



# Introduction of devices currently on the market that have been previously developed by clinical engineers in Japan and the US.

Sunday, June 11 | 9:15 a.m. - 10:15 a.m.

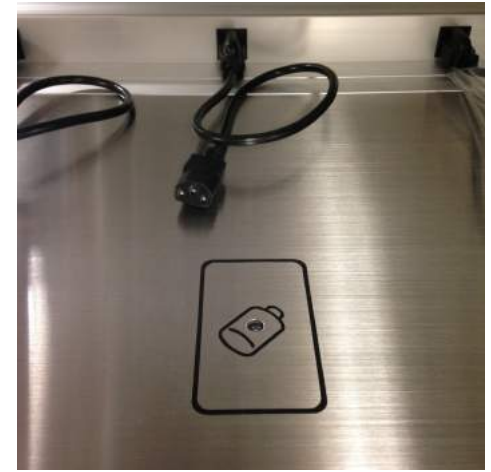
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Yamagata University Hospital

Chair, IEC of JACE (Japan Association for Clinical engineers)

# VOLT BANK

*Construction of a safe operating system and efficient battery-charge management for battery-equipped medical equipment*

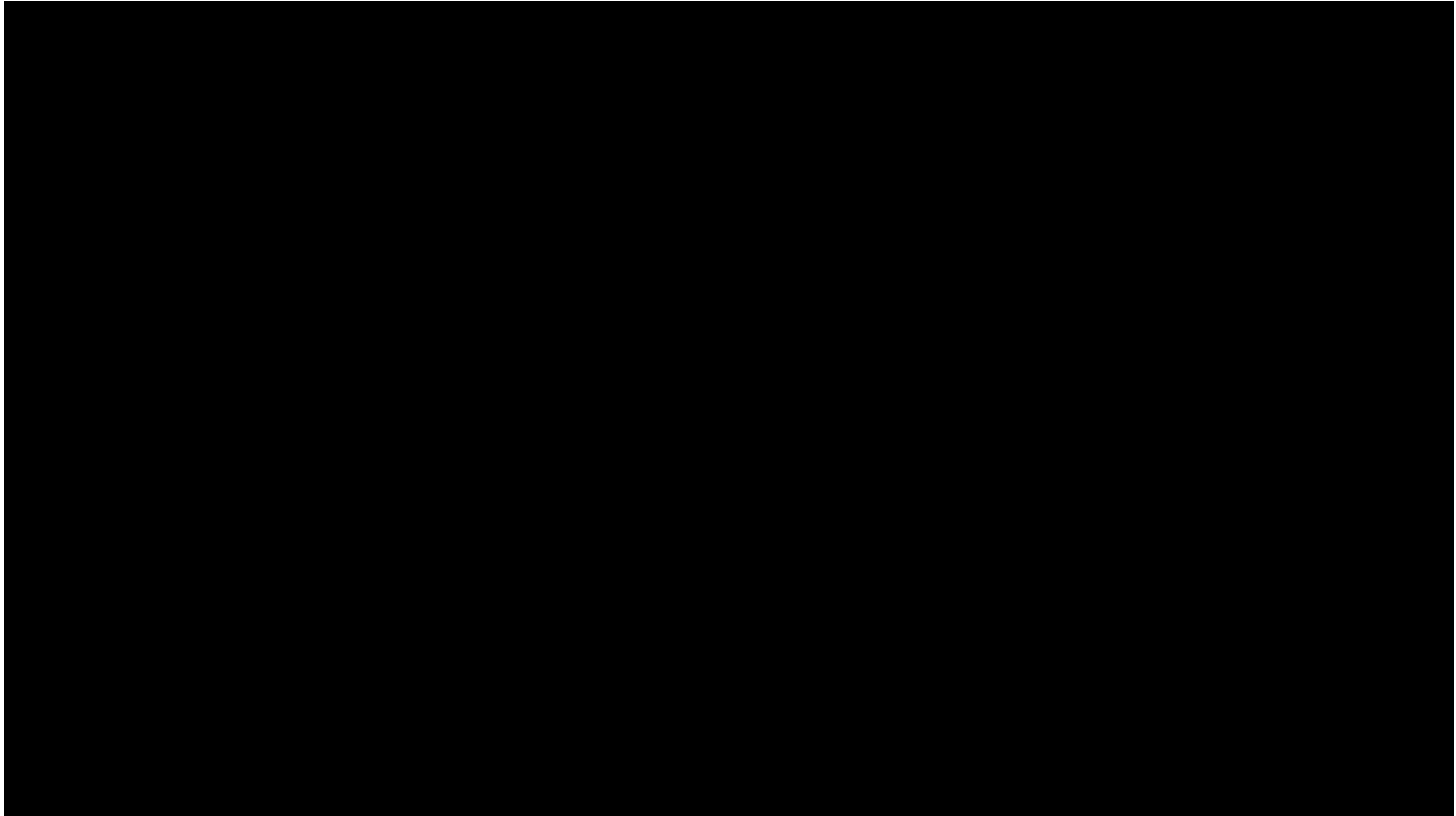


## **ABSTRACT:**

This study describes a battery-charging rack (VOLT BANK) that was developed and implemented in our institution. A charge-control box was created with various functions, and a special rack was incorporated. In the 100V cutoff function, when the batteries are fully charged, the equipment automatically turns off the power supply of 100V, in the order that they finish charging. A maximum of 36 medical devices can be simultaneously charged and stored. This rack was thought to enable construction of a safe, smoothly operating system for battery-equipped medical equipment and efficient battery-charge management that prevents overcharge and electrical discharge.

YOSHIOKA Jun, et al. Development of VOLT BANK. J of Clinical Engineering: 2015

# ***VOLT BANK***

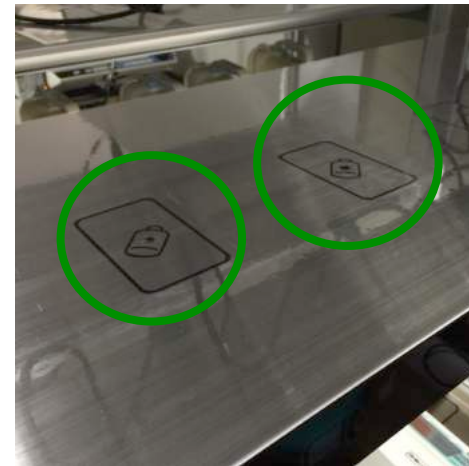


~~#~~**VOLT BANK** was developed jointly with **TAKASHIN Co., Ltd.** and enables efficient battery-charge management that prevents battery overcharge and discharge. The power is turned off to the fully-charged equipment without unplugging it, and overcharging of batteries is prevented. In addition, the liquid crystal display panel has marks that charging is **Orange**, completion is **Green** and **White** blink after charging is complete to clearly show priority assignment.

# Unique Function

## TAKING-OUT Prevention Alarm

If you are going to take out the devices during a charge, Volt Bank can warn us of the blinking battery mark and the beep.



*TAKING-OUT Prevention Sensor*

→TAKING-OUT Prevention Alarm enables efficient battery-charge management, helps to avoid rental of uncharged devices.

# IPCD Tester



*This tester earned awards for excellence in JACE 2014 congress*

## **ABSTRACT:**

Inspection for ensuring the safe use of medical devices is an essential part of patients' safety in clinical settings. Only basic checking appearance and operations of the intermittent pneumatic compression devices (IPCD), which can prevent venous thromboembolism, had been conducted, but any specific inspections did not. Although the vinyl tube that connects the device to pressurized sleeves worn on the lower limbs can break easily, there were no ways to conduct a thorough leak check of the tube in demand. We co-developed with a local manufacturing company an intermittent pneumatic compression device tester (IPCD tester) that can assess the air pressure value in the IPCD compressor circuit and alert the air leak. The IPCD tester can also assess the tube and its connector. We used this tester and screened troubles of the IPCDs in our hospital. The tester could detect failures of the IPCDs easily and consequently we repaired them. The tester thus prevented the broken IPCDs to be supplied to patients.



# IPCD Tester ~ Development History ~



Research and development of an IPCD tester took 1 to 3 years from start of research to successfully completed.

It is formed too big to fit in case.



## Third step

Two testers were accommodated into one case by changing general-purpose items from one's own products.



## Final step

It is a product that is being marketed.  
200×331.5×221.5 mm (width x depth x height),  
and a weight of 8 kg

# *IPCD Tester*



In the past: Only basic checks of external appearance and operation checks.

**Introducing IPCD tester:** Consequently, efficiency measurement, assessment of system errors, and testing of the easily broken sequential compression device (SCD) connector tube in intermittent pneumatic compression devices is now possible.

# Obtaining inspection results with high reliability by IPCD Tester

Objects: 99 intermittent pneumatic compression devices that is maintained by clinical engineers at our hospital.

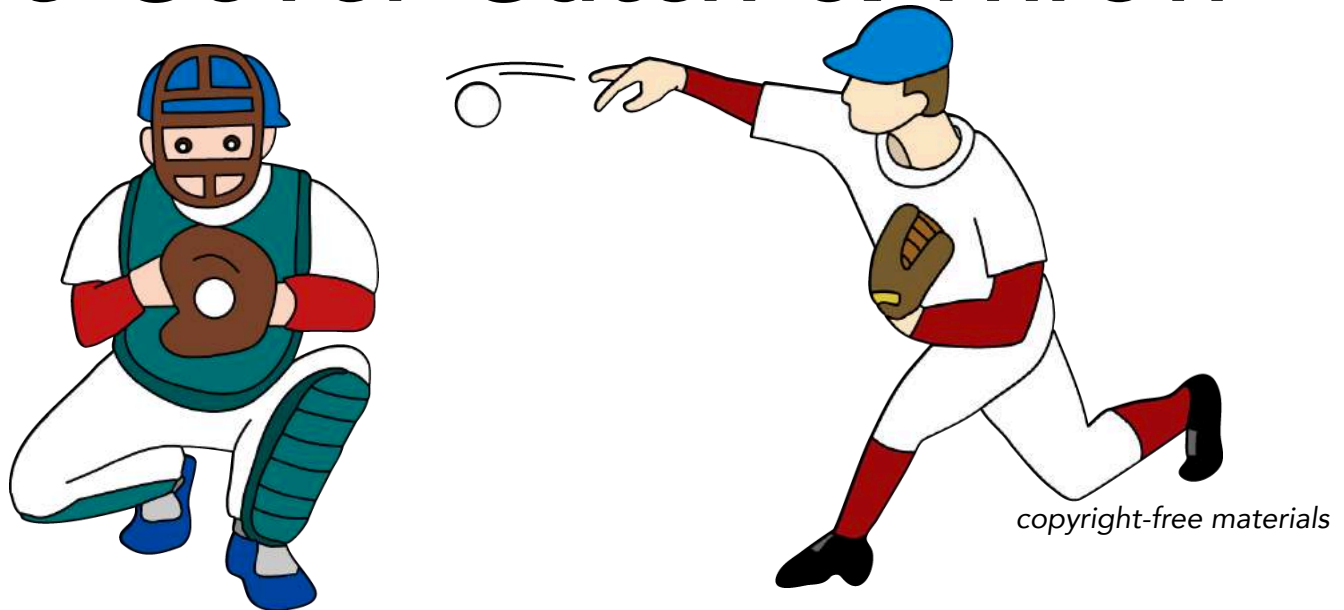
|                 | Air pressure   |               | System errors           |  | Leak |     |
|-----------------|--|---------------|-------------------------|--|------|-----|
|                 | PASS   | 94            | 95                      |  | PASS | 150 |
| FAIL            | <b>We used this tester and screened troubles of the IPCDs in our hospital. The tester could detect failures of the IPCDs easily and consequently we repaired them, help to avoid rental of broken devices.</b> |               |                         |  |      |     |
| Location        |  |               |                         |  |      |     |
| Cause of damage |  |               |                         |  |      |     |
| Repair          |  |               |                         |  |      |     |
|                 | inside of SCD  | Replacement 1 | Compressor Modulation 1 |  |      | 22  |

YOSHIOKA Jun, et al. Development and its operational usefulness of an intermittent pneumatic compression device dedicated tester. Jpn J Medical Instrumentation: 2017

Introducing IPCD testers to existing tests allows detection and repair of issues in intermittent pneumatic compression devices. Lending out of broken devices can be avoided before it happens, thus reducing the incidence of thromboses and embolism in patients.



# Shoe Cover Catch & Throw



## **ABSTRACT:**

Automatic shoe cover dispensers apply shoe covers quickly and hands-free in a clean room or operating room while the user remains standing. Because of its hands-free operation, an automatic dispenser is more sanitary and hygienic, and enables rapid and easy application of a shoe cover in about 5 seconds. In Japan, however, the act of removing shoe covers is still performed by hand even though preventing exposure of the user's skin and mucosa during removal is equally or even more important than during shoe cover application. Therefore, a device that can remove and dispose of shoe covers automatically is needed to protect medical staff from dermal and mucosal exposure to blood and body fluids adhering to the shoe covers. Therefore, as part of the development of medical devices through collaboration between medicine and industry, we clinical engineers have collaborated with a local company to develop a prototype for an automatic shoe cover removal and disposal device (Shoe Cover Catch & Throw) that reflects and prioritizes the practical needs of the operating room.

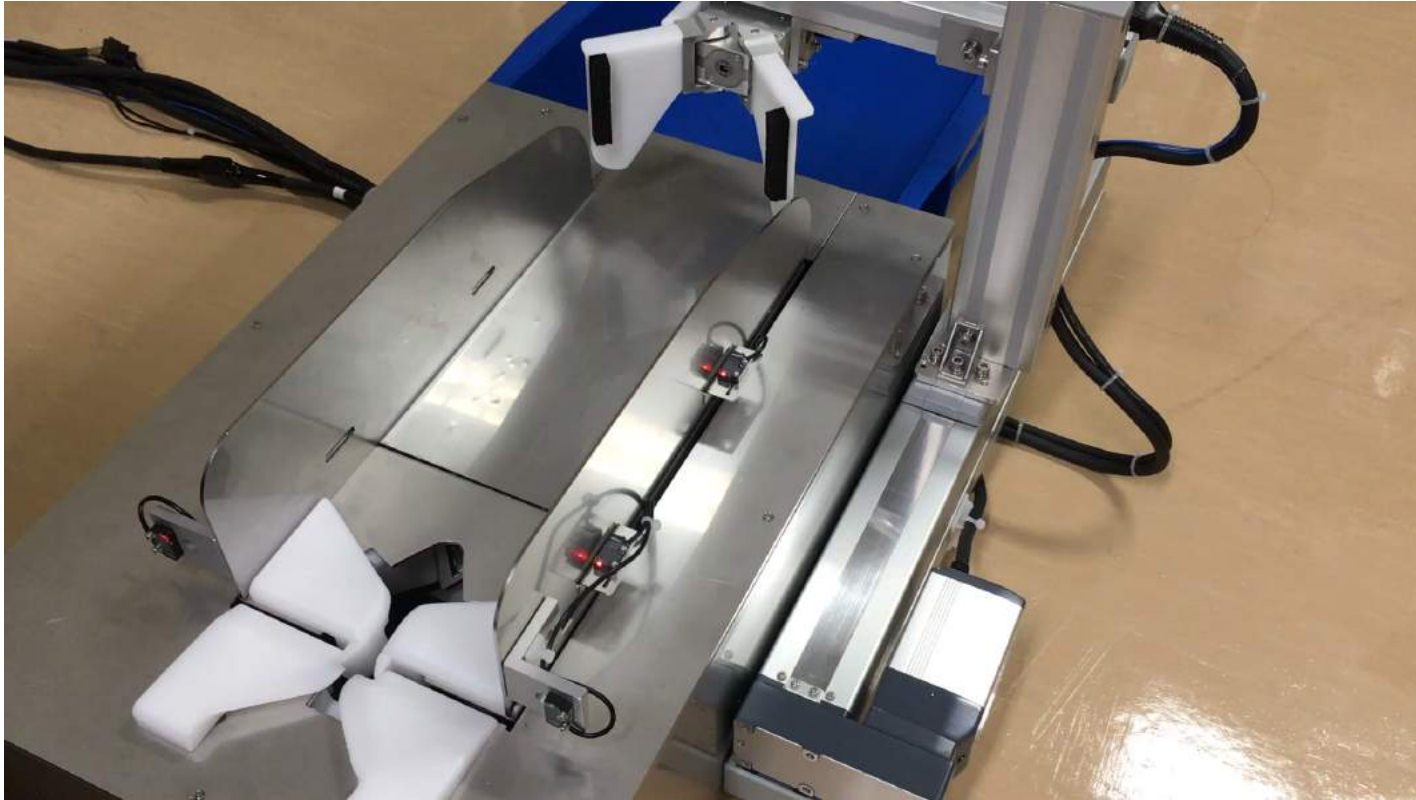
*YOSHIOKA Jun, et al. Development of a new automatic shoe cover release and collection machine. Jpn J Medical Instrumentation: 2016*

# Shoe Cover Catch & Throw (Prototype model)

With external dimensions of 400×550×350 mm (width x depth x height) and a weight of 15 kg as the main specifications, we constructed the Shoe Cover Catch & Throw device comprising a stainless steel frame; fingers; a disposal arm; power plug (input power: AC 100V, 50-60 Hz); multiple motors, gears and chains; optical sensors (2 sets of shoe detection sensors, one set of heel detection sensors); a control circuit; and a refuse receptacle.



# *Shoe cover catch & throw*

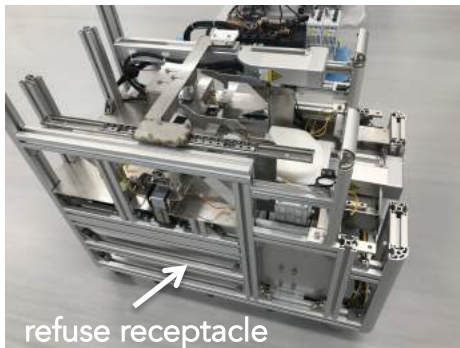


The development of the shoe cover removal and disposal device enables *automatic, hands free* removal and disposal of one shoe cover in about *5 seconds* while the user remains standing. By using a mechanism that does not contact the shoe when the cover is removed, this device can be used for a *wide variety of footwear from sneakers with heels to slippers without heels*. The Shoe Cover Catch & Throw protects medical staff from dermal and mucosal exposure to blood and body fluids, and can be expected to *reduce nosocomial infections*.

# Shoe cover catch & throw



New Shape ?



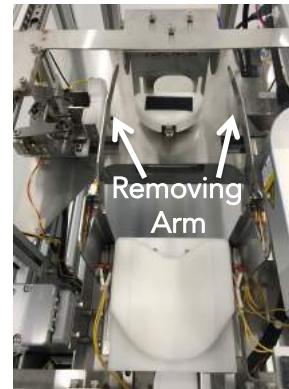
IMPROVEMENT



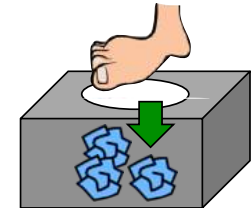
New Material ?



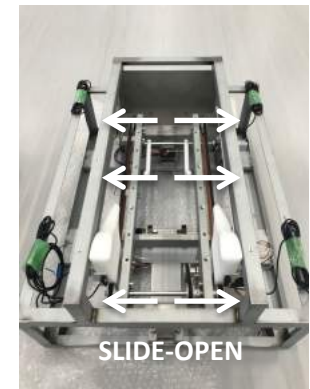
New Shoe Cover  
Removing Mechanism



New Shoe Cover  
Disposal Mechanism



New Color ?



~Plan to improve this prototype for market in the future~

For examples, change: *Shape* or *Color*, *Material*, and *Mechanism*.

We want to remove the Shoe Cover Disposal Arm Mechanism because this mechanism is incurring too many costs.

So we are thinking a new disposal mechanism such as *open the bottom of a footrest, and drop shoe cover below*.



# Waterless Infusion Pump Analyzer

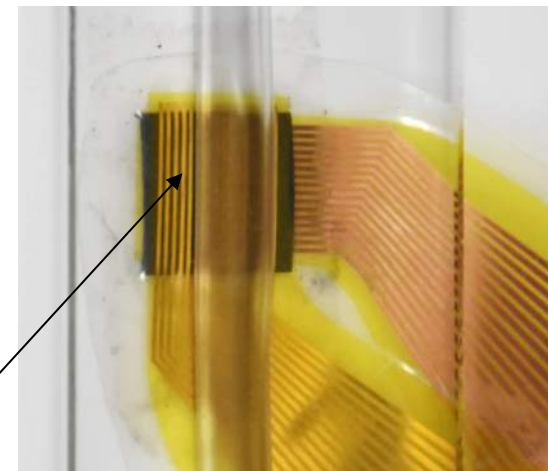
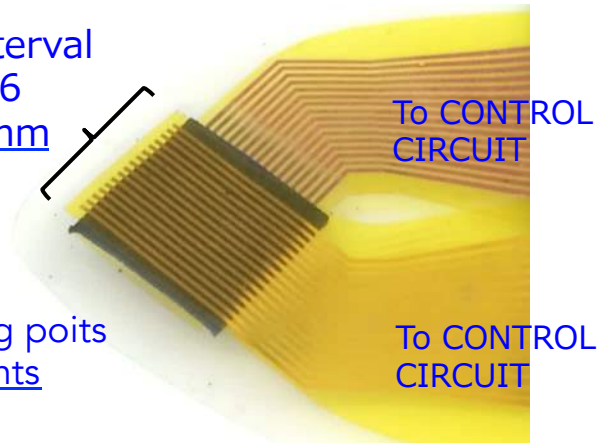
*-Easy infusion inspection without using water-*

We developed thin pressure sensitive sensor. (W10×H70×T2mm)  
We applied the sensor to new analyzer.

## Pressure sensor

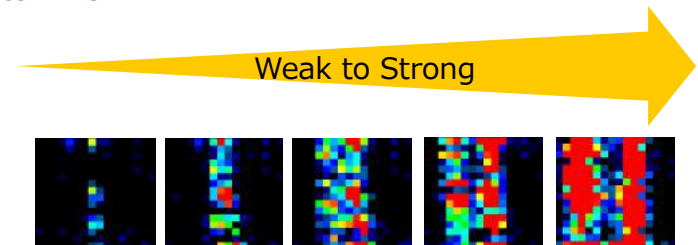
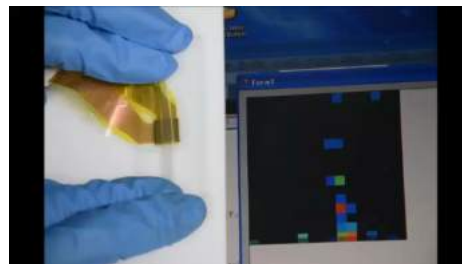
Electrode interval  
0.5 mm × 16  
TOTAL 8.0 mm

pressure measuring poits  
16 × 16 = 256 points



Infusion tube  
Internal diameter 3 mm  
Outside diameter 4.5mm

Glass plate

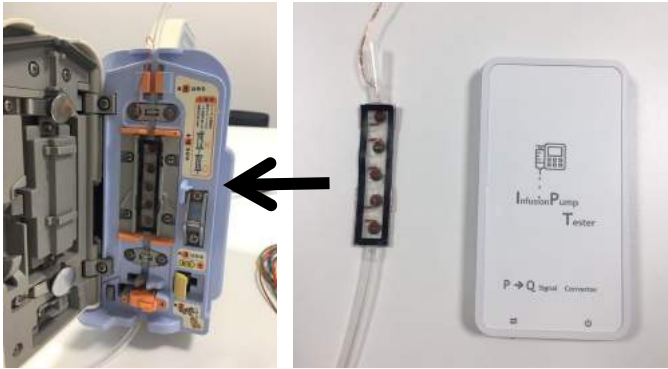


Contact pressure

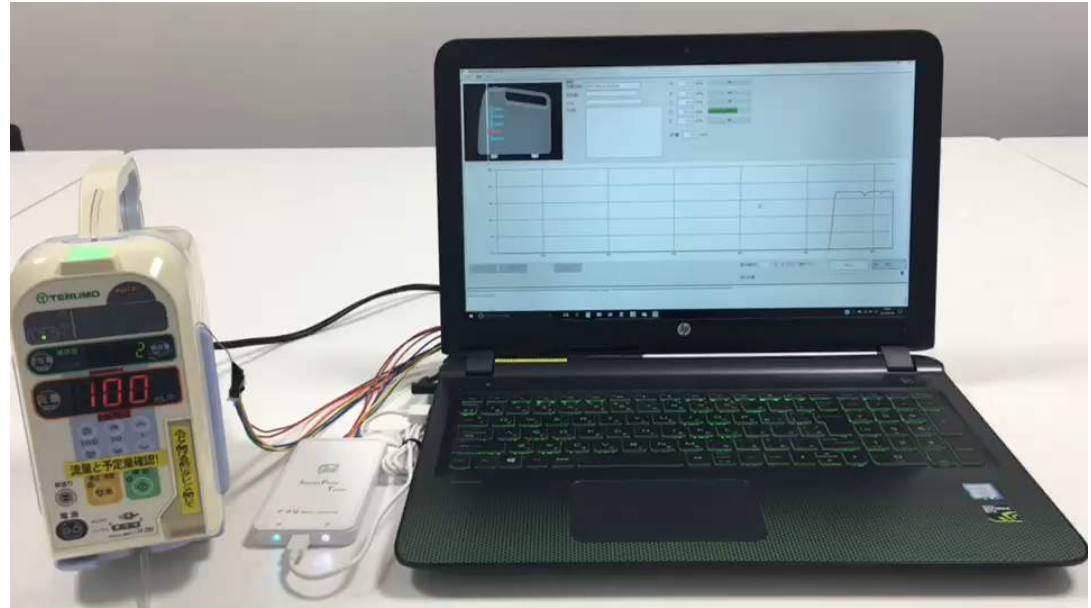
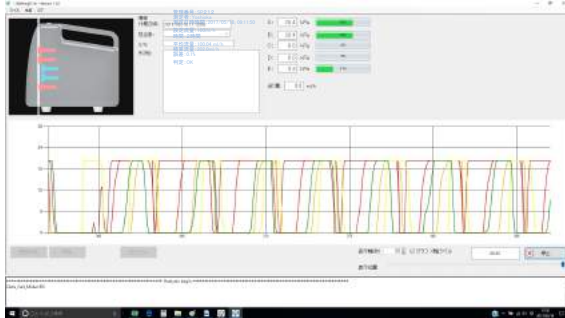


# Waterless Infusion Pump Analyzer

-Easy infusion inspection without using water-



Black cover that is protected by a patent.



*This analyzer earned awards for excellence in JACE 2017 congress*

- The waterless infusion pump analyzer uses fundamental measurement technology integrated with sophisticated electronics to ensure accuracy without water.
- The waterless infusion pump analyzer tests virtually any brand of infusion pump by varying the shape of the sensor.
- Additionally, the waterless infusion pump analyzer comes with original PC software for checking fingers movement and creating full-color graphs and reports.

# Conclusion

~Partnering with industry for the future of healthcare~

*Medical-Academic-Industrial Collaboration Is the Key to Improving Patient Safety.*

Japanese CEs foster collaboration with many industry partners to further clinical engineering to benefit patients and the future of healthcare.

## ***Acknowledgement***

We would like to express our sincere gratitude to the business development department of TAKASHIN Co., Ltd for the efforts in the development of medical devices.



# *END*

Thank you very much!!



**SHEEP-RIN:** JACE's mascot character