Mitutoyo

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Wireless Measurement Data Communication System
U-WAVE

U-WAVE fit

Promotes the Smart Factory by Collecting and Managing Measurement Data

"U-WAVE", the wireless communication system, collects measurement data in the inspection process swiftly and accurately, to increase a company's competitiveness with detailed data analysis. With MeasurLink, "IIOT* of Quality Control envisioned by Mitutoyo" can be achieved.
*Industrial Internet of Things

Achieve Smart Measurement

Wireless Measurement Data Communication System

U-WAVE

This system transmits data wirelessly from Mitutoyo Digimatic gages to SPC software or any software that accepts keyboard input, such as MeasurLink, Excel, or web browser.
It saves time, eliminates typos, helps achieve cost reductions and better efficiency while maintaining excellent operability.

U-WAVE fit

Compared to U-Wave T*, the compact and thin design provides better operability and fit to digimatic micrometers and calipers**

*please refer to page 8 for more details
**excludes micrometers and calipers over 12", MDH, Quick Mike, and some specialty hand tools

From a Digimatic gage connected with U-WAVE

Data is obtained via wireless communication and sent to commercial software such as Excel or MeasurLink

Advantages of Introducing U-WAVE

Higher Efficiency
Data can be input by single button operation! Since there is no need for manual input, typing errors do not occur. Efficiency is greatly improved!

Centralized Data Management
Measurement data can be managed centrally! "Visualization of quality" helps prevent the production of defective products!

Cost Reduction Effect
Modular design allows easy connection to existing Digimatic gages! Digimatic output comes standard on all specialty Mitutoyo gages such as spline and V-anvil micrometers, blade calipers, and carbon fiber calipers.

U-WAVE resolves measuring process issues!

Issue

Manual input of measurement data is inefficient and frequently generates mistakes in entering data (ie. transposing number, missing decimal, etc.)

Solution

U-WAVE immediately transmits the measurement data to your PC. Errors due to manual input can be eliminated, and therefore data reliability and operational efficiency is improved.

Issue

Wireless data transmission is unreliable in a noisy, industrial environment.

Solution

U-Wave boasts industry leading signal transmission and has been tested in poor conditions, proven to maintain strong signal connection.

Issue

Since multiple operators use Digimatic gages, it takes a long time for data collection and Pass/fail judgment.

Solution

Up to 100 Digimatic gages can be registered to a single U-WAVE receiver on the PC side. The data can automatically be entered separately in the Excel sheet. Therefore, data collection and Pass/fail judgment are easily performed.

Mitutoyo

Speedy and Reliable Data Collection Judgment Improves Manufacturing Competitiveness

Higher Efficiency

Conventionally...

Measure → 12.34 Data is displayed → ✗ Typo Manually record data → **Requires time** / **Troublesome** Transfer data to PC → **Misinput** / **Troublesome** Input by keyboard

If U-WAVE is used...

Measure → 12.34 Data is displayed → Load data to PC by push button operation

No typing inaccuracies and time is saved!
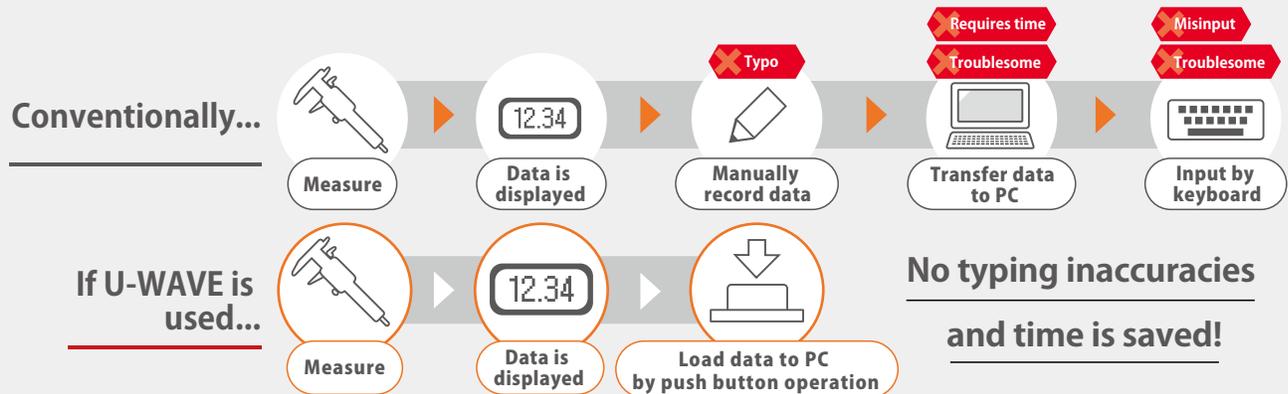
LED or a buzzer* notifies data reception

Confirmation that data was successfully received.

Patented in Japan

* The optional buzzer model includes LED.

- Normally received: green LED blinks
- Buzzer sounds twice briefly

- Reception failed: red LED blinks
- Buzzer sounds once

Dustproof and water resistant IP67 model

The buzzerless transmitter can be submerged in water and is completely resistant to dust, maintaining the highest IP rating of the gage.

IP67

Cordless enables freedom of movement

No cord allows easy operation especially with large measuring tools, workpieces, and distant computers.

Wireless communication range up to 60ft*1 (line of sight)

The measurement site can be laid out freely.

*1: May be less according to the operating environment.

Digimatic gage   Receiver

Approx. 60ft at maximum
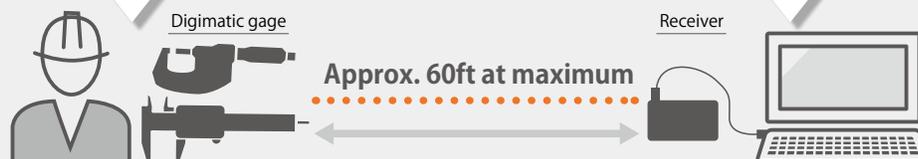
Typing errors generated by manual input is eliminated

The measurement data can be transmitted directly by a single button operation.

### Industrial wireless communication

Mitutoyo's original wireless communication based on IEEE802.15.4 (2.4 GHz) has been adopted.

Centralized Data Management

Operation in an Excel sheet

The data can be read directly from an Excel sheet.

Digitalization enables easy data collection and analysis

The measurement data from each process can be stored and managed on a central database with MeasurLink.

Up to 100 Digimatic gages can be registered to a single U-Wave Receiver

Using MeasurLink or USB-ITPAK V2.1, data can be laid out for each Digimatic gage based on the data identification ID.

Up to 15 receivers can be connected to a PC or multiple PCs

Data can be collected up to 1,500 measuring instruments equipped with Digimatic output on a central database.

Receiver
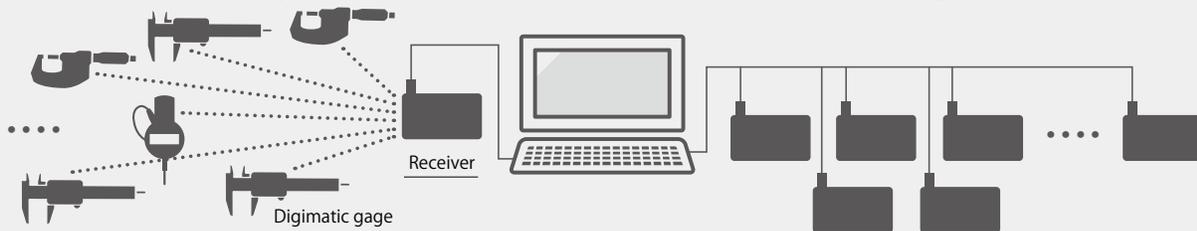
Digimatic gage

Cost Reduction Effect

Point **If a Digimatic gage is damaged, operation can be continued using a different gage**

The transmitter can be reconnected to a different Digimatic gage.

Transmitter
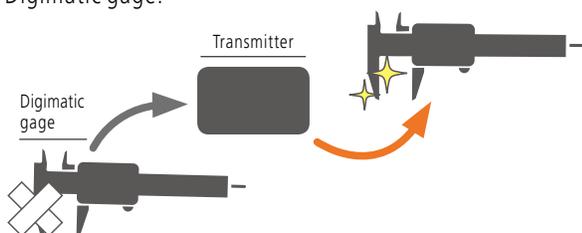
Digimatic gage

Point **Connectable to any of your existing Digimatic SPC gages**

No need to buy a replacement if your tool is equipped with the Digimatic function.

Point **Approximately 400,000 continuous data transmissions are possible**

Just one CR2032 lithium battery provides power for about 400,000 data transmissions.

![Mitutoyo]

Product Configuration

(Refer to pages 7 and 8 for details.)

Receiver

U-WAVE-R

- Receives measurement data and transmits to the PC via USB.
- Since USB bus power system is used, a battery or adapter is not required.
- The ID and frequency can be set using supplied software U-WAVEPAK.
- The data load function to Excel, etc. is supplied as a standard accessory.

PC (for storing data)
Data loaded to the PC via USB.

U-WAVE-R

Transmitters

NEW Products

U-WAVE-TM/TC/T

- Transmits the measurement data displayed on the gage to U-WAVE-R.
- Compact, cable-less design provides a better fit with the Digimatic gage and better operability.

U·WAVE fit

U·WAVE fit
U-WAVE-TC

U·WAVE fit
U-WAVE-TM

U-WAVE-T

Connecting unit/connecting cable

- A compact connecting unit connects the U-WAVE-TM/TC transmitter to the Digimatic gage.
- A dedicated cable connects the U-WAVE-T transmitter to the Digimatic gage.

Connecting unit

Connecting unit

Connecting cable
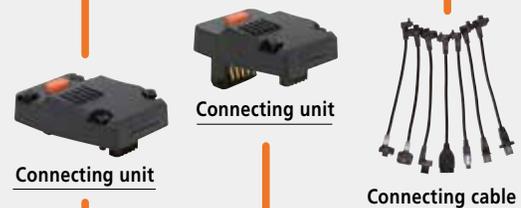
Digimatic gages

Compatibility

- U-WAVE-TM/TC can be used with most of the calipers and micrometers equipped with the Digimatic output function.
- U-WAVE-T can be used with all the Digimatic gages equipped with the Digimatic output function.

Digimatic caliper

Digimatic micrometer

Digimatic Gages

Product Outline

U-WAVE fit   **U-WAVE-TM/TC compatible Digimatic gages**(reference)
For details, refer to a separate sheet "U-WAVE-TM/TC Compatible Devices" or our web site.

Digimatic micrometer	Digimatic caliper

Transmitters

U-WAVE-TM/TC

Patent applied for in Japan, U.S., China, and Germany
Design registered in Japan, U.S., EU, and China

NEW Products

With functions and performance inherited from U-WAVE-T, a compact and thinner design provides a neater solution which eliminated cables around the Digimatic gage and fot better operability!

U-WAVE fit

For micrometers
U-WAVE-TM

For calipers
U-WAVE-TC

U-WAVE-TM for micrometers and U-WAVE-TC for calipers are available, both as the buzzer type and water/dust-proof IP67 type. The buzzer type notifies the normal reception of data by LED and buzzer sound. The water/dust-proof IP67 type is designed for a harsh environment and as such is only equipped with LED notification of data reception.

■ Connecting compatible micrometers, calipers and other Digimatic gages to U-WAVE

Gage		Assembled appearance			Connecting unit/connecting cable	
For micrometers	Standard		Front	Back		02AZF310
	Water/ dust-proof		Front	Back		
For calipers	Standard		Front	Back		02AZF300
	Water/ dust-proof		Front	Back		02AZF310
Digimatic gages					Connecting cable*	

* Select according to the Digimatic gage to be connected. Refer to page 13 for connecting cables.

U-WAVE-T

This product successfully introduced U-WAVE to the industry.

U-WAVE-T is connected to a Digimatic gage with a dedicated cable that mates with the data connector on that particular gage.

The buzzer type and water/dust-proof IP67 type are available. The buzzer type notifies the normal reception of data by LED and buzzer sound. The water/dust-proof IP67 type is designed for a harsh environment and as such is only equipped with LED notification of data reception.

| Transmitter			Receiver
	U-WAVE-TM With buzzer 264-623	U-WAVEfit	
IP67	U-WAVE-TM Water/dust-proof 264-622	U-WAVEfit	
	U-WAVE-TC With buzzer 264-621	U-WAVEfit	U-WAVE-R 02AZD810D
IP67	U-WAVE-TC Water/dust-proof 264-620	U-WAVEfit	Design registered in Japan
	U-WAVE-T With buzzer 02AZD880G		
IP67	U-WAVE-T Water/dust-proof 02AZD730G		

Typical Measuring Issues Solved

In combination with application software MeasurLink or USB-ITPAK V2.1, better efficiency in quality assurance can be achieved.

Case 1

Standard sequential measurement input

Issue
To record the measurement results, on a chart, from three points on a mass-produced product measured using two gages.

Solution
Set the procedure of inputting data to the Excel sheet with USB-ITPAK V2.1, to automatically enter measurement data.

Measure the workpiece dimensions, X and Y, with a micrometer. Then, measure H with a caliper. Finally, visually check the appearance and judge OK or NG. Perform the above for 5 workpieces consecutively.
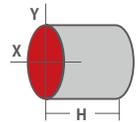
Point Measurements in order

The designated table will be created by measuring and transmitting data for X and Y of 5 workpieces, measuring and transmitting data of H, and then entering the result of visual check.

Point Set the sequential measurement input order

Designate the Excel sheet, select the data loading range, loading order, and allocate the ID for each cell.

❶ Measure X and Y for 5 workpieces with a micrometer.

❷ Measure H for 5 workpieces.
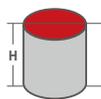
❸ Enter "OK" or "NG" for the visual check.

USB hub (Commercially available)
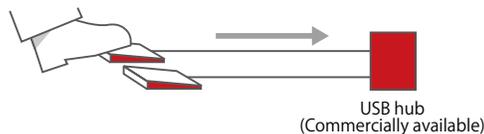
Designated Excel sheet

	A	B	C	D	E	F
1	Setting	1	2	3	4	5
2	Dimension X	10.025	10.033	9.964	10.031	10.046
3	Dimension Y	9.982	10.017	10.008	9.996	10.027
4	Dimension H	29.97	30.02	30.07	29.96	30.04
5	External Appearance	OK	OK	NG		

Input range of micrometer

Input range of caliper

Input range of visual judgment

Data will be input one by one in the registered order to the cells of the Excel sheet designated beforehand.

‹ Option ›

USB-ITPAK V2.1

USB dongle

A USB dongle must be connected to the PC running the software.

Measurement Data Collection Software

USB-ITPAK V2.1

USB-ITPAK V2.1 is optional software to be installed in the PC connected with U-WAVE-R. It enables setting up the procedure to input the measurement data received from U-WAVE-R to the Excel sheet and to achieve greater inspection efficiency and enhanced credibility.

| The combined use with U-WAVE will improve the operational efficiency of the inspection work. | Best suited for recording data in mass-production inspections where the procedure is repeated every day. |

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<table>
<tr><td rowspan="2">**Case**
 2

 Data input by multiple operators</td><td>**Issue**</td><td>To sort data into separate Excel sheets per Digimatic gage in the inspection process.</td></tr>
<tr><td>**Solution**</td><td>The data collected by multiple operators can be individually set to be input to the designated cells in the Excel sheet.</td></tr>
</table>

▶ Input data of each Digimatic gage in order into the designated cells of the separate Excel sheet.

(Point) Up to 100 Digimatic gages can be registered

100 Digimatic gages at maximum can be registered to a receiver and the same number of Excel sheets can be designated.

(Point) Designate the Excel sheet per Digimatic gage

Using USB-ITPAK, designate the Excel sheet per Digimatic gage. Then, same as the sequential measurement, select the data loading range, loading order, and allocate the IDs.

ID=00
ID=01
ID=02
ID=99

Sheet 1   ID=00
Sheet 2   ID=01
Sheet 3   ID=02
Sheet 100   ID=99
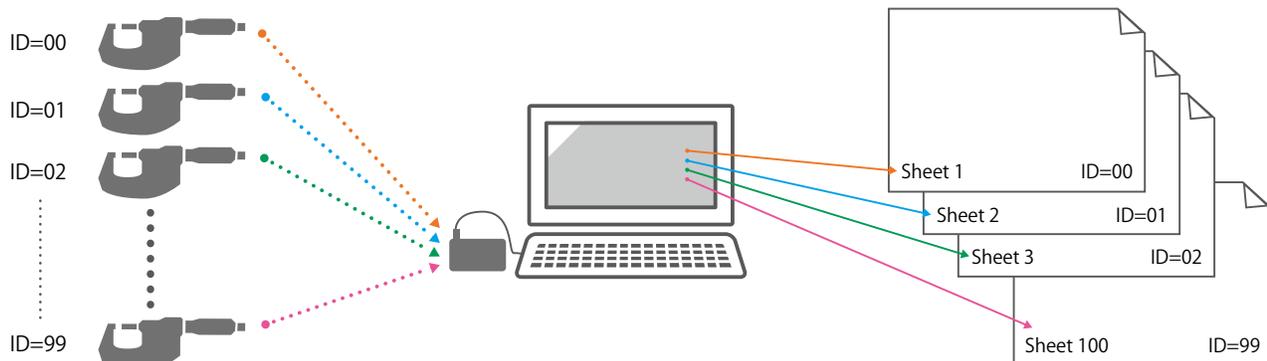
Multiple measurement data (via U-WAVE-TM/TC/T) can be sorted into the separate Excel sheets without requiring you to program macros.

▶ Features of USB-ITPAK V2.1

● The measuring methods can be configured, such as sequential measurement, batch measurement, individual measurement and more.

● Data can be canceled by a single operation of the foot switch or function key.

● Input range can be specified per Digimatic gage, which reduces the chance of a misinput.

● Data input or cancellation can be instructed globally in multiple-point simultaneous measurement.

● The Excel sheet can be automatically called for data input.

● The cursor movement after data input can be set to enable automatic input.

Case 3
Batch measurement using timer

Issue — To measure displacement using multiple Digimatic gages and automatically obtain data in a certain input interval.

Solution — Batch timer input is available using the USB-ITPAK batch measurement function and the optional timer input function.

■ Specify the interval for measuring the displacement of the workpiece and collect data at once.

Point — Batch measurement with all the Digimatic gages

Data can be obtained globally by a foot switch operation.

Point — Timer input option

Using USB-ITPAK, the data request interval can be set by hours, minutes, and seconds (0.0 sec. to 24 hrs.).

Point — Batch timer input

Data can be obtained at the desired interval using the timer input function in batch measurement.

	A	B	C	D	E	F	G
1	Displacement (1)	Displacement (2)	Displacement (3)	Displacement (4)	Displacement (5)	Displacement (6)	Measurement date/time
2	0.281	0.162	0.121	0.051	0.011	−0.001	2013/4/1 7 30 00
3	0.279	0.152	0.133	0.064	0.018	−0.003	2013/4/1 7 30 05
4	0.265	0.149	0.142	0.089	0.021	−0.007	2013/4/1 7 30 10
5							
6							

After 5 sec.
After 5 sec.
After 5 sec.

Configuration

USB hub (Commercially available)

U-WAVE-R

Frequency 2.405 GHz   Frequency 2.475 GHz

U-WAVE-T

Workpiece   Displacement

Data acquisition order ① ② ③ ④ ⑤ ⑥

● To perform simultaneous measurement using U-WAVE, a special order software U-WAVEPAK (Event drive) is required.
● Since the data refresh interval of the event drive is fixed at 0.5 seconds, the setting range is from 0.5 seconds to 24 hours.

〈 Option 〉

Check the displayed value per 0.5 sec.

Transmitter

Elapsed time (sec.)	Measurement data
0.0	2.001
0.5	2.001
1.0	2.003
1.5	2.003
2.0	2.004
2.5	2.004
⋮	⋮

Transmits when data is changed.

Receiver

Retained data
2.001
2.003
2.004

Overwrite save

Data request command

PC

Excel

Load   2.004
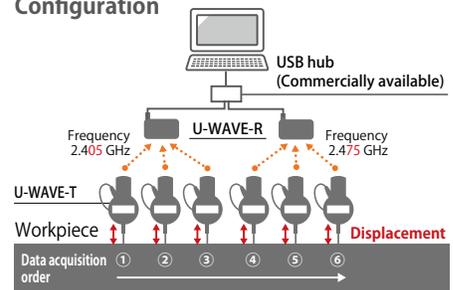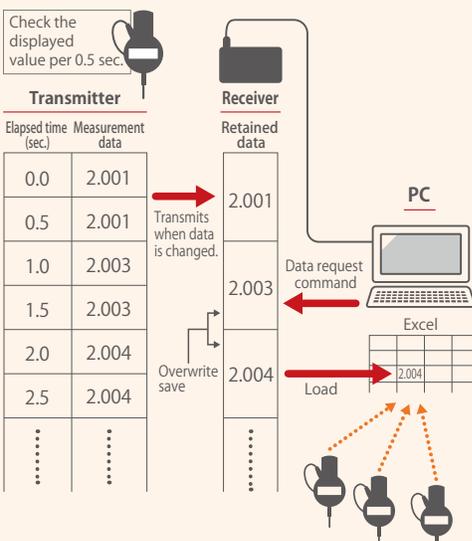
Responds to data request from PC
Special order U-WAVEPAK (Event drive)

Using event drive mode

① For configuration, special order software U-WAVEPAK (Event drive) is used.
② The data request command can be sent to U-WAVE-R at an arbitrary timing.

Responds to data request command

① U-WAVE-TM/TC/T checks the displayed value of the Digimatic gage in the 0.5 sec. interval, and transfers data if the value is changed.
② U-WAVE-R overwrites data in the storage.
③ Sends data responding to the data request command.

Enables automatic data load

Without operating the send button of the Digimatic gage, data can be obtained automatically from multiple Digimatic gages.

Achieve "Visualization of Quality"

Collecting the measurement data

Measurement Data Wireless
Communication System
U-WAVE

IIoT of Quality Control

Measurement Data Network System
MeasurLink

Configure the measurement system with MeasurLink using U-WAVE as the base for Smart Measurement
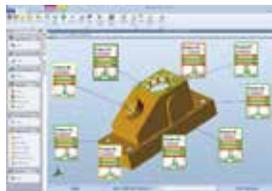
The benefits of MeasurLink®

MeasurLink is an IIoT platform for quality management that realizes "Visualization of Quality" by enabling real-time data collection with easy to see charts and statistics. From the networked Digimatic gages to global control and analysis, U-Wave supports MeasurLink as an infrastructure that collects and controls data.

Preventing defectives

Collects data from the Digimatic gages on the network and performs statistical process control (SPC) to warn of possible generation of defectives.

Diagnosis by data analysis

Check measurement results by accessing the data base and perform various analyses to help investigate and resolve process performance concerns.

Begin achieving IIoT

In addition to conventional data storage, the network can be configured in steps to begin IIoT of Quality Control.

Linkage between U-WAVE and MeasurLink

Inspection room

Shop floor

Network

U-WAVE

Inspection room

MeasurLink
Database server

Data Collection Software   MeasurLink Real-Time
This SPC software allows data collection from each tool and instrument and still allows realtime display of statistical processing data such as control charts, histograms and process capability indexes.

Process Management for Administrators   MeasurLink Process Manager
This administrative software enables centralized monitoring of information from all MeasurLink data collection terminals networked together on the shop floor.

Process Analysis module for Administrators   MeasurLink Process Analyzer
This administrative software allows confirmation of measurement results and various statistical analyses by access to the database where the measurement data collected with MeasurLink Real-Time is stored.

Gage Management Software   MeasurLink Gage Management
This software plans and implements a complete calibration schedule and incorporates a powerful retrieval function in addition to recording and managing the operational status of gages.

Evaluation / Analysis Software for Measurement System Analysis (MSA)   MeasurLink Gage R&R
This is evaluation and analysis software compliant with the MSA* required in ISO/ TS 16949.   *Measurement System Analysis

Measurement data	Collect data	Unify	Analyze	Visualize

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◤ Specifications

Transmitter (Refer to page 7 for combinations.)

Product name	U-WAVE-TM (for micrometers)		U-WAVE-TC (for calipers)		U-WAVE-T	
Model	U-WAVE-TM (IP67 type dust/water-proof)	U-WAVE-TM (buzzer type)	U-WAVE-TC (IP67 type dust/water-proof)	U-WAVE-TC (buzzer type)	U-WAVE-T (IP67 type dust/water-proof)	U-WAVE-T (buzzer type)
Order No.	264-622	264-623	264-620	264-621	02AZD730G	02AZD880G
Protection level	IP67	N/A	IP67	N/A	IP67	N/A
Data reception indication	LED	LED, buzzer	LED	LED, buzzer	LED	LED, buzzer
Power supply	Lithium battery CR2032×1					
Battery life	Approximately 400,000 transmissions					
Mass	18g				23g	
Appearance						
External dimensions	(mm) 38.8 / 12.9 / 41.9		(mm) 56 / 30.4 / 11.45		(mm) 44 / 29.6 / 16.6 / 18.5	

Receiver

Product name	U-WAVE-R
Model	U-WAVE-R
Order No.	02AZD810D
Power supply	USB bus power system
Connectable U-WAVE-R units (per PC)	Up to 15
Connectable U-WAVE-T units	Up to 100
Mass	130g
Appearance	
External dimensions	(mm) 80 / 140 / 31.6

U-WavePak comes standard with each Uwave-R to manage hardware and incoming data. Compatible OS: Windows 2000 Professional (SP2 or later) / Windows XP / Home Edition (SP2 or later) / Windows XP Professional (SP2 or later) / Windows Vista* / Windows 7* / Windows 8* / Windows 8.1* /Windows 10* (*compatible with 32/64-bit OS)

Connecting unit/connecting cable (Refer to page 7 for combinations.)

Product name	Order No.	Protection level	Mass	Appearance	External dimensions
Connecting unit (for water/dust-proof type)	02AZF310	IP67	6g		(mm) 27.15 / (19.6) / (14.8) / 21.8 / 27.15 / (12.75)
Connecting unit (for standard type)	02AZF300	N/A	6g		(mm) 26.25 / (19.6) / 21.8 / 26.25 / 17.65 / (12.75)

Product name	Appearance		Cable connector type	Part No.
Dedicated cable for U-WAVE-T		A	Water-proof type with output button	02AZD790A
		B	Water-proof type with output button	02AZD790B
		C	With data-out button	02AZD790C
		D	Flat 10-pin type	02AZD790D
		E	Round 6-pin type	02AZD790E
		F	Flat straight type	02AZD790F
		G	Flat straight waterproof type	02AZD790G

Wireless Communication Specifications

Wireless communication	Original (based on IEEE802.15.4 (2.4 GHz))	Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Wireless communication distance	Approx. 20 m (line of sight)	Communication frequency	2.4 GHz band (ISM band: Universal frequency)
Wireless communication speed	250kbps	Used band	15 channels (2.405 to 2.475 GHz at intervals of 5 MHz) The noise search function avoids interference with other communication devices.
Transmission output	U-WAVE-T: 1 mW (0 dBm) or less U-WAVE-TC/TM: 2.5 mW (4 dBm) or less		

Note: This product is a radio equipment classified in the 2.4 GHz Wide-band Low Power Data Communication System.
To use this product, conformity to the radio law of each country is required. Please contact your dealer or nearest Mitutoyo sales office.

Optional Products

Application system

Product name	Model No.	Compatible OS: Windows[1]	Compatible Excel version[2]	Part No.
USB-ITPAK	USB-ITPAK V2.1	2000 SP4 XP SP2 or later Vista 7 8 8.1 10	2000 2002 2003 2007 2010 2013 2016	06AFM386
U-WAVEPAK (for event drive)	This is a special order product. For the latest pricing, please contact your dealer or the nearest Mitutoyo Service Center. Product configuration: Only the program CD ● For U-WAVE-R and U-WAVE-TM/TC/T, please purchase the standard model. ● Install this special order U-WAVEPAK (Event drive) and perform setups without using the standard accessory U-WAVEPAK. ● A program to send a data request command is separately required to load data to the PC. <Event drive supporting software> USB-ITPAK V2.1 (manual input by the function key or foot switch and automatic timer input enabled)		

*1: 32-bit, 64-bit OS supported   *2: The operation with Excel for MAC OS is not guaranteed.

Accessories for U-WAVE-T

Product name	Product configuration				Order No.
Foot switch and connecting cable	U-WAVE-T / Foot Switch Type Connecting Cable / Foot Switch / Digimatic Indicator ID-C112CXB			Foot switch	937179T
		Connector type	A	Water-proof with switch	02AZE140A
			B	Water-proof with switch	02AZE140B
			C	With switch	02AZE140C
			D	10-pin plain	02AZE140D
			E	6-pin round	02AZE140E
			F	Straight type	02AZE140F
			G	Water-proof straight type	02AZE140G

Product name	Appearance	Dimensions and fixing example	Order No.
U-WAVE-T Installation Bracket Kit		Unit : mm 2-ø2.4 32.5 Hole to allow **U-WAVE-T** unit's battery to be replaced while the unit is still attached to the mounting plate 20 Access hole 61.6 71.6 49.6 15 Hole for connecting cable One fastener affixed to this surface Digimatic Indicator ID-C112XB	02AZE200

14

Coordinate Measuring Machines	Vision Measuring Systems	Form Measurement	Optical Measuring
Sensor Systems	Test Equipment and Seismometers	Digital Scale and DRO Systems	Small Tool Instruments and Date Management

**Whatever your challenges are,
Mitutoyo supports you from start to finish.**

Mitutoyo is not only a manufacturer of top-quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

**Find additional product literature
and our product catalog**

www.mitutoyo.com

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Mitutoyo

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Aurora, Illinois (Headquarters)
Boston, Massachusetts
Charlotte, North Carolina
Cincinnati, Ohio
Detroit, Michigan
Los Angeles, California
Birmingham, Alabama
Seattle, Washington
Houston, Texas