
<tr>
<td>06ADV380F</td>
<td>05CZA625</td>
<td>(F) Digimatic Carbon Fiber/Scale Unit/Caliper</td>
</tr>
<tr>
<td>06ADV380G</td>
<td>05CZA624</td>
<td>(G) Digimatic Thickness Gage/Scale Unit/Caliper</td>
</tr>
</tbody>
</table>

### (3) When connected with U-WAVE-T [Order No. list of the U-WAVE-T dedicated connecting cable]

Select one of the USB input tool direct from table below to fit the connector (A to G).

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Model No.</th>
<th>Instrument models that incorporate a data switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>02AZD790A</td>
<td>02AZD790B</td>
<td>(A) Digimatic Caliper/Depth Gage/Scale Unit</td>
</tr>
<tr>
<td>02AZD790C</td>
<td>02AZD790D</td>
<td>(B) Digimatic Carbon Fiber/Scale Unit/Caliper</td>
</tr>
<tr>
<td>02AZD790E</td>
<td>02AZD790F</td>
<td>(C) Digimatic Thickness Gage/Scale Unit/Caliper</td>
</tr>
<tr>
<td>02AZD790G</td>
<td>02AZD790A</td>
<td>(D) Digimatic Micrometer/Quantumite/Micrometer</td>
</tr>
</tbody>
</table>

### Measuring instrument models that incorporate a data switch

- [Surface Roughness Tester] [Linear Height Tester]
- [Coating Thickness Gage] [Measurement of Hardness Testing Machines]
- [Reference Gage] [Borematic Gage]
- [Digimatic Thickness Gage] [Digimatic model (D-CX)]
- [Digimatic Carbon Fiber Caliper] [Portable Hardness Testing Instruments]

### Measuring instrument models that do not have a data switch

- [Digimatic Indicator] [Digimatic Thickness Gage]
- [Digimatic model (ID-C)] [No corresponding models]

### SPC Connecting Cables

- [USB-ITN-A] [USB-ITN-B] [USB-ITN-C] [USB-ITN-D] [USB-ITN-E] [USB-ITN-F] [USB-ITN-G]

### Codes of major compatible measuring instruments

- [Digimatic Caliper]
- [Super Caliper]
- [Digimatic Carbon Fiber Caliper]
- [Digimatic Depth Gage]
- [Digimatic Scale Unit]
- [Digimatic Exclusive Caliper]

### Figure 1 Standard type connecting cable

- [USB-ITN-A]
- [USB-ITN-B]
- [USB-ITN-C]
- [USB-ITN-D]
- [USB-ITN-E]
- [USB-ITN-F]
- [USB-ITN-G]

### Figure 2 Foot switch type connecting cable

- [USB-ITN-A]
- [USB-ITN-B]
- [USB-ITN-C]
- [USB-ITN-D]
- [USB-ITN-E]
- [USB-ITN-F]
- [USB-ITN-G]