New system improves workability by eliminating long and cumbersome cables when communicating data to a PC
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.

**Easy loading in Excel format**

The U-WAVEPAK, U-WAVE-R standard package features a keyboard interface function. This allows measurement data to be easily loaded to a PC in Excel, Notepad or other format that accepts numeric value input via a keyboard.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.24</td>
</tr>
<tr>
<td>2</td>
<td>10.76</td>
</tr>
<tr>
<td>3</td>
<td>9.00</td>
</tr>
</tbody>
</table>

In addition, a virtual COM driver allows measurement data to be input to a program that supports RS-232C serial communication. However, note that the communication speed (baud rate) is fixed to 57,600 bps.

**Approximately 400,000 Data Transmissions**

One commercially available CR2032 lithium battery can be used for about 400,000 data transmissions. Assuming that the device is used twenty days a month, sending data 2,000 times a day, one battery would last for about ten months.

**Dustproof and water resistant IP67 model**

IP67-type U-WAVE-T (No.02AZD730D) has an IP67-level dust/water-proof function. This model can be used in combination with, for example, a coolant-proof caliper, micrometer or indicator.

**Reception is reported by LEDs (and a beep sound).**

- The green LED blinks when data is successfully received. A short beep sounds twice.
- The red LED blinks when data reception fails. A long beep sounds once.

Note: According to the Radio Regulations the use of this product is permitted in Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada. This product must not be used in other countries or areas.
Up to 100 measuring tools can be connected to one U-WAVE-R unit

Up to 100 U-WAVE-T units can be registered with one U-WAVE-R unit, and up to 16 U-WAVE-R units can be connected via a commercially available USB hub.

Up to 16 U-WAVE-R units can be connected to one PC.

Data communication range up to 20 m possible

The maximum reliable communication range is approximately 20 m*. Even when multiple U-WAVE-R units are used within the range of 20 m, interference does not occur since an ID (00 to 99) is assigned to each unit. Radio interference between U-WAVE-R units can also be avoided by setting different frequencies (selected from 15 bands).

*The range achievable depends on the local radio transmission characteristics.

Different frequencies ensure no radio interference

Because different frequencies are used, radio interference does not occur even when multiple devices are used in the same communication range.

Substantial cost reduction compared with conventional Mu-WAVE models!!

With a variety of function improvements, this product is now available at a lower price due to substantial cost reductions.

Cordless operation improves workability in measurement data recording

Measurement on surface plate

With a cordless device, the surface plate and PC desk no longer need to be adjacent, enabling freer layout in the inspection room.

Measurement of large workpieces

With U-WAVE operators can perform measurement freely walking around the workpiece. There are no cable constraints.

Measurement using long measuring tools

Long measuring tools are hard to handle, but U-WAVE eliminates cable constraints and improves workability.
Just pressing a switch loads measured data

Purchase the following four products (1 to 4) to enable data loading onto your PC.

3 U-WAVE-T/tool connection

A short cable is used to connect a measuring tool to its U-WAVE-T unit. Select the appropriate cable from A to G below (7 types) to suit the measuring tool. Detailed information on cable suitability is given on page 7.

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Water-proof model with output button</td>
<td>02AZD790A</td>
</tr>
<tr>
<td>B Water-proof model with output button</td>
<td>02AZD790B</td>
</tr>
<tr>
<td>C With data-out button type</td>
<td>02AZD790C</td>
</tr>
<tr>
<td>D 10-pin plain type</td>
<td>02AZD790D</td>
</tr>
<tr>
<td>E 6-pin round</td>
<td>02AZD790E</td>
</tr>
<tr>
<td>F Plain type straight</td>
<td>02AZD790F</td>
</tr>
<tr>
<td>G Plain type straight water-proof model</td>
<td>02AZD790G</td>
</tr>
</tbody>
</table>

Cable length: 160 mm

3 Mitutoyo Measuring Tool with Digimatic Output

This product can be connected to a measuring tool that provides Digimatic data output. Digimatic output is Mitutoyo's proprietary output format. The Digimatic specifications remain unchanged since the first Digimatic measuring tool was released. Therefore any tool having a Digimatic port can be used, regardless of whether the instrument is new or old, although note that the connectors on some older instruments are not compatible with the connectors used on the above-listed cables. Check with the cable list on page 7.
onto a PC through wireless communication.

When the data input button is pressed, the value displayed by the measuring tool is input to the active cell of Excel followed by “Enter” key input. The cursor movement direction after input (up, down, left or right) can be set in Excel.

Communication distance of approximately 20 m
(in a good transmission/reception location)

*Refer to page 6 for wireless communication specification

| U-WAVE-R | Model | Order No. | Power supply | Number of U-WAVE-R
|----------|-------|-----------|--------------|-------------------|
|          | U-WAVE-R | 02AZD810D* | USB bus power system | units that can be connected to one PC
|          |        |           |              | Up to 16
|          |        |           |              | Number of U-WAVE-T
|          |        |           |              | units that can be connected
|          |        |           |              | Up to 100
|          |        |           |              | External dimensions
|          |        |           |              | 140 x 80 x 31.6mm
|          |        |           |              | Mass
|          |        |           |              | 130g

*Detailed information on conformity standards of wireless communication specification is given on page 6.
*Refer to page 6 for specification of U-WAVEPAK (setup software)
Specifications of wireless communication

<table>
<thead>
<tr>
<th>Conformity standards</th>
<th>European conformity standards*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EN 50371:2002</td>
</tr>
<tr>
<td></td>
<td>EN 300 440-1 V1.3.1</td>
</tr>
<tr>
<td></td>
<td>EN 300 440-2 V1.1.2</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-01 V1.6.1</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-03 V1.4.1</td>
</tr>
<tr>
<td>U.S.A. conformity standards</td>
<td>47 CFR Part 15.247 (Subpart :C)</td>
</tr>
<tr>
<td></td>
<td>47 CFR Part 15, (Subpart :B)</td>
</tr>
<tr>
<td></td>
<td>Canada conformity standards</td>
</tr>
<tr>
<td></td>
<td>RSS-210 (Issue 7)</td>
</tr>
<tr>
<td></td>
<td>RSS-Gen (Issue 2)</td>
</tr>
<tr>
<td></td>
<td>ICE5 003 (Issue 4)</td>
</tr>
</tbody>
</table>

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

Note: According to the Radio Regulations the use of this product is permitted in Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada. This product must not be used in other countries or areas.
- This product is not compatible with the conventional Mu-WAVE, for which communication specifications are different.
* Japan conformity standards: ARIB STD-T66

1) U-WAVE-R
Receives 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 that accepts keyboard input. Data can also be input to a program that supports RS-232C serial communication using the virtual COM driver.

1) Operating environment
- Supported OS: Windows 2000 Professional (SP4 or higher)
- Windows XP Home Edition (SP2 or higher)
- Windows XP Professional (SP2 or higher)
- Windows Vista
- Other information: USB port needed

2) Initial setup procedure
- (1) Install the U-WAVEPAK (setup software).
- (2) Connect the U-WAVE-R main unit to the PC with a USB 2.0 cable.
- (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.

3) Data interface function
Data is input into an Excel or Notepad file as keyboard-input data.
- (1) Control key (terminal code)
- Codes to be suffixed to measurement data can be switched.
  - ENTER (default), TAB, up, down, left, right
- (2) Data loading mode
  - Two data formats are selectable.
    - Measurement data only (default) Example: +00000012.34
    - All data Example: DT1 01 02 +00000012.34 M
  - Measurement data
  - Unit: M: millimeter
  - I: inch
- Header: measurement data
  - U-WAVE-R ID: 00 to 99
  - U-WAVE-T ID: 00 to 99
- Measurement data
  - U-WAVE-R ID: 00 to 99
  - U-WAVE-T ID: 00 to 99

3) Use of status code
Select the state of U-WAVE or whether to output control command or other data.
- Ignore (default), load
- Status code: low battery voltage (00), no response from measuring tool (01), measurement data missing (03), data cancellation (99), etc.
- Example data cancellation
  - Header: status
  - U-WAVE-R ID: 00 to 99
  - U-WAVE-T ID: 00 to 99
  - Device ID: 0999999073
  - Status code: 99: data cancellation

*Unique number assigned to U-WAVE-T and WAVE-R at shipment
List of U-WAVE-T Connecting Cables

Select one from cables A to G, referring to the part number of connecting cable for wired connection in your measuring tool catalog or manual. If you are unsure which cable is appropriate, check the cable connectors, the shapes of terminal on the measuring tool side, or the codes of compatible measuring tool for cables A to G below. It is not possible to connect to EF and EH counters.

<table>
<thead>
<tr>
<th>Cable type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>02AZD790A</td>
<td>02AZD790B</td>
<td>02AZD790C</td>
<td>02AZD790D</td>
<td>02AZD790E</td>
<td>02AZD790F</td>
<td>02AZD790G</td>
</tr>
</tbody>
</table>

Connector shape on the measuring tool side:
- Light gray

Socket shape on the measuring tool:
- 

List of U-WAVE-T Connecting Cables

<table>
<thead>
<tr>
<th>Codes of major compatible measuring tools and instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Digimatic Caliper) CD67-S, PM, CD-PMX, CD-P/G/G/G/Gu</td>
</tr>
<tr>
<td>(Digimatic Depth Gage) HTD-R</td>
</tr>
</tbody>
</table>

Reference Order No. of connecting cable
- 05CZA624
- 05CZA662
- 959149
- 936537
- 937387
- 905338
- 21EAA194

Name and Dimensions of Each Part

<table>
<thead>
<tr>
<th>U-WAVE-T</th>
<th>U-WAVE-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector cover</td>
<td>Device ID label</td>
</tr>
<tr>
<td>44</td>
<td>Certification label</td>
</tr>
<tr>
<td>Battery cover</td>
<td>Buzzer (buzzer model only)</td>
</tr>
<tr>
<td>LED display</td>
<td>USB connector 160</td>
</tr>
<tr>
<td>Certification label</td>
<td>Buzzer (model only)</td>
</tr>
<tr>
<td>Certificate label</td>
<td>U-WAVE-R</td>
</tr>
</tbody>
</table>

Cautions

- Safety Caution:
  - Do not use this device near medical equipment that might malfunction due to radio interference.
  - Caution on radio law:
    - This device is certified as a 2.4 GHz band wide-band low-power data communication system based on the Radio Regulations in Japan, Europe, U.S.A., and Canada. It is prohibited by law to disassemble or modify this device or peel off the certification label from it.
  - Note on Wireless Communication Environment Although the communication range for U-WAVE is approximately 20 m line-of-sight, sufficient performance may not be obtained depending on the environment due to an obstacle or other factor.

Items that may cause communication error

<table>
<thead>
<tr>
<th>Item</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete wall</td>
<td>Communication is not possible in a room completely shut off.</td>
</tr>
<tr>
<td>Metal partition</td>
<td>Communication speed may drop or communication may be interrupted.</td>
</tr>
<tr>
<td>Wireless LAN, communication device such as Zigbee Bluetooth, and microwave oven</td>
<td>Communication speed may drop or communication may be interrupted. Maintain the set frequency and installation distance if at all possible.</td>
</tr>
<tr>
<td>Medical instrument</td>
<td>Do not use this product near a medical instrument such as a laser knife or electronic scale.</td>
</tr>
</tbody>
</table>
Combination with application systems

Combining this product with commercially available quality control software allows creation of statistical processing and inspection tables. New functions including U-WAVE ID identification and data cancellation have been added.

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.

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

Other Specifications

- Alarm function: tolerance judgment, control limit value, series, tendency, etc.
- Report output: statistical calculation result, chart, measured value, etc.
- Comment addition and per-layer function: it is possible to add history information (such as inspector, machine tool, lot number, serial number, and cause of failure) to data as comment so that it can be checked when a problem occurs or used as a keyword to search for or narrow down data.
- File import function: Text, PocketDL or other file
- File output: Excel, text or other format

Association between U-WAVE-T ID and the Measured Item

When there is a one-to-one relationship between the measuring tool and the measured item, data randomly measured by the operator can be automatically input into the associated measured item. When a single measuring tool measures multiple items, determine the measurement order in advance since a single ID cannot identify measured items.

When V6.0 or earlier version is used

When using an older version, it is necessary to upgrade to V6.1 to support data cancellation and other new functions in U-WAVE. In V6.0, data can be input in the USB input tool mode with the data interface function (identification by ID is not supported).
U-WAVE®

Measurement Navigation Program — PDA Navi

PDA Navi is a measurement navigation program that allows data input to MeasurLink Real-Time Plus on a PC to be viewed using a commercially available PDA* via a wireless LAN. This means that even when you make measurements at a station remote from your PC the measurement data can still be sent to the PC with U-WAVE, loaded into MeasurLink and the results fed back to PDA Navi for viewing at your remote station. GO/NG judgment results, statistical processing results, next point to be measured and other data can all be verified.

Operating Environment for PDA Navi

<table>
<thead>
<tr>
<th>Supported OS</th>
<th>Microsoft Windows Mobile 5.0 for Pocket PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported PDA</td>
<td>PDA equipped with above OS and wireless LAN</td>
</tr>
<tr>
<td></td>
<td>Recommended memory: ROM: 192 MB or more, RAM: 64 MB or more</td>
</tr>
<tr>
<td></td>
<td>Certified model: &quot;iPAQ hx 2490b2&quot; (from HP)</td>
</tr>
<tr>
<td>Supported MeasurLink</td>
<td>Real-TimePlus or STAT MeasurePlus V6.1 or higher (required when using PDA Navi)</td>
</tr>
</tbody>
</table>

PDA Navi Measurement Screen Example

Central Management of Quality Information through Construction of Measurement Data Network System

MeasurLink can be expanded to a network system of server and clients. This software consolidates and centrally manages measurement data generated across the factory (handheld measuring tools to CMMs) to support quality information sharing.

Operating Environment (Recommended)

<MeasurLink V6.1 Real-TimePLUS>

- OS: Windows 2000/XP
- CPU: Pentium II 400 MHz or higher
- Memory: 512 MB or more
- Hard disk: 2 GB or more free space
- I/O: USB port (required for U-WAVE-R connection)
- Media drive: CD-ROM (required at installation)
- Other specifications: keyboard and mouse

*PDA stands for Personal Digital Assistant and refers to a personal mobile information terminal.
**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**

![Measurement Data Input Screen](image)

**Creating, printing, and saving an inspection table using your original Excel format**

It is usually possible to edit an Excel data sheet for use as the inspection format for MeasureReport.

**New U-WAVE function**

Controlling input destination of measurement data

Possible controls include specification of input items using IDs, grouping of measured items, and specification of the cell to which the cursor moves after input.

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

Measuring tool A (channel 00)

Measuring tool B (channel 01)

Measured item group 1

Cell movement direction: right

Measured item group 2

Cell movement direction: down
Association between a U-WAVE-T ID and the Measured Item

A U-WAVE-T ID can be associated with each measured item.

When Using a Version before V4.0

When using an older version, it is required to upgrade to V4.1 to support the above function. In V4.1, data can be loaded by using the data interface function (identification by ID is not supported).

Other Specifications

- Capacity: Up to 200 items
  - Up to 2,000 workpieces
- GO/NG judgment function:
  - Tolerance judgment (NG value marked)
  - Workpiece judgment (OK/NG in the judgment field)
- Statistical analysis function: 15 items including average, maximum, minimum, standard deviation, range, Cp, Cpk, and fraction defective
- Format creation: automatic creation of template format (specification of cells as many as the number of items x number of workpieces)
- Inspection table printing and saving: printing and saving in Excel format
- Other specifications: alignment of digits after the decimal point, error display, automatic pagination

Operating Environment (Recommended)

<Measure Report V4.1 No.02ARA784A>

OS: Windows 2000/XP
CPU: 500MHz or higher
Memory: 256 MB or more
Display: resolution of 1024 x 768 or higher
Hard disk: 2 GB or more free space
I/O: USB port (required for U-WAVE-R connection)
Media drive: CD-ROM (required at installation)
Other specifications: keyboard and mouse
*Excel must be purchased separately.

U-WAVE’s New Function (Common):
Data Cancellation Function Activated by Holding Down the Data Button

Release the button when the U-WAVE-T LED starts blinking orange.

Hold down the DATA button for two seconds or longer.

Data input immediately before the button is pressed is canceled.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.23</td>
<td>5.32</td>
<td>5.51</td>
<td></td>
</tr>
</tbody>
</table>

------------|------------|------------|------------|
5.23        | 5.32       |            |            |
Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this pamphlet, as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs, dimensions and weights. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. Only quotations submitted by ourselves may be regarded as definitive.

Export permission by the Japanese government may be required for exporting our products according to the Foreign Exchange and Foreign Trade Law. Please consult our sales office near you before you export our products or you offer technical information to a nonresident.

Mitutoyo Corporation
20-1, Sakado 1-chome,
Takatsu-ku, Kawasaki-shi,
Kanagawa 213-8533, Japan
T +81 (0) 44 813-8230
F +81 (0) 44 813-8231
http://www.mitutoyo.co.jp