
A robot ensures reliable stock placement and removal of wafers in the shelf

# Everything Under Control

**Turck's BL ident RFID system coordinates the robot-supported stock placement and stock removal of intermediates in semiconductor production in China**

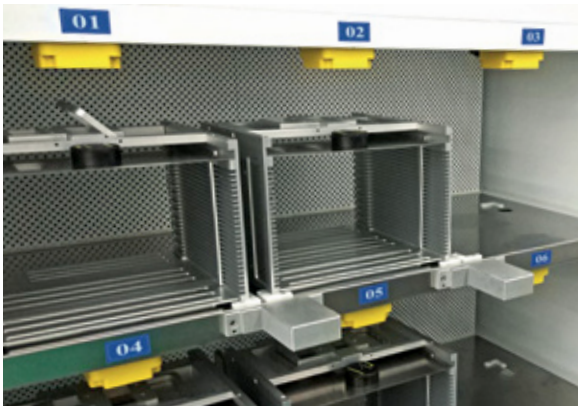
Digitalization and microelectronics are becoming part of all areas of life, with the result that the semiconductor industry has become a driver of the global economy within just a few years. In the midst of this boom, manufacturers are facing the challenge of meeting the ever-growing demand.

Semiconductor production is a highly complex process consisting of hundreds of work steps. Due to their size and complexity, it is barely possible to create integrated circuits manually. In addition, production places high demands on purity, cleanliness and functionality. Accordingly, semiconductor factories require highly automated, intelligently networked, modular and flexible production concepts.

One of the world's leading semiconductor manufacturers in China faced the challenge of storing the delicate silicon wafers safely between quality testing and packaging. These sensitive components must be stored in material racks until the next process step. In this process phase, the wafers were previously removed manually and the stock removal was documented on paper sheets. Not only was this time-consuming, but also prone to errors and provided only a poor overview of the material flow in the overall process. There was therefore a need for an automated solution that would guarantee a reliable and efficient process.

Consequently, the customer now uses RFID in warehouse management to achieve fault-free and transparent production throughout the entire process. RFID storage location identification uses RFID tags to monitor which wafer is stored at which storage location during stock placement and stock removal or transfer. All stored wafers can therefore be found immediately if necessary.

The RFID tag is located on top of the wafer carrier




The RFID HF read/write heads on the top of the material racks read out the tags of the wafer carriers during stock placement and stock removal


The BL20 RFID and I/O system from Turck ensures reliable communication with the PLC

### Robot-based RFID solution

Specialized high-performance handling robots play an important role in the automated processing of unprocessed wafers into integrated circuits. These Automated Guided Vehicles (AGVs) with integrated robotic arm navigate autonomously and guarantee reliable handling of the components between processes. In cooperation with a Chinese robotics company, Turck developed a complete RFID solution to use an AGV for material transport. The solution significantly reduces the supply time for the wafers and minimizes the work involved in this process step. The warehouse management system links the information from the RFID system with the information from the production control system (MES) and monitors all wafers in real time.

### BL ident RFID solution convinces

Turck's BL20 gateway fits well into the clean and tidy production environment. It forwards the data collected by the RFID and I/O modules in the field to the higher-level controller. The RFID tags are attached to the upper end of the wafer carrier. RFID read/write heads installed on the top of the wafer shelves automatically recognize the carriers and thus guarantee their reliable identification during stock placement and stock removal by the AGV.

"The modular design of Turck's BL20 solution, which can be equipped with RFID modules as well as other I/O modules, allows sensors and LED displays to interact with the MES via the same gateway. This reduces the amount of work involved in field wiring," explains project manager Tao Zhang Yitao. "If a new read/write head is added, only the RFID module and the base plate need to be added, which significantly reduces hardware costs and construction effort.

LED displays provide clear information about the operating status of the read/write head and RFID module at all times. The large read distance of the read-write head allows the robot arm enough space to pick up and position the carrier. The epoxy resin carrier housing in protection class IP68 does not interfere with the reading process, nor does contamination on the surface. In addition, the tag can be reused, which is ideal in closed loop applications. And Tao Zhang Yitao was impressed by even more advantages: "The preassembled cables can be installed quickly and guarantee secure data transmission. Above all, Turck's RFID products can be replaced quickly during operation, which significantly reduces downtime and makes maintenance of the devices quick and easy."

### Summary

With the rapid development of Industry 4.0 and IIoT, RFID technology will continue to play an important role in the semiconductor industry. By using Turck's RFID storage location identification solution, the user is able to significantly increase storage efficiency and further advance the paperless flow of materials and information. Not only has the delivery of materials been accelerated, but the complete traceability of the material data and thus a consistently transparent production process have been achieved.

**Author** | Lin Qiang, Marketing & Product Management Department, Turck (Tianjin) Sensors Co.
**Web code** | more22152e

## QUICK READ

A Chinese semiconductor manufacturer automates the stock placement and stock removal of wafers between production steps with RFID support, thereby ensuring a smooth process flow. Turck's BL ident RFID system was chosen — partly because the modular system can be easily integrated into existing plant configurations.