

# interface

FORCE MEASUREMENT SOLUTIONS.

## CASE STUDY

## Vertical Farming on Earth and in Space



### About

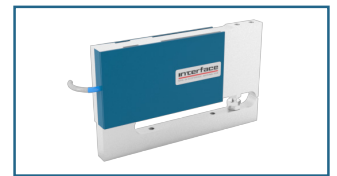
As we look towards the stars as a potential new frontier for human life, there are countless innovations to sustain life from these explorations. One of the most critical is the production of food. This is where new solutions for indoor farming is gaining momentum. According to NASA, the United Nations predicts Earth will have to feed another 2.3 billion people by 2050, mostly concentrated in urban centers far from farmland. NASA has been working for decades to tackle food production both on Earth and in space.

Any transformation requires designing and testing of these systems to be viable in sustainability. Vertical farming is where industries intersect through R&D. Education, space, agriculture, and manufacturing sectors are working together to solve for food scarcity and production challenges. Interface force measurement solutions are at the center of these innovations.

### Challenges

The challenges that vertical farming solves across all application areas is reducing space and the enormous water savings. These stacked systems reduce the amount of surface areas needed to grow plants, while also using gravity to allow water to filter from top down through the stacked garden beds. This innovative technique is perfect for use in space systems and for urban living. Innovation needed to maintain a vertical farm includes robotics, smart measurement systems for irrigation, center of balance testing and various sensors used in monitoring and harvesting.

A smart watering system ensures that each level of stacked system is receiving enough water. In space applications, recycling water is core to advancements in agriculture. Sensors within the plant beds must be able to provide feedback on the amount of water each level is receiving and report that accurate data.



SPI Low Capacity  
Platform Scale Load Cell



MBI Overload Protected  
Miniature Beam Load Cell



WTS-BS-6 Wireless  
Strain Bridge Module



WTS-AM-1E Wireless Strain  
Bridge Transmitter Module

Robots manage monitoring and moving the plants around, reducing human involvement, eliminating contamination risk.

All these challenges utilize force measurement devices and instrumentation in design of the systems and for real-time feedback. Load cells are critical in engineering and designing advanced agriculture systems. Miniature force sensors are commonly designed as an activated component in vertical farm equipment.

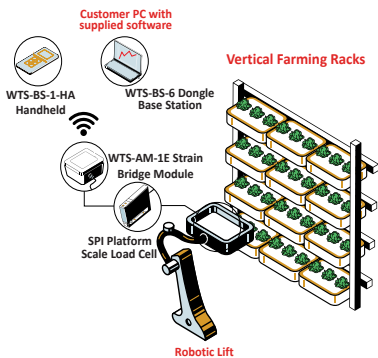
## Solutions

Interface products have been utilized in the space, agricultural and automation industries for decades. We provide both standard and custom solutions to customers for a variety of food-based applications. Therefore, we understand the needs of each industry individually and are well-equipped to provide solutions for new innovations in vertical farming, on the ground or in the galaxies

One of the developments in force measurement used to test the complex variety of farming robotics is multi-axis sensors. Because of the construction and capabilities of robotics, engineers need to be able to test on multiple axes to ensure each part of the robot's movement can be evaluated and monitored. Multi-axis sensors allow for more comprehensive and accurate data of each of the robot's movements, critical to plant systems that can often be very temperamental and sensitive to disturbances.

For force monitoring in irrigation systems, especially weighing and monitoring water levels in plant beds, Interface offers exceptionally reliable and accurate load cells. Most importantly, we offer wireless systems for force monitoring that reduce human interaction, while also keeping a mess of wires and cables away from the plants.

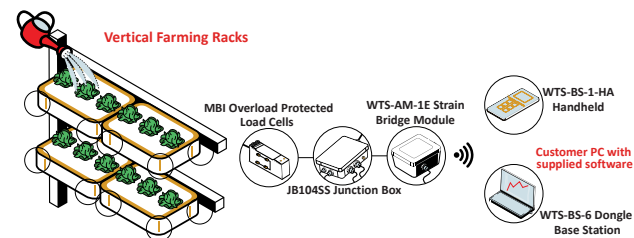
## Vertical Farming Monitoring



In vertical farming applications, automated mechanics pick up and move the products, thus using less human involvement and contamination. To keep an eye on these automated systems, a wireless force measurement system monitors the robotics that pick up and move the produce to their next destination of the packaging process. Interface suggests installing SPI Low Capacity Platform Scale Load Cells, along with WTS-AM-1E Wireless Strain Bridge Transmitter Modules in the center of the platforms of the robotic lifting system that move around the produce. The WTS-AM-1E's wirelessly transmit the data collected from the SPI's to the WTS-BS-1-HA Wireless Handheld Display for multiple transmitters, and the WTS-BS-6 Wireless Telemetry Dongle Base Station when connected to a computer.

## Vertical Farming Irrigation System

Vertical farming is better using smart technology indoors for the irrigation system. A wireless force measurement solution monitors the amount of water. Interface suggests installing four MBI Overload Protected Miniature Beam Load Cells under each corner of the trays of the produce. A JB104SS 4-Channel Junction Box is connected to each load cell, and to a WTS-AM-1E that wirelessly transmits the sum weight to the WTS-BS-1-HA Wireless Handheld Display for multiple transmitters, and the WTS-BS-6 Wireless Telemetry Dongle Base Station. Interface's Wireless Telemetry System helps to monitor and weigh the amount of water used on the produce in this vertical farming system.



To learn more about Interface's work with in space, agriculture and robotics, or for more information on how our products can serve vertical farming systems, contact us.