Measurement Data Management

Convenient data collection tool and quality control software

Measurement Data Wireless Communication System
U-WAVE-TCB/TMB（Mitutoyo *Bluetooth*® U-WAVE）

● Bluetooth® communication allows for wireless transmission of measurement data from digimatic micrometers and calipers to PCs, smartphones, tablets and other such terminals.

● More compact and thinner for a better fit with Digimatic gages, and featuring improved operability and performance inherited from its predecessor, U-WAVE-TCB/TMB is now available with Bluetooth® wireless technology. No receiver is required, and one PC can conect up to seven units of Mitutoyo *Bluetooth*® U-WAVE. Dust/water-proof models are also available for arduous shop floor usage.

● Bluetooth® communication not only allows cost reduction, as it does not require the conventional dedicated receiver unit, but it also improves operability.

● The application software for transferring measurement data to smartphones and tablets, or the application **U-WAVEPAK-BM** (English version only) is available at app stores (Google Play, Apple Store) for download.

U- WAVEPAK-BM

● **U-WAVEPAK-BW, the computer communication software for transferring measurement data to computer software, is available for download from our company's website.**

https://www.mitutoyo.co.jp/contact/products/u-wave/

Bluetooth® communication not only allows cost reduction, as it does not require the conventional dedicated receiver unit, but it also improves operability.

U-WAVE-TCB/TMB (Mitutoyo *Bluetooth*® U-WAVE) System Communication Specifications

• Wireless Communication Specifications

Wireless communication	Bluetooth® 4.2 Low Energy
Wireless communication distance	Approx. 16 m (line of sight) Approx. 10 m (in a factory environment)
Transmission output	3.2 mW (5 dBm) or less (Class2)
Modulation method	FH-SS (Frequency-hopping spread spectrum)
Communication frequency	2.4 GHz band

Note1 To use **U-WAVE-TCB/TMB**, conformity to the radio law of each country is required. Please contact your dealer or nearest Mitutoyo sales office.

Note2 **U-WAVE-TCB/TMB** is not compatible with **U-WAVE fit**, for which communication specifications are different.

Optional Accessories

Model No.	**USB-ITPAK V2.1**
Order No.	**06AFM386**
Compatible OS (Windows)	10 (64 bit)
Compatible Excel version	2016 (The operation with Excel for MAC OS is not guaranteed.)

Note: Refer to pages A-22 to A-24 for details of **USB-ITPAK V2.1**.

USB-ITPAK V2.1

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

Refer to the Measurement Data Wireless Communication System **Mitutoyo *Bluetooth*® U-WAVE** Brochure (**E12048**) for more details.

Measurement Data Wireless Communication System
U-WAVE-TMB/TCB（Mitutoyo *Bluetooth*® U-WAVE）

Transmitter/Receiver

264-626

264-625

SPECIFICATIONS

Order No.	For Digimatic micrometers		For Digimatic calipers	
	264-626	**264-627**	**264-624**	**264-625**
Model	**U-WAVE-TMB** (IP67 type dust/water-proof)	**U-WAVE-TMB** (buzzer type)	**U-WAVE-TCB** (IP67 type dust/water-proof)	**U-WAVE-TCB** (buzzer type)
Protection level	IP67	N/A	IP67	N/A
Data reception indication	LED	LED, buzzer	LED	LED, buzzer
Power supply	Lithium battery CR2032×1			
Battery life	Approx. 1 year under normal conditions of use, but varies according to usage.			
Mass (g)	18			

02AZF310

02AZF300

Choose a connecting unit compatible with your gage.

Order No.	**02AZF310**	**02AZF300**
Protection level	IP67	N/A
Mass (g)	6	
Connecting unit	**U-WAVE-TCB/TMB** (for dust/water-proof type)	**U-WAVE-TCB** (for standard type)

For model compatibility information, refer to "**U-WAVE** fit Compatible Devices", a separate sheet provided with **Catalog No. 12000**: Measurement Data Wireless Communication System **U-WAVE**.
https://www.mitutoyo.co.jp/support/service/catalog/09_system/1200_appendix.pdf

Compatibility of measuring tool and unit

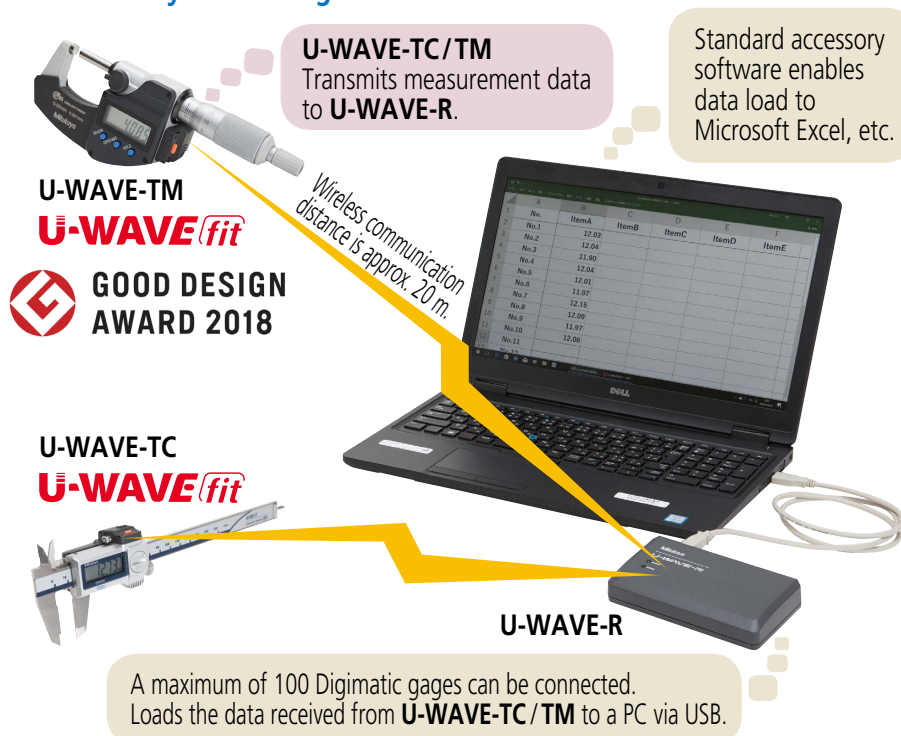|		Assembled appearance	Connecting unit	Transmitter
For micrometers	Standard		02AZF310	**264-627** **U-WAVE-TMB** (buzzer type)
	Water-proof type		02AZF310	**264-626** **U-WAVE-TMB** (IP67 type dust/water-proof)
For calipers	Standard		02AZF300	**264-625** **U-WAVE-TCB** (buzzer type)
	Coolant-proof type		02AZF310	**264-624** **U-WAVE-TCB** (IP67 type dust/water-proof)

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A

Measurement data wireless communication system
U-WAVE-TC/TM (U-WAVE fit)

- Data from tools with Digimatic output function can be sent to a PC via wireless communication.
- With functions and performance inherited from **U-WAVE-T**, the compact and thinner design provides better fitting to an instrument and improved operability, which enables further improvement of efficiency.
- The data interface function of the **U-WAVE-R** standard accessory software enables data input to commonly available software (Microsoft Excel, Notepad, etc.) by keyboard input.
- Wireless communication eliminates cabling, improving measuring operability.
- By combining with **USB-ITPAK V2.1**, recording of inspections using Excel becomes more efficient. Loading multiple measurement data into separate Excel sheets, or simultaneous measurement using the event driven is now available without the need for macro programming yourself. (Automatic loading in a certain interval is available with a timer function.)

U-WAVE fit system configuration

U-WAVE-TM

GOOD DESIGN AWARD 2018

U-WAVE-TC/TM
Transmits measurement data to **U-WAVE-R**.

Standard accessory software enables data load to Microsoft Excel, etc.

Wireless communication distance is approx. 20 m.

U-WAVE-TC

U-WAVE-R

A maximum of 100 Digimatic gages can be connected.
Loads the data received from **U-WAVE-TC/TM** to a PC via USB.

U-WAVE-R
Receives data from **U-WAVE-TC/TM, U-WAVE-T** and loads to a PC via USB.

Model	U-WAVE-R
Order No.*	02AZD810D/02AZD810E/02AZD810F
Power supply	USB bus power system
Number of **U-WAVE-R** units that can be connected to one PC	Up to 15
Number of **U-WAVE-T** units that can be connected	Up to 100
External dimensions	140×80×31.6 mm
Mass (g)	130

* Order No. differs depending on the destination country.

U-WAVEPAK software (standard accessory)
System Environment: Compatible OS
Windows 2000 Professional (SP4 or later)
Windows XP Home Edition (SP2 or later)
Windows XP Professional (SP2 or later)*
Windows Vista*, Windows 7*, Windows 8/8.1*
Windows 10*
* 32-bit, 64-bit OS supported
   <Versions confirmed operational on Windows 10>
   · **U-WAVEPAK Version1.020** or later

U-WAVE-R main unit

USB2.0 cable (1 m) attached

U-WAVEPAK

Connectability confirmed for tablet PC
· Microsoft Surface Pro 6 (the version whose operation on Windows 10 Professional is confirmed)
· Required environment: DVD drive (required for installation), USB port ×2 ports or more
Note: Cannot be connected to a device other than a PC (such as **DP-1VA LOGGER**, sequencer etc.).

U-WAVE-TC/TM (U-WAVE fit)
System Communication Specifications
• Wireless communication

Wireless specifications	IEEE802.15.4 base
Wireless communication distance	Approx. 20 m (line of sight)
Wireless communication speed	250 kbps
Transmission output	2.5 mW (4 dBm) or less
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Communication frequency	2.4 GHz band (ISM band: Universal frequency)
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.

Note: To use **U-WAVE-TC/TM**, the conformity to the radio law of each country is required. If you use this product outside the country of purchase, please contact your dealer or nearest Mitutoyo sales office.

Refer to the **U-WAVE** Brochure (**E12000**) for more details.

For model compatibility information, refer to "**U-WAVE** fit Compatible Devices", a separate sheet provided with **Catalog No. 12000**: Measurement Data Wireless Communication System **U-WAVE**.

Main specifications of U-WAVEPAK
- Setup of dedicated driver software (USB and virtual COM port)
- Initial setting of ID number and frequency selection (required only once for the first time)
- Load data to Microsoft Excel or Notepad through the data interface function

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A-17

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Measurement data wireless communication system
U-WAVE-TM/TC (U-WAVE fit)

Type of transmission unit

264-622

264-621

SPECIFICATIONS

IP67 type is resistant to water and dust ingress. Buzzer type notifies data reception by buzzer sound and LED.

Connectable measuring instruments	Micrometer		Caliper	
Order No.	**264-622***	**264-623***	**264-620***	**264-621***
Model	**U-WAVE-TM** (IP67 type)	**U-WAVE-TM** (Buzzer type)	**U-WAVE-TC** (IP67 type)	**U-WAVE-TC** (Buzzer type)
Protection Rating	IP67	N/A	IP67	N/A
Data reception indication	LEDs	Buzzer and LEDs	LEDs	Buzzer and LEDs
Power supply	Lithium battery CR2032×1			
Battery life	Approx. 400,000 times continuous data transmission			
External dimensions (mm)	41.9×12.9×38.8		56×11.45×30.4	
Mass (g)	18			

* Order No. differs depending on the destination country. Add the following suffix to the order No.: K for Korea, B for Brazil and Argentina.
Note: IP67 type is water/dust-proofed suitable for the factory floor. Buzzer type is not water/dust-proofed.

02AZF310

02AZF300

Fixed to transmission unit and inserted into output connector of Digimatic gage.

Order No.	**02AZF310**	**02AZF300**
Protection level	IP67	N/A
Mass (g)	6	
Connectable transmission unit	**U-WAVE-TC/TM** (IP67 type)	**U-WAVE-TC** (buzzer type)

Note: **02AZF310** ensures water-proof performance only when attached to measuring instruments of IP67 type.
For information on supported connecting units, please contact your local Mitutoyo sales office.

Compatibility of measuring tool and unit

Digimatic gage		Assembled appearance (Front/Back)	Connecting unit	Transmission unit
Micrometer	Standard		**02AZF310**	**264-623*** U-WAVE-TM (buzzer type) **U-WAVE fit**
	Water-proof type			**264-622*** U-WAVE-TM (IP67 type) **U-WAVE fit**
Caliper	Standard		**02AZF300**	**264-621*** U-WAVE-TC (buzzer type) **U-WAVE fit**
	Coolant-proof type		**02AZF310**	**264-620*** U-WAVE-TC (IP67 type) **U-WAVE fit**

* Order No. differs depending on the destination country. Add the following suffix to the order No.: K for Korea, B for Brazil and Argentina.
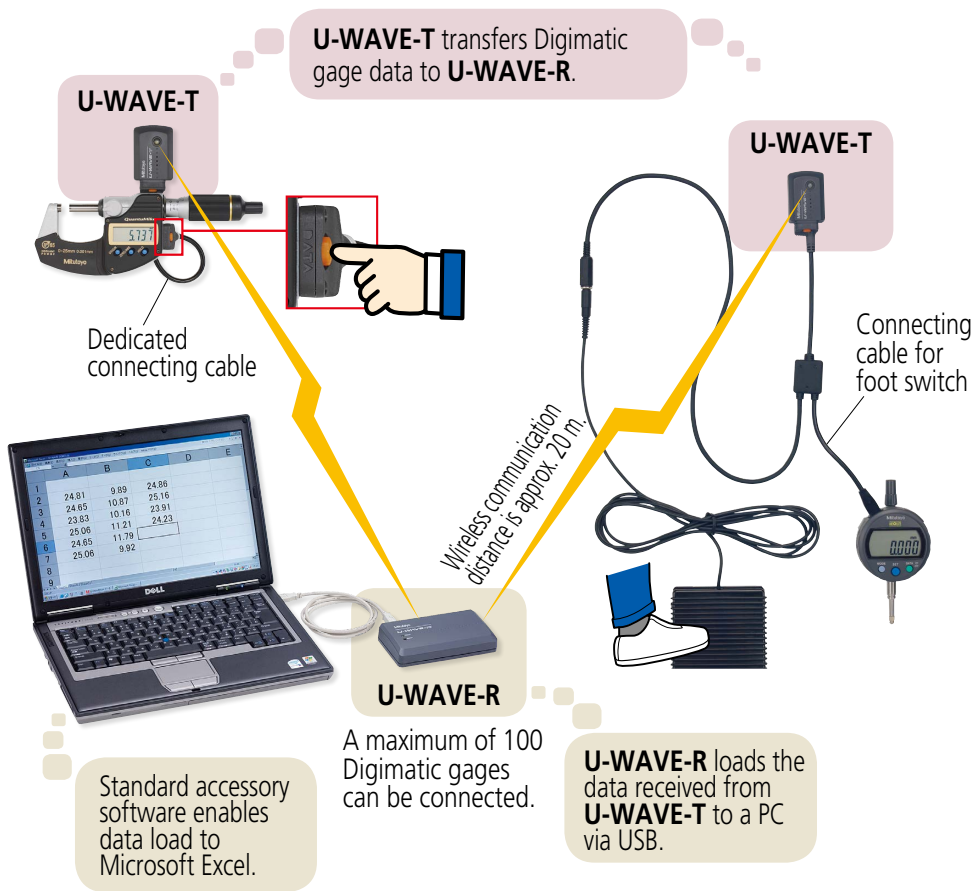
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Measurement Data Wireless Communication System U-WAVE

- Data from Digimatic gages can be loaded to a PC easily.
- Wireless communication eliminates cabling, improving measuring operability.
- The Data Interface Function of the **U-WAVE-R** standard accessory software enables data input to commonly available software by keyboard input (Microsoft Excel, Notepad, etc.).
- **USB-ITPAK V2.1** supports **U-WAVE**!
  Loading multiple measurement data into separate Excel sheets, or simultaneous measurement using the event driven is now available without the need for macro programming yourself.
  (Automatic loading in a certain interval is available with the timer function.)

U-WAVE system configuration

U-WAVE-T transfers Digimatic gage data to **U-WAVE-R**.

U-WAVE-T

Dedicated connecting cable

Connecting cable for foot switch

Wireless communication distance is approx. 20 m.

U-WAVE-R

A maximum of 100 Digimatic gages can be connected.

Standard accessory software enables data load to Microsoft Excel.

U-WAVE-R loads the data received from **U-WAVE-T** to a PC via USB.

U-WAVE-T
System Communication Specifications
• Wireless communication

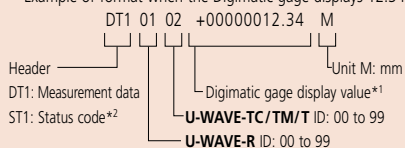| Order No.*	02AZD730G/02AZD730H/ 02AZD880G/02AZD880H	02AZD730J/02AZD880J
Transmission output	1 mW (0 dBm) or less	5 mW (7 dBm) or less
Wireless specifications	IEEE802.15.4 base	
Wireless communication distance	Approx. 20 m (within visible range)	
Wireless communication speed	250 kbps	
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise	
Communication frequency	2.4 GHz band (ISM band: Universal frequency)	
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.	

* Order No. differs depending on the destination country.
Note: To use **U-WAVE-T**, the conformity to the radio law of each country is required. If you use this product outside the country of purchase, please contact your dealer or nearest Mitutoyo sales office.

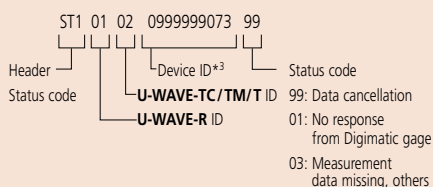Refer to the **U-WAVE** Brochure (**E12000**) for more details.

• Data format

Example of format when the Digimatic gage displays 12.34

DT1 01 02 +00000012.34 M

Header
DT1: Measurement data
ST1: Status code*[2]
Digimatic gage display value*[1]
Unit M: mm
U-WAVE-TC/TM/T ID: 00 to 99
U-WAVE-R ID: 00 to 99

*[1] Data interface function is switchable to "Measurement value only"
e.g.) 12.34
*[2] Example of status code format

ST1 01 02 0999999073 99

Header
Status code
Device ID*[3]
Status code
U-WAVE-TC/TM/T ID
U-WAVE-R ID
99: Data cancellation
01: No response
from Digimatic gage
03: Measurement
data missing, others

*[3] Unique number assigned to **U-WAVE** at shipment

Notes on Identification of Measurement Data and Multiple Systems Operation

Following the above format, the **U-WAVE** data format starts with a 4-digit code where the first two digits represent receiver channels and the last two are transmitter channels. The large number of transmitter/receiver combinations possible with this scheme ensures that the receivers in a factory measurement system only accept data from the intended transmitters, even when several receivers are all within communication range of different transmitters using the same channel.
Different frequency bands (up to 15 available) may also be used to further ensure that there are no communication problems between adjacent **U-WAVE-R** units.
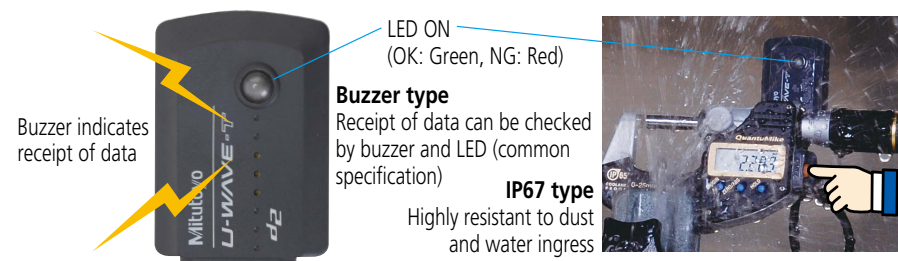
Measurement Data Wireless Communication System U-WAVE

U-WAVE-T

Transmits measurement data to **U-WAVE-R**. Select IP67 or buzzer type, according to your application.
U-WAVE-R can be connected to Digimatic gages by dedicated cable for **U-WAVE-T** (optional).

Model	U-WAVE-T (IP67 type)	U-WAVE-T (Buzzer type)
Order No.*	**02AZD730G / 02AZD730H / 02AZD730J**	**02AZD880G / 02AZD880H / 02AZD880J**
Protection Rating	IP67	None
Data reception indication	LEDs	Buzzer and LEDs
Power supply	Lithium battery CR2032×1	
Battery life	Approx. 400,000 transmissions	
Dimensions (mm)	44×29.6×18.5	
Mass (g)	23	

* Order No. differs depending on the destination country.

LED ON
(OK: Green, NG: Red)

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

Buzzer indicates receipt of data

IP67 type
Highly resistant to dust and water ingress

U-WAVE-T dedicated connection cable

A dedicated cable connects a Digimatic gage to **U-WAVE-T**. Check the connector (A to G; refer to pages A-27 and A-28 for details) compatible with the Digimatic gage to be used and select either standard type (figure 1) or foot switch type (figure 2) according to your application.

Type	Standard connecting cable Order No.	Connecting cable for foot switch Order No.
(A) Water-proof model with output button	**02AZD790A**	**02AZE140A**
(B) Water-proof model with output button	**02AZD790B**	**02AZE140B**
(C) With data-out button	**02AZD790C**	**02AZE140C**
(D) 10-pin plain type	**02AZD790D**	**02AZE140D**
(E) 6-pin round type	**02AZD790E**	**02AZE140E**
(F) Plain type straight	**02AZD790F**	**02AZE140F**
(G) Plain type straight water-proof model	**02AZD790G**	**02AZE140G**
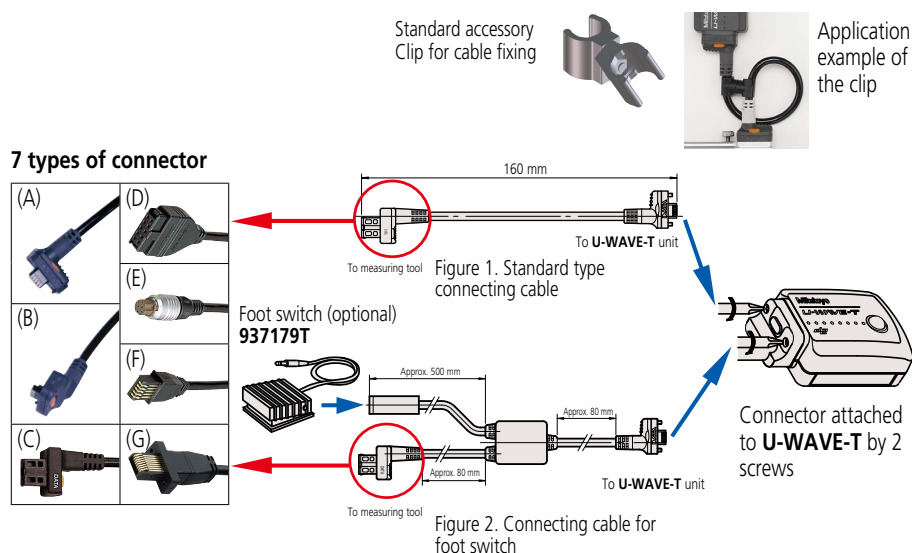
Standard accessory
Clip for cable fixing

Application example of the clip

7 types of connector

(A) (D)
(B) (E)
(C) (F)
(G)

160 mm

To measuring tool
To **U-WAVE-T** unit
Figure 1. Standard type connecting cable

Foot switch (optional) **937179T**

Approx. 500 mm
Approx. 80 mm
Approx. 80 mm
To measuring tool
To **U-WAVE-T** unit
Figure 2. Connecting cable for foot switch

Connector attached to **U-WAVE-T** by 2 screws

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Measurement Data Wireless Communication System U-WAVE

Optional Accessories for U-WAVE-T

U-WAVE-T mounting plate

Since the standard cable clip is not sufficient to support the **U-WAVE-T** on a Digimatic gage, a mounting plate is provided. The mounting plate can be fixed to the gage by the easily detachable hook-and-eye type fasteners provided. Batteries can be replaced without needing to detach the **U-WAVE-T** from the gage.
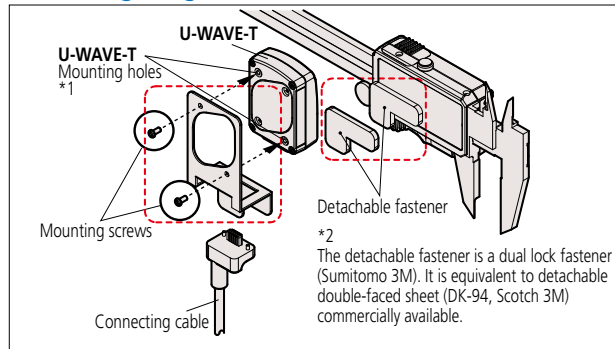

U-WAVE-T mounting plate
02AZE200
Standard accessories
• Detachable fasteners: 1 set
• Mounting screw: 2 pcs.

Mounting diagram (02AZE200)

U-WAVE-T

U-WAVE-T
Mounting holes
*1

Mounting screws

Detachable fastener

*2
The detachable fastener is a dual lock fastener (Sumitomo 3M). It is equivalent to detachable double-faced sheet (DK-94, Scotch 3M) commercially available.

Connecting cable

*1 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.
*2 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.

U-WAVE-T mounting plate for QM-Height
02AZE990
Standard accessories
• Detachable fastener, 2 pcs. (mirror-imaged)
• Mounting screw: 2 pcs.

Mounting Diagram for QM-Height (02AZE990)

Refer to the **U-WAVE** Brochure (**E12000**) for more details.

Typical applications of the mounting plate

Super Caliper CD67-S15PM

Front view   Rear view

QuantuMike MDE-25MX

Front view   Rear view

Digimatic Indicator ID-C112XB

Front view   Rear view

Applications of the 'Event driven' mode
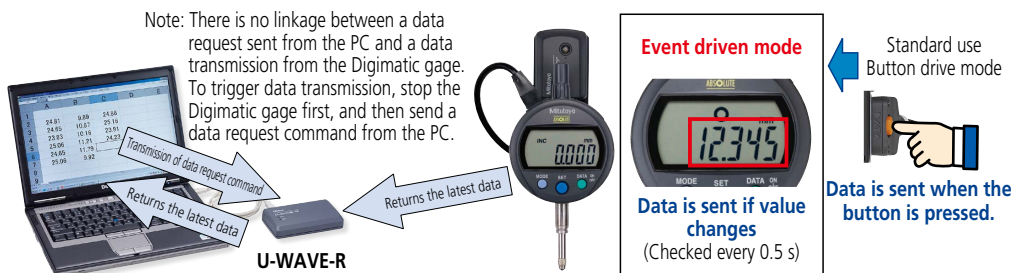
Data request support from PC

The currently displayed data can be sent by pressing the data switch.
This is called "**button drive mode**".
In the "**event driven mode**", the measurement value is checked every 0.5 seconds and measurement data is automatically sent if there is a change. At this time, the data switch is disabled. The sent data is written in the **U-WAVE-R** memory, and only the latest data is kept, it is not output to the PC. The data is loaded to the PC from the **U-WAVE-R** memory when the data request command is sent. The mode switching between "button drive" and "event driven" is enabled by **U-WAVEPAK**.
In the event driven mode, pressing the data switch on the Digimatic gage is not necessary. PC operation enables loading data from multiple gages at once.

To perform simultaneous measurement using USB-ITPAK V2.1, U-WAVEPAK must be in the event driven mode.

Note: There is no linkage between a data request sent from the PC and a data transmission from the Digimatic gage. To trigger data transmission, stop the Digimatic gage first, and then send a data request command from the PC.

Transmission of data request command

Returns the latest data

Returns the latest data

U-WAVE-R

Event driven mode

Standard use
Button drive mode

Data is sent if value changes
(Checked every 0.5 s)

Data is sent when the button is pressed.
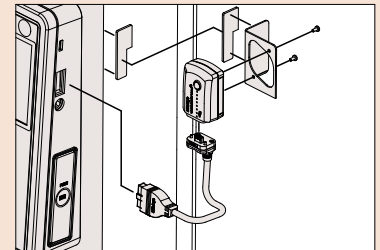
When using the event driven please note:
• The battery life is shorter than in normal mode.
  The battery lasts approximately 20 days with continuous use.
  Switching to the button mode when the battery is not in use extends the battery life.
• When using several Digimatic gages (**U-WAVE-T**), communication errors may occur because of radio interference in simultaneous measuring. Therefore, it is required to add **U-WAVE-R** and set different frequencies (15 ch) to avoid radio wave interference.