7 Solutions for Improved Weighing Automation

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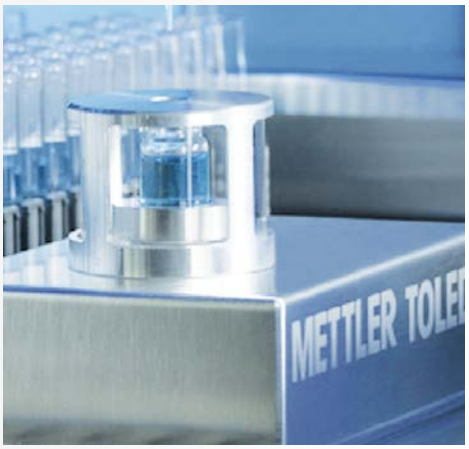


METTLER TOLEDO

Process Control and Quality
Of High-Performance Battery Assembly

Keeping up with the forecasted battery cell quantities, machine builders must design highly automated manufacturing lines capable of fulfilling market demand. A high-precision weighing system ensures reliable measurement results for increasing production efficiency.

Core steps influencing battery quality

Starting from simple raw materials and creating a high quality product, a battery has to run through up to 25 production steps. The most crucial ones are laying the foundation of high performance. This means quality checks and process control via weighing, whether mixing the electrode slurry, coating, filling in the electrolyte or welding battery packs.

Also the capacity through the whole process varies from 5g up to 3,000 kg. That means the requirements on the weighing system are very high, as an accuracy of less than one percent for dosing and filling should be reached.

Customer example

Expensive raw materials are used to formulate the electrode slurry. These basic materials represent up to 60% of overall battery production costs. Essential to this production step is the right formulation. Our customer uses weighing because it is the most accurate method of meeting high process tolerances.
To avoid expensive waste, which could lead to millions of dollars lost per 0.1% overfilling within one year, METTLER TOLEDO provides our customers with high-accuracy technology.

Economical production

After mixing, a carrier sheet is coated with the electrode material. With a thickness of up to 250µm and an accuracy level of 2 µm, the outstanding quality characteristic for the produced electrodes is the density of the material layer. Controlling this parameter enables fast intervention during a detected parameter deviation. Another critical pa-

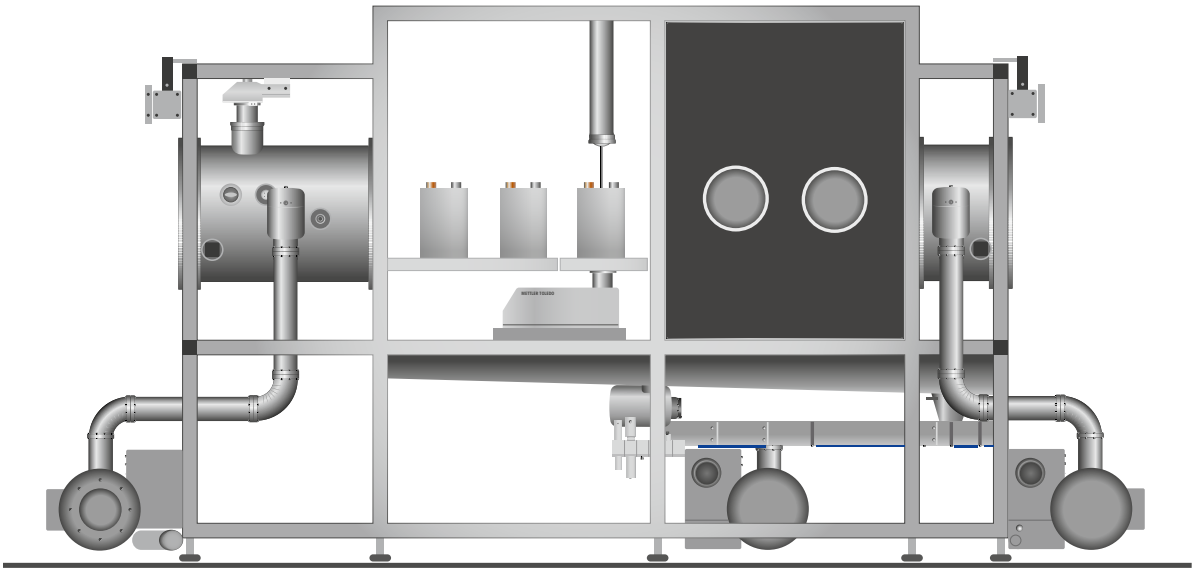


Figure 1: Our customers' electrolyte filling mashines combine maximized throughput with highest filling accuracy

rameter for the overall functionality of the battery is the purity of the coated material. Weighing helps to detect inclusions in the material layer and prevent the development of short-circuits within the electrode, which can lead to dangerous accidents.

Customers rely on the highest-resolution technology of our WMF weigh module for in-production quality control.

Safety and failures affect company image

After the electrodes are stacked, the fine-filling procedure, which leads to finished battery cells, is performed (Figure 1). Our customers requirements include a flexible filling range starting from 10 ml up to 300 ml (for prism cells) with a accuracy of 1% total weight. That is why weighing is the best solution for electrolyte filling. Even if it is possible to control the electrolyte flow, the accuracy of METTLER TOLEDO's WMF weigh modules can ensure 100% quality control.

This quality control is critical because device recalls caused by exploding batteries have a drastic cost impact and will forever damage a brand's image.

Perfect finish for the highest quality

To increase power density, produced battery cells are packed together in one battery module. For this reason, the cells need to be combined manually or semi- automatically with an electric welding machine. Double-welded wires and missing parts could cause a fire and destroy the pack. An additional benefit to the customer is that foreign objects which have fallen into the battery are detected by weight, even those that are not visible.

This can be prevented using a WMF weigh module for a completeness check. This before-and-after weighing process even eliminates detection issues linked to shiny surfaces. Relying on our experience will help give your high quality batteries a perfect finish.

WMF weigh modules are ideal in battery production

- Plug & communicate with common PLC systems
- Comprehensive overload protection assures high uptime
- Fast weighing enables high throughput rates
- Functionality test with calibration weight at any time
- Protection allows rinsing with liquid for clean-in-place
- Easy mechanical integration into machines
- Accuracy from 0.1 mg to capacities up to 320 g

Learn more about
www.mt.com/WMF

Big and Small on One Machine
The Reason for Being Cutting Edge

Our customer, a filling machine manufacturer, used the new WMS Weigh Modules to create a compact and scalable weighing system with multiple tracks. It weighs very small and very large vials fast and accurately on the same machine. In addition the weigh modules carry heavy preload caused by the special weighing pan.

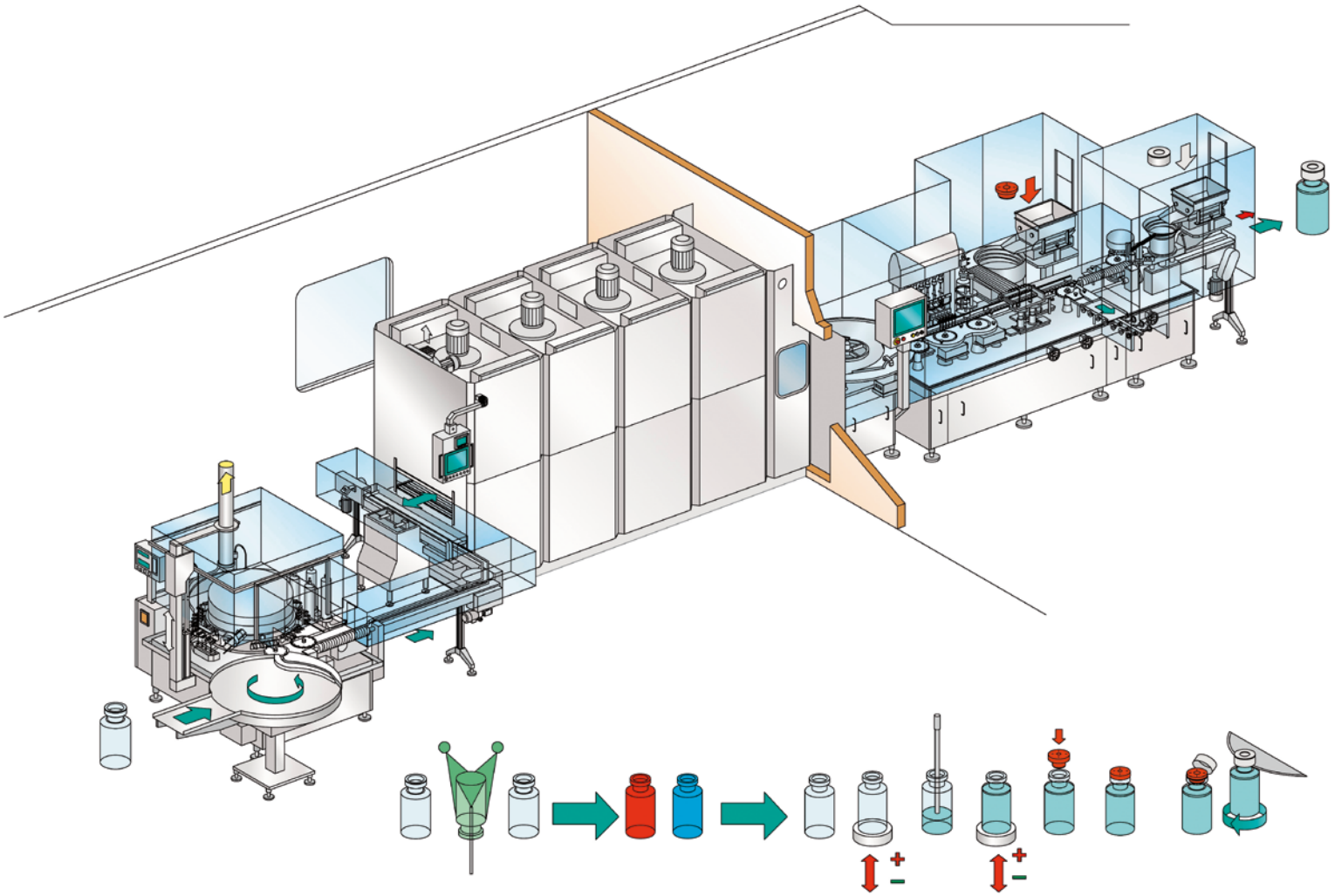
For many years, our customer has been one of the world's leading companies in the field of filling and packaging machine technology for pharmaceuticals and cosmetics. Their position as leader is based on the innovative work by their engineers and close collaboration with users. An efficient service organization helps customers with start-up, validation and maintenance.

Their filling machines for syringes, bottles and vials with volumes up to 1 liter can fill up to 60,000 items per hour. These machines offer 100% in process control (IPC) by weighing all filled vials, as is required increasingly often by the pharmaceutical industry. Their fast cadence and requirement to fill small and large containers on one machine place heavy demands on the performance of the incorporated weighing technology.

High quality at all levels of the company is one of many factors contributing to the success of this customer. However, these high quality requirements also affect suppliers. METTLER TOLEDO has been a reliable supplier of accurate weighing technology for many years. The strong performance of the WM weigh module product line was appreciated for several years. Its high level of accuracy combined with a high weighing capacity facilitates accurate weight control for all sizes of pharmaceutical packaging on the same machine.

New weigh module meets even tougher requirements

A recent demand for an exceptionally multi-faceted, high-speed machine required a weighing range higher than the 510 g for the WM503 weigh module previously used. The limited amount of space available also meant a reduced overall width was necessary. METTLER TOLEDO was in a position to present the new WMS weigh modules to this customer at this very moment. The WMS1203C meets the tougher requirements in every respect. It has high readability and reproducibility of 1 mg across the entire weighing range of 1200 g. This makes it capable of car-



rying a special heavy weighing pan for various container formats and for weighing both small and large containers accurately. When the requirements are such, the approximate weighing time is a mere 0.3 seconds per weighing process. Despite the high-speed weighing technology, several modules needed to be arranged in parallel to be able to reliably check the entire output of the machine. For this reason, the customer integrated several WMS weigh modules in one parallel row with a track width of 30 mm. The arrangement in this limited amount of space led to an eccentric load pick-up by the weigh module, but this did not adversely affect the level of accuracy. The weigh module also has a built-in calibration weight, ensuring that the smooth functioning can be inspected at any time, even when a special weighing pan is fitted.

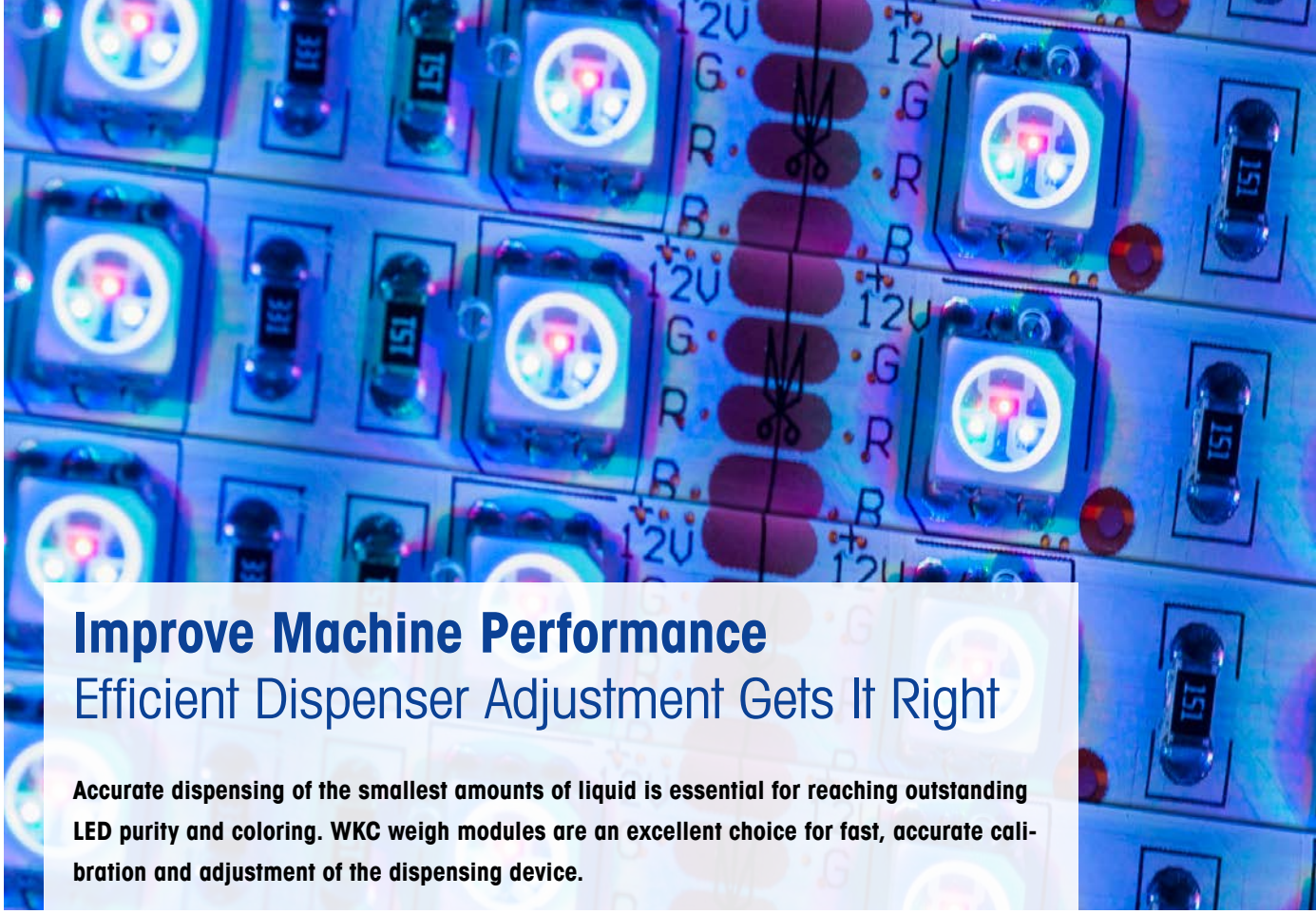
Top marks all-round:

Our customers' engineers, by employing multiple WMS weigh modules in parallel, have turned a scalable weighing system into a reality. Individual weighing points can be added or removed from the machine without any problem. In the event of a failure, the local service technician will replace the affected module in just a few simple steps. The high weighing capacity and the option of eccentric load pick-up support the use of attachment equipment, without restricting the vial volume. With the new WMS weigh module, the customer has a complete weighing technology solution. The company will be able to use this to react to future market requirements or take the market by surprise with their own innovations. Speed up your filling process with this fast and accurate weighing technology.

WMS1203C Weigh module

- Readability: 1 mg
- Capacity: 1,210 g
- Stabilization time: 0.15 – 0.8 sec.
- Stainless steel housing
- Integrated calibration weight
- Can be cleaned thanks to IP66 protection

Learn more about
www.mt.com/WMS



Improve Machine Performance

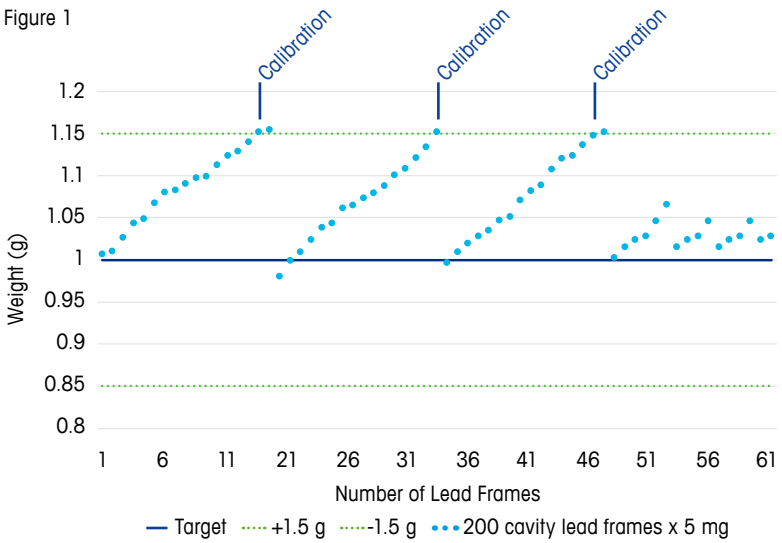
Efficient Dispenser Adjustment Gets It Right

Accurate dispensing of the smallest amounts of liquid is essential for reaching outstanding LED purity and coloring. WKC weigh modules are an excellent choice for fast, accurate calibration and adjustment of the dispensing device.

Due to requirements for lower power consumption and higher quality in the production of LEDs, our customers are demanding more accurate dispensing of the smallest amounts of silicone phosphor, the liquid used when making diodes. This is because the customers they serve must have exactness in dispensing to ensure they can provide:

- Accurate CIE (Commission internationale de l'éclairage) values, which determine LED color
- Power savings, to help lower environmental impact and costs
- Production costs, to help maintain already thin manufacturing margins

Figure 1



Improving efficiency

Highly efficient machines can deliver new ways of extracting as much light as possible to lower total power-supply input. To ensure that, our customers' machines provide the so-called cavity encapsulation. Cavity encapsulation combines a simple structure and high material availability along with high working efficiency and requires that the smallest amounts of silicone phosphor be dispensed into a cavity. This is the most critical parameter to control, as it controls the characteristic LED color. METTLER TOLEDO's WKC weigh modules help our customers keep the volume of dispensed mixture constant.

Process control

For high-precision results, METTLER TOLEDO provides them with weighing equipment that is able to communicate with their automation interfaces. This helps them calibrate and adjust dispenser valves by measuring the weight

Integrated calibration
WKC weigh modules feature an internal test weight. This enables a weigh-module adjustment if deviation is detected.

Fast installation
Standard M12 connector sealing and coated connection cable enables fast commissioning and reliable data communication.

Robust housing
Fully enclosed stainless-steel housing protects the weigh module against aggressive materials.

Adaptable weighing pan
A detachable weighing platform with threaded holes allows for the installation of custom weighing pans.

of the liquid dot (Figure 1). By using this highly accurate weighing feedback, they can compensate for changes caused by differences in fluid properties, such as viscosity or volume, even when production tolerances reach a mere +/-1,5 percent weight total per dot. This means for a 200-cavity lead frame a readability of 1,5 milligrams must be reached.

Achieve the same benefits
Learn how you can offer your customers higher-accuracy dispensing by providing them with a cost-effective technology that meets their needs for exactitude at very small volumes. Your customers will be able to dispense faster and more precisely for longer periods, ensuring maximum uptime and productivity.

WKC weigh modules

- Capacity: from 220 g up to 6 kg
- Internal calibration device
- IP42 when weighing
- Very compact
- Stainless steel housing with smooth surface
- Direct connection to control systems
- With optionary accessory module: DeviceNet, PROFIBUS DP, EtherNet/IP, PROFINET, CC-Link

Learn more about
www.mt.com/WKC

Assuring Top Performance
with Portable Calibration Solution

Hamilton Bonaduz AG is a premium provider for automated liquid-handling solutions. They have comprehensive verification procedures in place to ensure specified performance over the entire life cycle of their laboratory instruments. The pipetting performance is verified with portable WXS high-precision weigh modules at the final quality control and for preventive maintenance. The daily use of the WXS weigh modules as portable verification instruments is plausible proof of its robust design.

The Hamilton Company is a global enterprise with headquarters in Reno, Nevada (USA); Franklin, Massachusetts (USA); and Bonaduz, Switzerland, with subsidiary offices throughout the world. It is an industry leader in the design and manufacture of liquid handling, process analytics, robotics and automated storage solutions. The applications for its STAR line automated pipetting platform range from simple pipetting to complex sample processing and system intergrations.

Hamilton's air displacement pipetting technology can accurately pipette liquids from 0.1 microliters up to 5000 microliters. Their ML STAR line offers configurations with 1 to 16 independent channels for pipetting into individual wells plus 96 and 384 multiprobe heads for simultaneous pipetting into all wells of a microplate on the same system, whereas the multiprobe heads are capable of pipetting with single tips as well.

To verify its pipetting accuracy and precision, Hamilton implemented installation and verification procedures as well as complementary service provisions to ensure that their systems meet specifications over their entire life cycle. One of these methods is gravimetrical verification of the pipetting performance during the final quality-control check before delivery and during installation at the customer site. Their field service engineers perform gravimetrical verification for preventative maintenance (as a standard part of the service contracts). All gravimetrical verifications are done with high-resolution WXS205DU weigh modules from METTLER TOLEDO. Hamilton's service engineers praise the robust design of the weigh modules, which are used several times per week and transported from one customer to the next.

Hamilton's field service engineers are equipped with portable WXS weigh modules. Shown here is the portable WXS weigh module placed in its carrying case.

Systems used for pipetting liquids which require a high safety level can be equipped with a permanently installed WXS weigh module. This allows verification of pipetting heads anytime it is needed. The weigh module has two integrated calibration weights. This enables the accuracy and functionality of the weigh module to be verified before verifying the pipetting performance. This combination of gravimetrical verification and Hamilton's Pipetting technology including features such as the Total Aspirate and Dispense Monitoring (TADM) ensures that highest safety standards are met and waste of materials is eliminated.

The WXS205DU high-resolution weigh module from METTLER TOLEDO is one of several key components that ensures the highest quality in automated pipetting of liquids for analytics and research. Hamilton is very satisfied with the performance and the self-monitoring capability with integrated calibration weights. They also appreciate the global presence of METTLER TOLEDO's weighing experts to consult them locally wherever they need them.

For more information about Hamilton, visit:

www.hamiltoncompany.com

WXS weigh modules

- Capacity: 22 g to 220 g
- Readabilities: 1 µg to 0.1 mg
- Internal calibration device
- Fast update rate on interface
- Stainless steel housing 1.4404 (316L)
- Direct connection to control systems:
- Integrated RS232 and optional Ethernet TCP/IP
- With additional module: DeviceNet, PROFIBUS DP, EtherNet/IP, PROFINET, CC-Link

Learn more about
www.mt.com/WXS

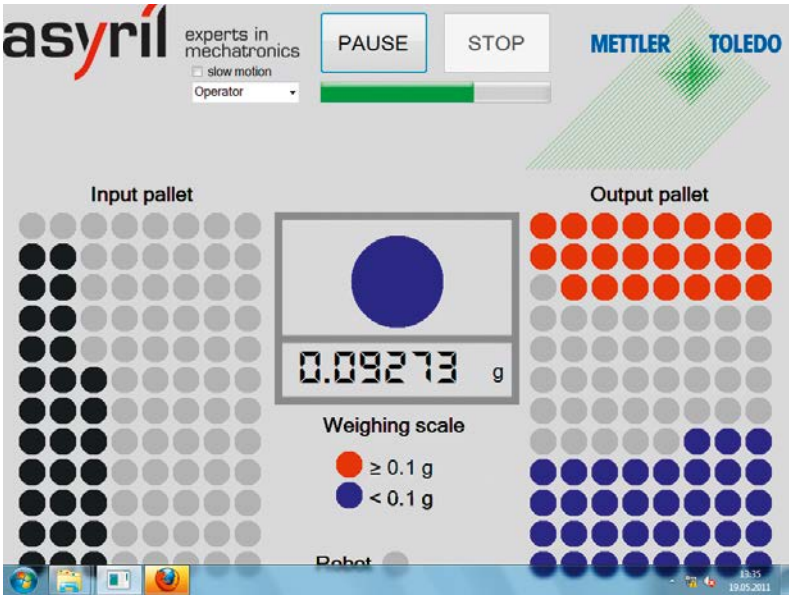
Compact Robot for Pipette Calibration

Small Weigh Module Saves Space

A very compact robot cell replaces tedious low added-value manual operations whenever a large amount of samples need to be weighted or pipettes have to be calibrated. The ultra small sized weigh module was easy to integrate into the cell. It saves space and leaves room for more pallets with products or additional measuring devices.

Asyril SA is a Swiss company focused on the development of miniaturized mechatronical devices for automation. They realize solutions for the watch industry, assembly of miniature products, high-speed palletizing, surface mount technology, flexible feeding systems, medical and bio-medical industry. The founders of the company have an excellent record in the design and control of miniaturized robotic systems, such as the PocketDelta for example. This robot won the Swiss Technology Award 2007 and the prestigious Hermes Award at the Hannover Fair 2007.

The company received an order from a research laboratory in bio technology for an automatic vial weighing device. The new solution had to replace manual



The operator display shows places of good and bad samples.

The very compact robot from Asyril can be used for automatic weighing including sorting and sample identification.

operations whenever a large amount of samples needed to be measured to calibrate pipetting systems

Asyril built a compact table-top cell of 700 x 700 x 700 mm only comprising a Delta robot. The very compact robot cell hosts several paletts of 96 places for vials to check more than one lot without operator intervention. It has a drawer mechanism for in feed and out feed of pallets into the robot cell. This allows convenient and safe handling of pallets. The robot is mounted on top of the casing, which makes the cleaning of the work surface an easy thing to do. Work cycles can be programmed with a simple and intuitive programming language via a user-friendly interface. It can also be turned into an automatic sorting machine, where tight weight tolerances are a must.

The space for the weighing device was very limited. Therefore Asyril decided to use the very small sized WMC weigh module which has a foot print of 25 by 65 mm only. This saves valuable space inside the robot cell to leave room for allocating other measuring devices or more paletts. The WMC has a capacity of 20 g which offers to mount an additional preload for a holding device if needed.

The end customer and Asyril were impressed by the unusual small size and high performance of the WMC weigh module. It allowed them to optimize the interior of the robot cell to leave space for hosting additional equipment in the future.

www.mt.com/wmc

www.asyril.com

WMC weigh modules

- Capacities: 11 g or 21 g
- Readabilities: 0.1 mg or 0.01 mg
- Dimensions (l x w x h): 65 x 25 x 73 mm
- Fast update rate on interface
- Stainless steel housing 1.4404 (316L)
- Direct connection to control systems: RS232 / RS422
- With optional accessory module: DeviceNet, PROFIBUS DP, EtherNet/IP, PROFINET, CC-Link

Learn more about www.mt.com/WMC

Automatic, Rapid and Accurate Preparation of Cytostatic Drugs

Loccioni humancare research announces APOTECAchemo, the first automation and information system for chemotherapeutic drug compounding in oncology treatment. As the flow of materials, data and tasks is coordinated, the technology becomes the means to a higher end: to benefit people, be they patients, pharmacists, specialists or operators. Every therapy produced is identified and checked. The use of high-precision WMS6002C weigh modules by METTLER TOLEDO ensures that the dispensing process fully conforms to pharmaceutical standards.

Ultra high-precision weighing in automated processes

The preparation of anti-cancer drugs in hospitals involves the development of individually tailored chemotherapy treatments for patients. The doses take account of individual characteristics, including the patient tolerate to a certain drug, and are prepared in containers of various shapes. The main critical factor concerns the high toxicity of the drugs; a dosage error can be lethal for the patient and the manipulation of these substances is also a high risk for the hospital operators.

In order to overcome these critical issues, Loccioni humancare developed APOTECAchemo, a robotized system for weighing drugs and solutions, reconstituting powdered drugs, dosing compounds using a mechanical arm and dedicated actuators, preparing syringes, bags and infusion devices, and disposing of used materials in full safety. The patient is protected by the automatic recognition of all the products handled, by a barcode-based system of labelling offering full traceability, and above all by the checks on all the weight measurements using the high-precision WMS6002C weigh module made by METTLER TOLEDO. By measuring the dispensed substance and the residual substance (such as that left inside the initial vials), dosage errors are completely eliminated, since 100 % of the hospital production is checked as a matter of routine.

Courtesy LOCCIONI

Efficient and extremely accurate preparation

The main feature of the WMS6002C high-precision weigh module by METTLER TOLEDO is its ability to make very accurate measurements in a fraction of a second. Complex digital filtration algorithms ensure reliable weight measurements even in environments with vibrations. Preparation times are further optimized by rapid digital data computation and direct data transfer via RS232 or RS422, enabling the measurement quality results to be sent to a PLC. The maintenance of the weighing sensor can be carried out in its installed place, and it can easily be calibrated using the internal calibration device or external weights. Meticulous standard operating procedures are followed to avoid cross-contamination.

Loccioni humancare is part of the Loccioni Group, with 40 years of experience alongside the leading players worldwide, bringing quality of life, comfort, safety and sustainability to the health, home, environment, mobility, public administration and industrial markets.

In its own words, Loccioni humancare develops a unified framework of methods, measurements and innovations deriving from decades of experience in global industry, to address the main issues of our time: health, nutrition and wellbeing. Through the creation of genuine development laboratories with its partners (AOR – United Hospitals of Ancona; IEO – the European institute of Oncology, Milan; and Johns Hopkins USA), Loccioni provides new solutions based on measure and constant dialogue. The human being is the common thread unifying all its scientific, technological and organizational solutions. The health system becomes an ecosystem in its own right, integrating research, diagnosis and technology with the goal of reducing risk, reducing costs and optimizing resources. Every treatment and every episode mediated by a human dimension can be improved through instruments that make it measureable: system design for a more sustainable life is the humancare mission at every level.

www.loccioni.com
http://humancare.loccioni.com

WMS weigh modules

- Capacity: from 120g/0.1mg up to 6kg/10mg
- Internal calibration device
- ATEX: Zone 1 or 2
- Wash down option IP66
- Very compact
- Up to 92 updates per second
- Stainless steel housing 1.4404 (316L) with smooth surface
- Direct connection to control systems: RS232 / RS422
- With optionary accessory module: DeviceNet, PROFIBUS DP, EtherNet/IP, PROFINET, CC-Link

Learn more about
www.mt.com/WMS

Fully Automated Preparation
Provides Consistent Samples

Precise sample preparation is a prerequisite for reliable results in quality control. The Sample Prep WorkBench from Agilent uses an integrated high-precision weigh module for directly providing accurate weight measurement.

Agilent offers innovative measurement solutions for chemical analysis, life sciences, diagnostics and genomics. Its singular focus on measurement helps scientists, researchers and engineers address their toughest challenges with precision and confidence.

The Agilent 7696A Sample Prep Workbench provides consistent, accurate and safe sample preparation, eliminating potential problems during weighing, dilutions and derivatizations. It uses only small volumes of chemicals and solvents, reducing waste. Because of its size, the Agilent 7696A Sample Prep WorkBench fits inside a standard fume hood, reducing analysts' exposure to hazardous materials.

Automated sample preparation increases efficiency

Agilent enhanced its automatic 7696A Sample Prep WorkBench with a new WeighStation, which is based on a WMC weigh module made by METTLER TOLEDO. This provides the ability to weigh accurate amounts of material directly into the GC or LC vials, allowing for calculations required in specific ASTM (American Society for Testing and Materials) and EN (European Norms) methods.

Small footprint for effective lab bench use

The WorkBench has to be small in size to fit under fume hoods. This limits the space available for the weighing station. The ultra small WMC weigh module from METTLER TOLEDO met Agilent's requirement perfectly. It fits into the compact instrument and didn't require a size extension of the existing automatic vial-handling device. It benefits from mechanical protection against vertical overload and lateral forces in the event of handling-device malfunction. METTLER TOLEDO also manufactured a customized calibration weight to automatically verify functionality and accuracy of the weigh module anytime it is needed.

Even more competitive than previous models

Agilent is very satisfied with the WMC weigh module, which is known in their terminology as the "WeighStation." Its accuracy and small size allowed them to provide new benefits for the users of their 7696A Sample Prep WorkBench. They also appreciated METTLER TOLEDO's expertise in integrating weighing technology into their compact instrument. Agilent is convinced that integrating the WeighStation into their WorkBench further improves their competitiveness as a supplier for automated solutions to make quality control and research more efficient.

www.agilent.com/chem/workbench

WMC weigh modules

- Build arrays with a minimal pitch
- Parallel multi line filling or check weighing within fractions of a second
- No Limit in the number of weigh modules within an array
- Easy replacement and service of single weigh modules
- Direct connection to control systems
- With optionary accessory module: DeviceNet, PROFIBUS DP, EtherNet/IP, PROFINET, CC-Link

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One stop for industry expertise and resources to support your weighing processes.

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