

Smart Sensors for Industrial Weighing

Simplify Integration and Condition Monitoring



METTLER TOLEDO



Table of Contents

How Smart Sensors Optimize Industrial Weighing

Page 3



How to Reduce Complexity and Optimize Control

Page 7



Cumulative Enhancements Support Major Growth

Page 4



Why Standardize

Page 8



Why IT/OT Convergence is Imperative

Page 5



4 Tips to Select Smart Devices

Page 9



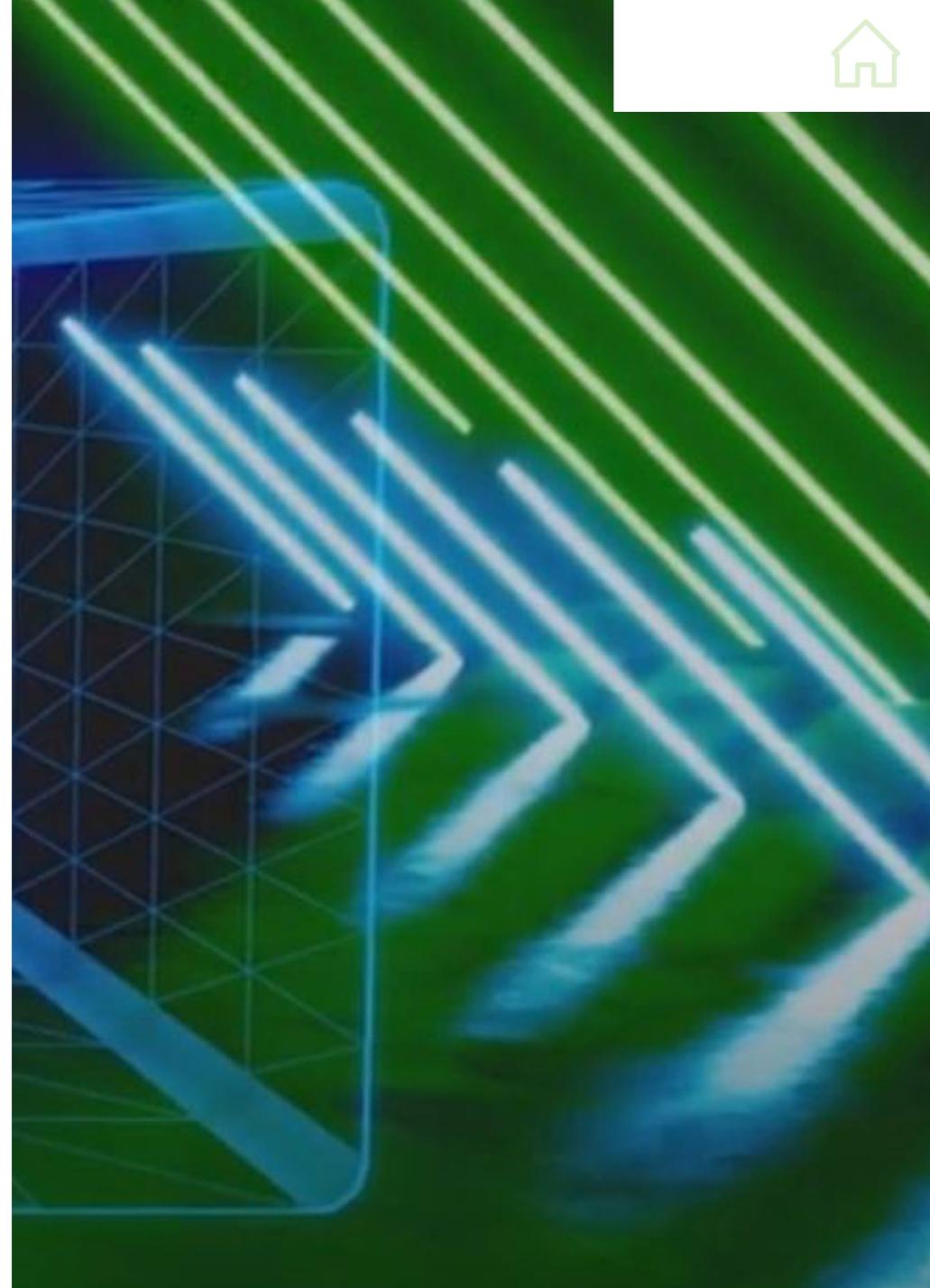
How Condition Monitoring Informs Action

Page 6



High-Performance Weighing Sensors

Page 10





How Smart Sensors Optimize Industrial Weighing

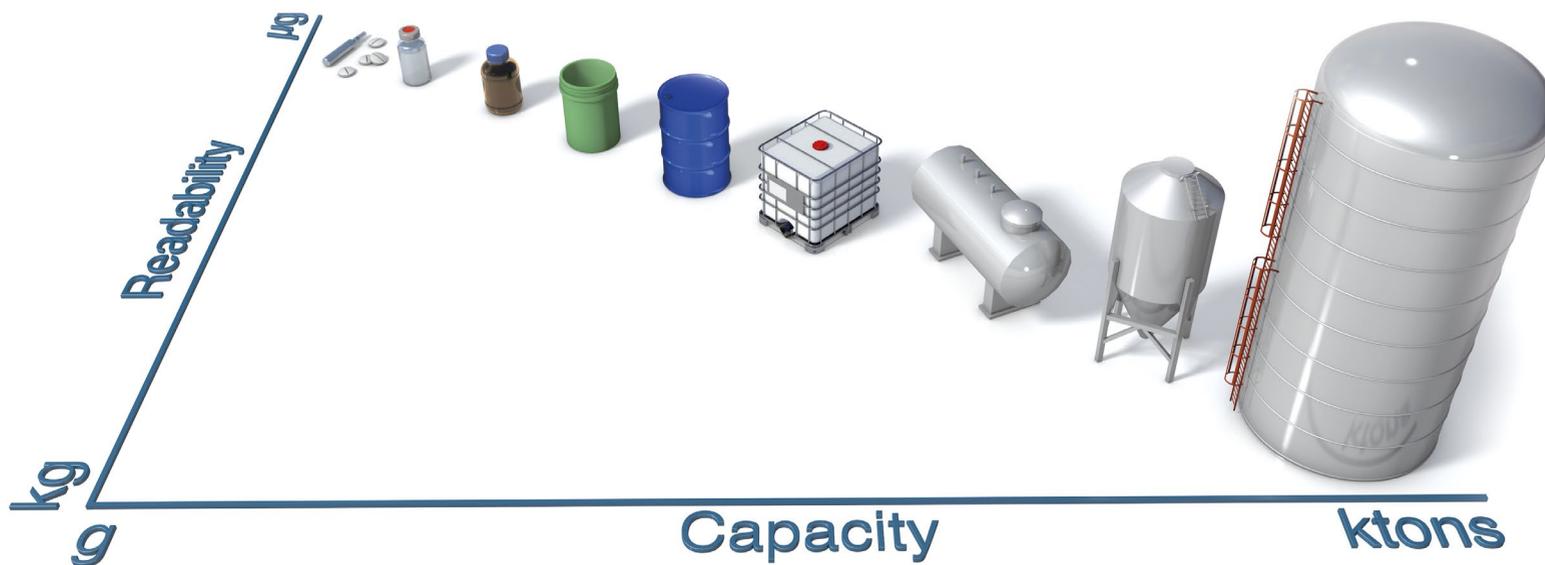
Design Systems with a Competitive Edge

Ready-to-weigh sensors and integrated connectivity enable IT/OT convergence and condition monitoring to increase system visibility, drive faster decision-making, and lower costs.

Rising costs, growing industrial skills gaps, and the pursuit of measurable return on investment (ROI) have manufacturers leaning heavily on automation and condition monitoring to increase performance and equipment uptime.

With recent advancements in smart, ready-to-weigh sensors and integrated connectivity, available solutions now encompass the full range of industrial weighing applications, from measuring micrograms of material in analytical laboratories to thousands of tons of product in harsh or combustible industrial

environments. These mission-critical solutions lower development costs, increase system visibility and control, reduce complicated troubleshooting, and therefore maximize production quality and yield.





Cumulative Enhancements Support Major Growth

Addressing Invisible Pitfalls of Analog Technology

Measurement Considerations

For critical weight-based applications, people implementing machine integration must consider the mechanical and environmental effects that may be overlooked by those who design or use the equipment.

For example, vibrations that are imperceptible to humans can create instability in the process. The selected sensor must be sensitive enough to detect such movement while avoiding negative effects on the product or downstream application.

Advantages of Smart Technology

Smart sensors automatically adjust measurements in response to changes or inconsistencies in the environment, providing higher precision than analog sensors. Additionally, compared to simple weight measurements from a traditional sensor, intelligent devices

provide real-time condition monitoring and prioritized alarms according to NAMUR NE107. This 5-level prioritized alarm system gives you instructions on what to do when something goes wrong.

Potential for Optimization

With these capabilities, smart sensors enable machine builders to build more compact machines that have a higher degree of precision and support multiple tasks on the same sensor, freeing up space in the machine while reducing equipment costs.

For end users dealing with increasingly expensive products and production time, leveraging smart sensors allows critical information to flow upward to control systems with unprecedented speed and precision, supporting a lower overall system cost and higher operational efficiency.



Leveraging smart sensors allows critical information to flow upward to control systems with unprecedented speed and precision.





Why IT/OT Convergence is Imperative

The Critical Flow of Information

Historically, all production data remained in production, and all IT data lived with IT. Any data that crossed the lines did so only with manual intervention. The process was time-consuming, often incomplete, and too late to substantively improve processes or decision-making.

Comprehensive Data Visibility

Today, digital transformation enabled by Industry 4.0 – also known as the Industrial Internet of Things (IIoT) – has IT and operational technology (OT) merging. Controlling weight-specific applications by connecting smart sensors to the network allows shop-floor data to integrate with IT and OT simul-

taneously, solving speed and transparency concerns.

Rather than point-to-point connections, such as a scale to a PLC, smart sensors make multipoint connections possible. A weighing automation device can be connected to a PLC, a distributed control system (DCS), the cloud, and a server – all at the same time – giving production and back-office personnel real-time access to crucial machine data while individuals in the front office gain the timely IT perspective.



How Condition Monitoring Informs Action

Smart Alarms Support Continuous Performance

With analog weighing technology, days, months, or a year can go by before anyone realizes a costly problem exists. Condition monitoring with smart sensors provides real-time feedback when something goes wrong and allows time to shut down the process to take corrective actions before producing out-of-spec products.

When It Matters Most

Condition monitoring is particularly essential when imperceptible changes to a process need to be managed. If a weight variation is detected, it is necessary to know immediately whether the sensor is in good working order and that it is not underloaded or overloaded.

Smart5™ Alarms

Having smart, prioritized alarming as part of condition monitoring makes it immediately apparent which alarms must be dealt with first. Whether something needs to be calibrated, a wrong step was taken, or an error is becoming more critical, priorities will vary, and the resolutions must be planned accordingly. Root causes can be eliminated before the product or process is comprised.

Alarm	Implication
	Safety risk Equipment damage Bad product
	Imminent performance loss
	Out of Specification Production errors
	Quality at risk
	Good production



How to Reduce Complexity and Optimize Control Offload Weighing Tasks to Automation Devices

Choosing smart automation devices enables higher precision and allows PLCs to be used for other tasks that do not involve weighing. This distributes resource load, speeds up processing, and reduces PLC costs and complexity.

Common Weighing Applications

For filling applications, as an example, the legal consequences of “cheating” customers with underfilled products have companies slightly, but intentionally, overfilling instead. Until smart, higher-precision sensors came on the market, this was the best they could do.

Now, smart devices can control the whole filling process, precisely weighing 100% of the product so overfilling is unnecessary and then communicating the results to the PLC when finished.

Rather than giving away excess product – thousands, hundreds of thousands, or even millions of times over – money is saved on every single transaction. Besides eliminating overfill material costs, smart sensors lessen the need to reweigh products before they leave the factory, because the risks of rejects, re-packaging, and rework due to underfilling are avoided.

More Flexibility, Less Spend

Application-specific, ready-to-use programming is also beneficial. For instance, the IND360 ultra-fast automation weight indicator has filling, inventory control, and tank and vessel weighing applications built into the indicator, saving engineering time and avoiding custom programming.



Why Standardize?

Benefits of Plug-and-Weigh Technology

Historic Automation Complexity

In the past, every automation technology supplier had its own proprietary network making integration difficult if not impossible across platforms from different suppliers. It often also required expensive adapters, extensive commissioning, and specialized training.

Make it Simpler

Happily, this is not the case with open-source automation languages, such as IO-Link, which work with many automation systems. This frees integrators who either do not want to be beholden to a proprietary system that requires extensive commissioning or who want to be more creative in terms of a build than a proprietary system allows.

Standardized sensor interfaces reduce complexity by providing a variety of commercially available options for quick and easy integration all on one network. They reduce the learning time for engineers and integrators responsible for design and implementation and mitigate the risk of supply-chain disruptions by eliminating dependency on any single vendor. They just plug in a sensor, and it works.

For equipment and machine builders, standardization helps bring better machines to market faster and more efficiently. It also reduces complexity so that it is easier and faster to both maintain equipment or bring it back to operational status if a component must be replaced, enhancing uptime and operational readiness.





4 Tips to Select Smart Devices

Leverage Industry 4.0-Ready Technology

Some tips to find and select smart weighing technology include the following:

Avoid Complicated, Non-Standardized Devices

Look for plug-and-weigh, open technology solutions that allow a choice of devices that can quickly connect to anything.

Prioritize Network Connectivity

Choose smart sensors that connect to an industrial network, which allows copious data to be sent and received in real time and avoids the communication lags of using weighing modules in PLCs.

Check for Device Drivers and Approvals

Choose sensors that have all the necessary files and drivers and the appropriate approvals, such as ODVA™, confirming that the device has been tested and is conformant.

Consider Your Communication Protocol

Minimize commissioning time and maximize system capabilities. Both IO-Link and high-speed IE communication can handle the data transfer required for real-time condition monitoring.



High-Performance Weighing Sensors

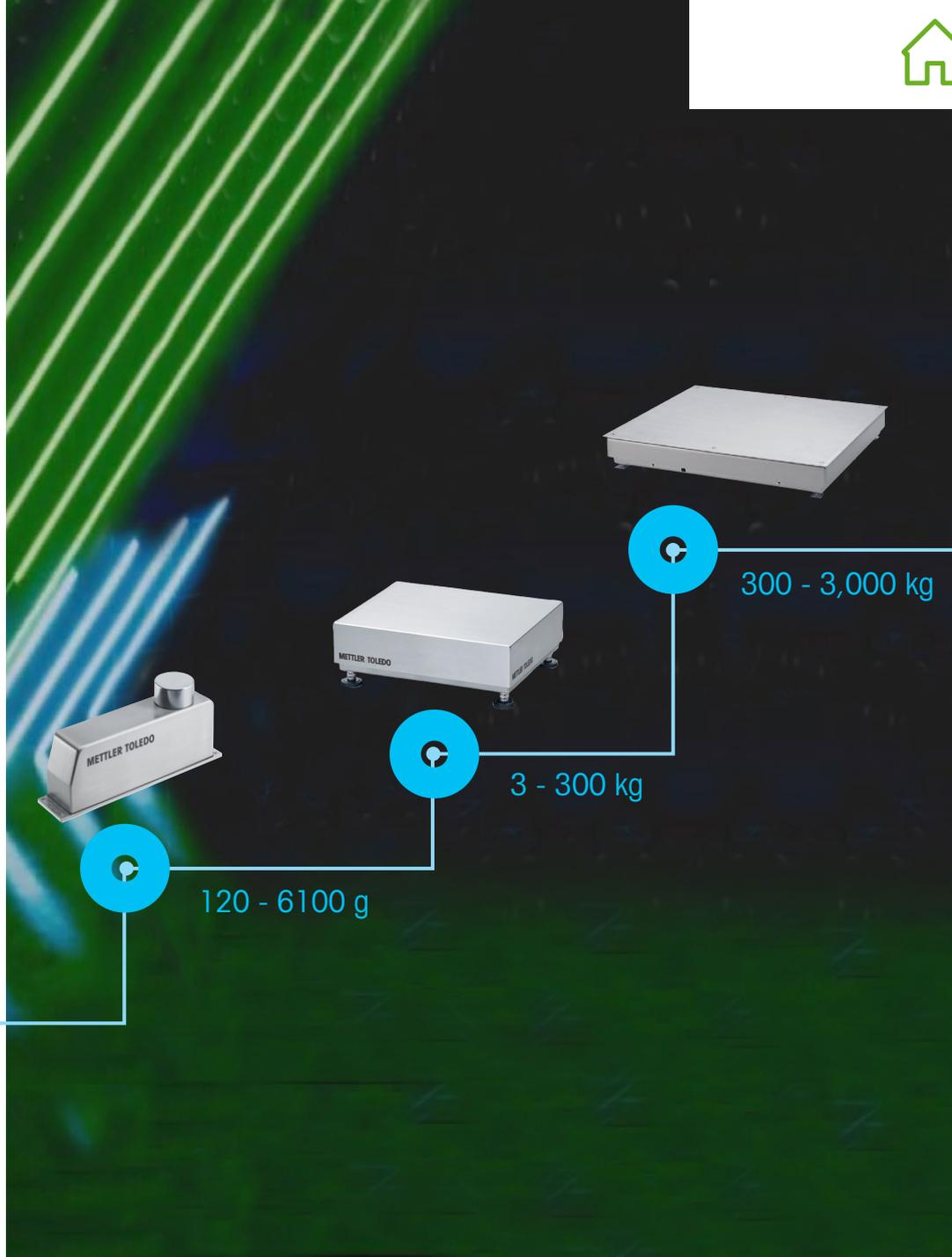
Equipment for the Full Weighing Range

METTLER TOLEDO develops self-contained smart sensors with embedded electronics that eliminate the need for transmitters, control cabinets and extra cabling by connecting directly to a variety of automation networks such as IO-Link and high-speed IE communication.

Industrialized high-precision automated precision weighing (APW) sensors are a class of Industrial Ethernet-based sensors from 11 grams to 3,000 kilograms with exceptional precision from 600,000 of up to 22,000,000 measurement intervals.

Each device is standardized and certified at multiple levels, including the network, the weight and measurement accuracy, and any relevant hazardous-area and electrical safety type requirements.

With products that are known, tested, and have global approvals, customers can specify, use, operate, and maintain them at low risk, and engage talent only as needed to help install, calibrate, troubleshoot, and support the weighing solutions.

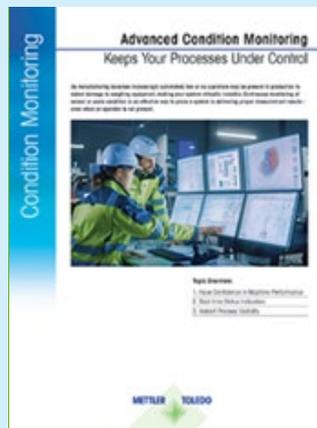




Weighing in the Smart Factory

Tools for Adopting Automation

Advanced Condition Monitoring for Automation Systems



Download our white paper to learn more about how continuous monitoring of sensor or scale condition is an effective way to prove a system is delivering proper measurement results – even when an operator is not present.

www.mt.com/scale-condition-monitoring

8 Considerations to Automate Your Weighing System



Download our white paper to read up on the eight aspects of ideal weight-based process control that should be considered when crafting machines that function at any point along the automation measuring chain.

www.mt.com/ind-weighing-automation-WP

► www.mt.com/ind-weighing-components

METTLER TOLEDO Group
Industrial Division

Subject to technical changes
© 08/2023 METTLER TOLEDO.
All rights reserved.
Document No. 30599399 A
Industrial Marcom