

**Awarded “100 million dollar Export Tower Award” for Contributing to Korea’s Export Earnings**

— ULVAC KOREA, Ltd.

In December 2015, ULVAC KOREA, Ltd. (herein-after referred to as “UK”) was awarded the “100 million dollar Export Tower Award,” sponsored by the Korea International Trade Association and supported by the Ministry of Trade, Industry and Energy of South Korea.

The “100 million dollar Export Tower Award” is an award aimed at companies the accumulate export value of which exceeds 100 million US dollars. South Korea holds a ceremony to recognize the outstanding export performance of companies on December 7 each year, which is celebrated as “Annual Trade Day” in the country. The ceremony was conducted on a grand scale again this year, with the attendance of President Park Geun-hye and those representing the companies to be honored.

This was the third time UK has been awarded an Export Tower Award, following the “10 million dollar Export Tower Award” in 2005 and “70 million dollar Export Tower Award” in 2012, showing that the company has made steady progress.

**•Contact Information**

ULVAC KOREA, Ltd.  
TEL:+82-31-683-2922  
URL: <http://www.ulvackorea.co.kr/>



**Paik Choong Ryul , President of ULVAC KOREA, Ltd., with the “tower” in his hands**

ULVAC, Inc. runs a website to provide its stakeholders with information about its business activities, IR, products, and so on. As part of its efforts to further increase customer satisfaction, new feature pages on five different areas of products have been launched to offer even more helpful information to customers. The five product areas are: “MEMS System” “HELIOT 900 (leak detector),” “UNECS (high-speed spectroscopic ellipsometer),” “Power Generator” and “Advanced Package (packaging technology).” There are plans to add more areas in the future. For further information, please visit the respective pages.

**•Contact Information**

ULVAC, Inc.  
TEL:+81-467-89-2033  
URL: <https://www.ulvac.co.jp/en/>

**New Products**

\* Please visit our website for further information.

**ULVAC, Inc.**

**World’s first\*, Low Temperature PZT Sputtering Technology in Mass Production Scale Developed for Piezoelectric MEMS Device Integrated on CMOS.**



**Sputtering system model SME-200**

ULVAC, Inc. announced industry’s first low temperature PZT sputtering technology in mass production scale enabling future advanced MEMS device integrated on CMOS which will be the mainstream of next generation MEMS devices.

Today many sensors such as accelerometers, gyros, and pressure sensors are widely used inside high performance smart phones, tablet PCs, and automobiles enabling the “Smart society” representing the IoT world.

The increasing demand and the key element to enable this functionality, is the piezoelectric MEMS (Micro Electro Mechanical Systems) device, using a piezoelectric thin film material called PZT (lead zirconate titanate, Pb (Zr,Ti) O<sub>3</sub>).

The future holds that, higher performance, multi - functional and smaller piezoelectric MEMS devices for the next generation of advanced sensor technology is rapidly expanding its applications by the integration with CMOS (Complementary Metal Oxide Semiconductor) devices.

PZT, Piezoelectric MEMS is one of the most practical MEMS devices available today, however, the process temperature was an obstacle, to integrate the MEMS device directly onto a CMOS device. A CMOS device due to its nature, can only withstand a process temperature of 500 degreesC or lower. A typical crystallization temperature for a PZT thin film is 600degreesC for sputtering and 700 degreesC for Sol-Gel.

ULVAC has developed world’s first unique innovative technology allowing integration of the piezoelectric MEMS device onto a CMOS device, thus achieving highest level piezoelectric performance, withstand voltage reliability, and cycle performance. This is accomplished by utilizing unique sputtering technology with process temperature below 500 degreesC.

The piezoelectric device, using thin film PZT, is formed by five (5) layers which are: an adhesion layer, a lower electrode layer, a buffer layer, a piezoelectric (PZT) layer, and upper electrode layer. All the accumulated layers are formed sequentially, through one single sputtering system developed by ULVAC. This multi-chamber type sputtering system (model SME-200) allows for consistent process flow, optimizing each individual layer inside each process chamber respectively, achieving highly stable repeatability of the

stacked layer performance, and also improving throughput, to that which is that is very suitable for mass production purposes.

**•Contact Information**

ULVAC, Inc.  
Advanced Electronics Equipment Division  
TEL:+81-467-89-2139  
URL: <https://www.ulvac.co.jp/information/20150325/>

**ULVAC, Inc.**

**Launching High-purity Niobium Material for Superconducting Accelerators**



**Single-cell accelerating cavity manufactured by KEK from ULVAC’s material**

ULVAC, Inc. has developed niobium material of high purity for superconducting accelerators and started selling the material.

Superconducting accelerators are expected to be used in a wide variety of areas, including researching the origin of the universe by International Linear Colliders (ILC) in particle physics, analyzing the structure of proteins in medicine, and partitioning and transmuring of

# Launched to Feature Five Product Areas

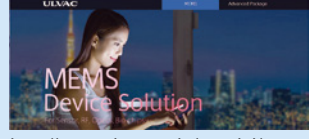
— ULVAC, Inc.

### ▶ Power Generator



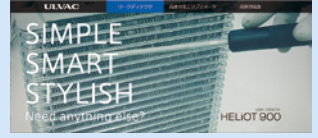
<http://www.ulvac.co.jp/special/powersupply/>

### ▶ MEMS System



<http://www.ulvac.co.jp/special/mems/mems/>

### ▶ HELIOT 900 (leak detector)



<http://www.ulvac.co.jp/special/heliot900/>

### ▶ UNECS (high-speed spectroscopic ellipsometer)



<http://www.ulvac.co.jp/special/ellipsometer/>

### ▶ Advanced Package (packaging technology)

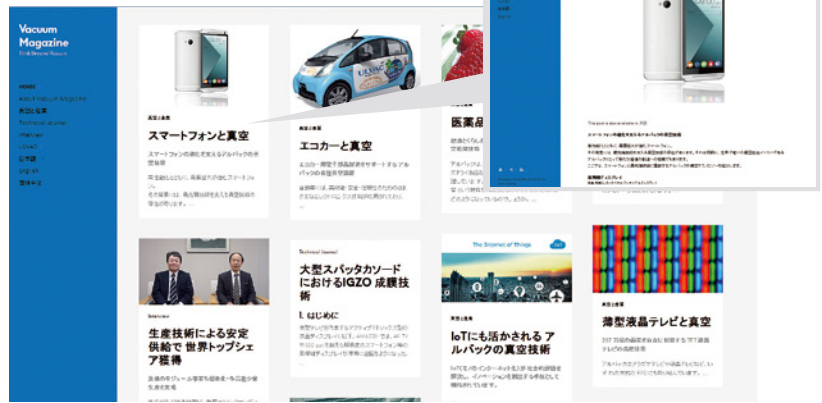


<http://www.ulvac.co.jp/special/advanced-package/>

## Vacuum Magazine —Think Beyond Vacuum— A New Digital Medium Launched to Explore Possibilities of Vacuum

ULVAC, Inc. has launched a new website entitled Vacuum Magazine specializing in exploring new possibilities of vacuum. It is a vacuum-themed blog-based website that provides information on topics like “relationship between vacuum and industry,” “latest vacuum-related technological trends” and “the history of vacuum” as the world’s only comprehensive vacuum manufacturer.

This website is compatible with smartphones and tablet PCs. For further information, please visit the following website: <https://www.ulvac.co.jp/wiki/>



### ●Contact Information

ULVAC, Inc.  
TEL:+81-467-89-2033 URL: <https://www.ulvac.co.jp/en/>

high-level radioactive waste using nuclear transmutation (ADS: Accelerator Driven System) in environmental and energy sciences.

Superconducting accelerators are used to accelerate charged particles (such as electrons, positrons, protons and ionized atoms). Niobium (Nb), which becomes superconductive at the highest temperature (9.25 K) among pure metals, is used as material for accelerating cavities. Niobium material for accelerating cavities must have a Residual Resistance Ratio (RRR) that exceeds 250.

To increase the purity of niobium, ULVAC optimized multiple conditions, including the selection of raw materials, the degree of vacuum, and melting speed by using a 600 kW EB melting furnace that was newly constructed at our group company ULVAC TOHOKU, Inc. (Hachinohe, Aomori), thereby successfully producing niobium ingots with an RRR exceeding 250.

We requested the High Energy Accelerator Research Organization (KEK) —an inter-university research institution with which we conduct joint research— to manufacture a single-cell accelerating cavity by using plates produced from these ingots and to conduct an electric field performance test. Consequently, we achieved a maximum accelerating electric field gradient of 41 MV/m (performance required for ILCs: at least 35 MV/m).

●Contact Information  
ULVAC, Inc. Material Division  
TEL:+81-467-89-0246  
URL: <https://www.ulvac.co.jp/information/20150625/>

### ULVAC, Inc. Launching Precise Microplate Paddle Mixer “MICROPADDLE”, Enabling Direct Mixing for 96 Well Microplate



MICROPADDLE (maximum 12 units controllable by 1 PC)

ULVAC, Inc. has developed Precise Microplate Paddle Mixer “MICROPADDLE” and started selling the product.

Precise Microplate Paddle Mixer “MICROPADDLE” is the mixer for 96 well microplate that is used in biotechnology experiments. It has been pointed out that the conventional mixer has the disadvantages, such as “Mixing can be done accurately, but it needs large volumes of chemical solution and it cannot process large number of the simultaneous mixing”, “It does not needs large volumes of chemical solution and it can process large number of simultaneous mixing, but mixing cannot be done accurately.”, etc.

To meet those demands, ULVAC has

developed and started selling the mixer “MICROPADDLE” that enables mixing with high precision, accuracy, and efficiency.

### [Feature]

- Low volume mixing: Reduce sample consumption by mixing with 96 well microplate (50 - 300 μL)
- High efficiency mixing: Direct paddle mixing and high rotation speed enable high efficiency mixing.
- Highly accuracy and precision mixing: Rotation speed from 1 to 3000min<sup>-1</sup>(1min<sup>-1</sup> increment) with ± 1% precision.
- Low rotation speed mixing: Available highly precise gentle mixing below 300 min<sup>-1</sup>
- Multiple rotation speed setting simultaneously: 12 Independent rotation speed setting in 1 microplate facilitates your optimum rotation setting search.

The use of the “MICROPADDLE” in wide range of market of Mixer with microplate, is highly expected, such as Basic research at Universities, Government Research laboratory of Medical, Pharmaceuticals, and Agricultural Science, and Evaluation of products and prototypes at pharmaceutical manufacturer and diagnostic pharmaceutical manufacturer.

●Contact Information  
ULVAC, Inc. Component Division  
TEL:+81-467-68-4212  
URL: <https://www.ulvac.co.jp/information/20150901/>

**Awarded “Encouragement Award” in the Mukaidono Safety Awards for Product Safety Assurance Efforts**

— ULVAC, Inc.

ULVAC, Inc. was awarded the “Encouragement Award” in the Mukaidono Safety Awards in December 2016 for its product safety assurance efforts.

The Mukaidono Safety Awards was established in 2015, when Dr. Masao Mukaidono, Professor Emeritus of Meiji University and one of the lead-



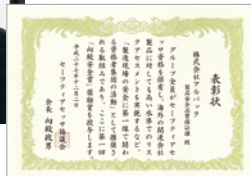
Reception of the certificate of commendation

ing figures in the area of product safety, was awarded the Prime Minister’s Commendations on Contributors to Public Safety. The purpose of the Awards is to recognize the achievements of individuals and organizations that have contributed to improving, advancing and proliferating safety in the Japanese manufacturing industry.

The reason for the Encouragement Award was that the entire ULVAC Group had 35 employees who had qualified as Safety Assessors, had carried out risk assessments against an appropriate set of safety design standards from an in-the-field point of view, and had made group-wide contributions to enhancing product safety.

●Contact Information

ULVAC, Inc.  
TEL:+81-467-89-2033  
URL: <https://www.ulvac.co.jp/en/>



ULVAC TOHOKU, Inc. (hereinafter referred to as “ULVAC TOHOKU”) was awarded the “Life Innovation Award 2015 (AOMORI)” by Aomori Prefecture.

Aomori Prefecture has established the Life Innovation Awards to recognize innovative, creative and challenging initiatives that contribute to creating industries in the prefecture in life-related fields (medicine, health and welfare), in the three categories of “medicine-engineering collaboration,” “service” and “product.” ULVAC TOHOKU was awarded the award in the “medicine-engineering collaboration” category.

[Reason for the honor]

ULVAC TOHOKU, Inc. has been promoting medicine-engineering collaboration by working in partnership with local medical institutions to contribute to medical safety through developing and improving peripheral equipment. The main products the company has developed include a mobile power cable checker that allows for easy and advanced measurements on 3P power cables and an oxygen flow meter checker that can periodically check the precision of oxygen flow meters in an efficient manner.

[Mobile power cable checker]

ULVAC TOHOKU’s mobile power cable checker can easily measure three wires —namely power

**New Products**

\* Please visit our website for further information.

ULVAC, Inc.

**Launching G-TRAN Series Multi Ionization Gauge ST2 Enabling a Long Product Life That Maintains High Precision Even Under Harsh Conditions**



G-TRAN Series Multi Ionization Gauge ST2

ULVAC, Inc. has developed G-TRAN series multi ionization gauge ST2, a transducer-type ionization vacuum gauge with a long product life that maintains high measurement accuracy even under harsh conditions, and started selling the product.

A variety of gas molecules may exist in a vacuum space under certain conditions.

Therefore, it is not uncommon that vacuum measurements are performed under conditions that are severe for a vacuum gauge.

As a result, we often hear that users encounter problems regarding lifetime of vacuum gauges (a short product life due to contamination, problems in electrical discharge, an increase in sensor head replacement frequency, etc.) and measurement accuracy (variation in sensitivity, errors, etc.).

To avoid such problems, it is necessary to replace sensor heads periodically. More frequent replacement of sensor heads leads to:

- An increase in running costs for sensor heads,

- which are consumables
- Losses caused by suspension of production lines (systems) during replacement of sensor heads
- An increase in time and effort required to replace them

To resolve these difficulties, ULVAC has developed an ionization vacuum gauge with a structure designed to lighten the load on ion collectors by reducing the ion current value per area and to make electric potential in ionized space uniform. This gauge enables the performance of accurate measurements (±10%) for a longer period of time (more than 30 times longer compared to our conventional models) even under harsh conditions for ionization vacuum gauges.

●Contact Information

ULVAC, Inc. Component Division  
TEL:+81-467-89-2410  
URL: <https://www.ulvac.co.jp/information/20150903-2/>

ULVAC, Inc.

**Launching the Revolutionary Dry Vacuum Pump Accessory ECO-SHOCK ES4A Substantially Reduce Power Consumption by Attaching to the Dry Vacuum Pump Exhaust Line**



ECO-SHOCK ES4A

ULVAC, Inc. has recently developed and started selling the ECO-SHOCK ES4A, a power saving accessory for dry vacuum pumps that can reduce power consumption substantially by attaching to the dry vacuum pump exhaust line.

Dry vacuum pumps consume particularly large amounts of electricity in production lines. Therefore, it is of crucial importance to reduce their power consumption. ULVAC has already released the ECO-SHOCK ES10, which reduces power consumption when attached to a dry vacuum pump exhaust line. However, it has been difficult to reduce power consumption of dry vacuum pumps that are used for frequent pumping down of loading/unloading chambers of vacuum systems and use large amounts of sealing gas

This new product, “ECO-SHOCK ES4A”, enables a reduction in power consumption of dry vacuum pumps that are used for frequent pumping down of loading/unloading chambers of large vacuum system and use large amounts of sealing gas.

[Features]

— The ECO-SHOCK ES4A makes possible a substantial reduction in power consumption of dry vacuum pumps used for the following purposes.

- (1) Dry vacuum pumps that are used for frequent pumping down of loading/unloading chambers
- (2) Dry vacuum pumps that use large amounts of sealed gas

— There is no degradation of pumping speed because any control such as rotation speed

## Innovation Award 2015 (AOMORI) — ULVAC TOHOKU, Inc.

wires and a protective earth— at the same time, and can even measure the low-value resistance of the protective earth stipulated by JIS.

In recent years, increasing numbers of highly-functional electric medical instruments have been used in operating rooms, intensive care units (ICUs) and other medical environments. However, patients are at risk of suffering electrical discharges known as “micro-shocks” that can be caused by electricity leaking from these instruments even if it is so minute that conventional measuring equipment cannot detect it.

To prevent risks from these micro-shocks, the JIS standards for medical electrical equipment set a standard for the resistance of protective earth conductors of medical instruments (0.1 to 0.2 Ω). As this resistance range stipulated by JIS is too low to be measured with general-purpose measuring equipment, the resistance value is normally measured by electricians using a special measuring system.

In response to Aomori Prefecture’s policy for promoting collaboration between medicine and engineering, ULVAC TOHOKU set about a few years ago to tackle this issue to meet the demand of the local Hachinohe City Hospital and other stakeholders. After about two years of efforts and hard work, the company has finally succeeded in developing an easy-to-measure mobile power cable checker.

This mobile power cable checker does not require any specialist knowledge or special equip-



Takeo Kato, President of ULVAC TOHOKU, Inc., giving a speech at the awards ceremony



Mobile power cable checker

ment and allows the user to quickly measure the “JIS safety standards” level of resistance simply by inserting the 3P plug of the power code of the target medical equipment. ULVAC TOHOKU sees this award as a good trigger for making further progress into new areas of business.

●Contact Information

ULVAC TOHOKU, Inc.  
TEL:+81-178-28-7839  
URL: <http://www.ulvac-tohoku.com>

■ Japan

- ULVAC, Inc.
- ULVAC TECHNO, Ltd.
- ULVAC KYUSHU CORPORATION
- ULVAC TOHOKU, Inc.
- ULVAC KIKO, Inc.
- ULVAC EQUIPMENT SALES, Inc.
- ULVAC CRYOGENICS INCORPORATED
- ULVAC-PHI, Inc.
- TIGOLD CORPORATION
- ULVAC COATING CORPORATION
- Nisshin Seigyo Co., LTD
- ULVAC Human Relations, Ltd.
- SHINKU CERAMICS CO., LTD.
- FINE SURFACE TECHNOLOGY CO., LTD.
- Reliance Electric Limited
- SHOWA SHINKU CO., LTD.

■ China

- ULVAC (China) Holding Co., Ltd.
- ULVAC (NINGBO) Co., Ltd.
- ULVAC (SUZHOU) CO. LTD.
- ULVAC Orient (Chengdu) Co., Ltd.
- ULVAC Automation Technology (Shanghai) Corporation
- ULVAC Tianma Electric (Jingjiang) Co., Ltd.
- ULVAC Vacuum Furnace (Shenyang) Co., Ltd.
- ULVAC (Shanghai) Trading Co., Ltd.
- ULVAC Materials (Suzhou) CO., LTD
- ULVAC Opto-electronics Thin Film Technology (Shenzhen) Co., Ltd.
- ULVAC CRYOGENICS (NINGBO) INCORPORATED
- ULVAC NONFERROUS METALS (NINGBO) CO., LTD.
- ULVAC Research Center SUZHOU Co., Ltd.
- Luoyang Xinyou Magnesium Co., LTD
- Hong Kong ULVAC Co., Ltd.
- ULVAC VACUUM EQUIPMENT (SHANGHAI) CO.,LTD.

■ Taiwan

- ULVAC TAIWAN INC.
- ULTRA CLEAN PRECISION TECHNOLOGIES CORP.
- ULCOAT TAIWAN, Inc.
- ULVAC AUTOMATION TAIWAN Inc.
- ULVAC SOFTWARE CREATIVE TECHNOLOGY, CO.,LTD.
- ULVAC Materials Taiwan, Inc.

■ South Korea

- ULVAC KOREA, Ltd.
- Ulvac Korea Precision, Ltd.
- Pure Surface Technology, Ltd.
- ULVAC CRYOGENICS KOREA INCORPORATED
- ULVAC Materials Korea, Ltd.
- UF TECH, Ltd.

■ Southeast Asia

- ULVAC SINGAPORE PTE LTD
- ULVAC MALAYSIA SDN. BHD.
- ULVAC (THAILAND) LTD.

■ North America

- ULVAC Technologies, Inc.
- Physical Electronics USA, Inc.

■ Europe

- ULVAC GmbH

ULVAC WEB SITE:

<https://www.ulvac.co.jp/en/>

adjustment is not required when attaching it to dry vacuum pump. Also, even if the ES4A was broken down, there is no decrease in performance of dry vacuum pump.

—The ECO-SHOCK ES4A can be attached to dry pump exhaust lines that have already been installed.

●Contact Information

ULVAC, Inc. Component Division  
TEL:+81-467-89-2185  
URL: <https://www.ulvac.co.jp/information/20150903-1/>

ULVAC, Inc.

ULVAC started selling KLA-Tencor’s Stylus Profiler and Optical Surface Profiler



Stylus Profiler P-17

ULVAC, Inc. started the domestic sales of Stylus Profiler/ Optical Surface Profiler made

by KLA-Tencor Corporation (Headquarter: California, USA).

Those profilers have the capability to measure the fine shape and the roughness of various sample surface with high precision, and measure a various applications from R&D to production, in many area like Semiconductors, Displays, Electronics, Optical Components, MEMS etc.

[Product Range]

1. Stylus Profiler (4 models)
  - Alpha-Step D-500:  
ø150mm manual stage
  - Alpha-Step D-600:  
ø200mm auto stage
  - P-7: ø150mm auto stage
  - P-17, P-17 OF:  
ø200mm (P-17 OF: 300mm) auto stage
2. Optical Surface Profiler (2 models)
  - MicroXAM-100:  
100 × 100mm manual stage
  - MicroXAM-800:  
ø150mm auto stage

●Contact Information

ULVAC, Inc. Component Division  
TEL:+81-467-89-2185  
URL: <https://www.ulvac.co.jp/information/20150930/>