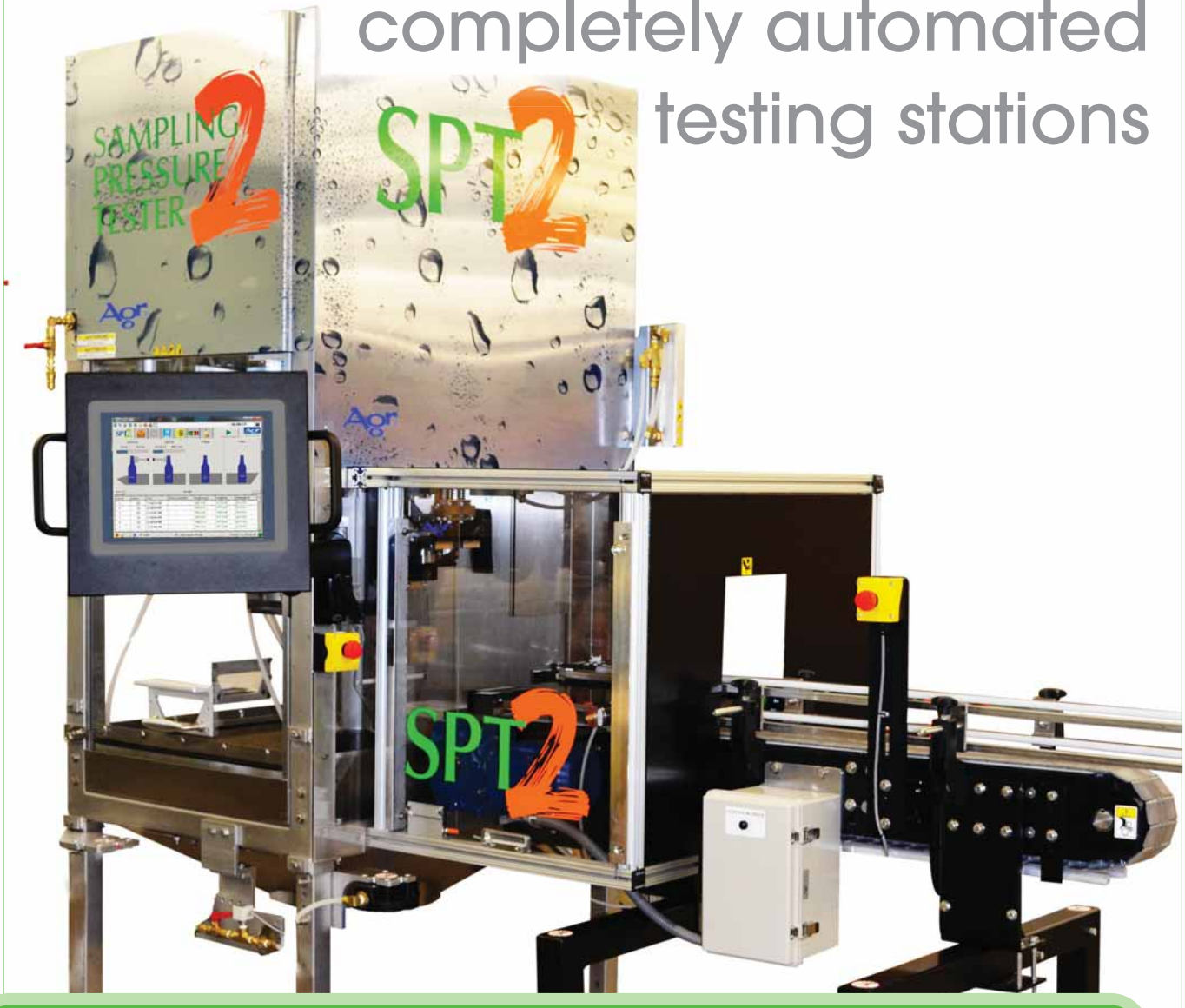
AGR INTERNATIONAL

From pressure, volume, coating and measurement testing to completely automated testing stations



Agr International is a worldwide supplier of testing and measurement instruments to the glass container and packaging industry. To its present product range it has added the latest models in its line of pressure testers, the SPT2, an automated testing station, the CCMS, Combined Coating Measurement System and the DSG400, a high-precision dimensional gauging system. Agr employs over 200 people with headquarters in Butler, PA, USA.

EARLY DAYS

Agr International, Inc. has a long history in the advancement of glass container quality. With the opening of Preston Laboratories in 1927, the predecessor of Agr International, many techniques and devices for analysing the strength and performance of glass containers were developed. The work of Preston Laboratories set the standards that are still used today for the production and quality management of glass containers around the world.

Agr International is a worldwide supplier of testing and measurement instruments to the glass container and packaging industry. Products range from devices for pressure testing, volume, coating, thickness and dimensional measurement to completely automated testing stations.

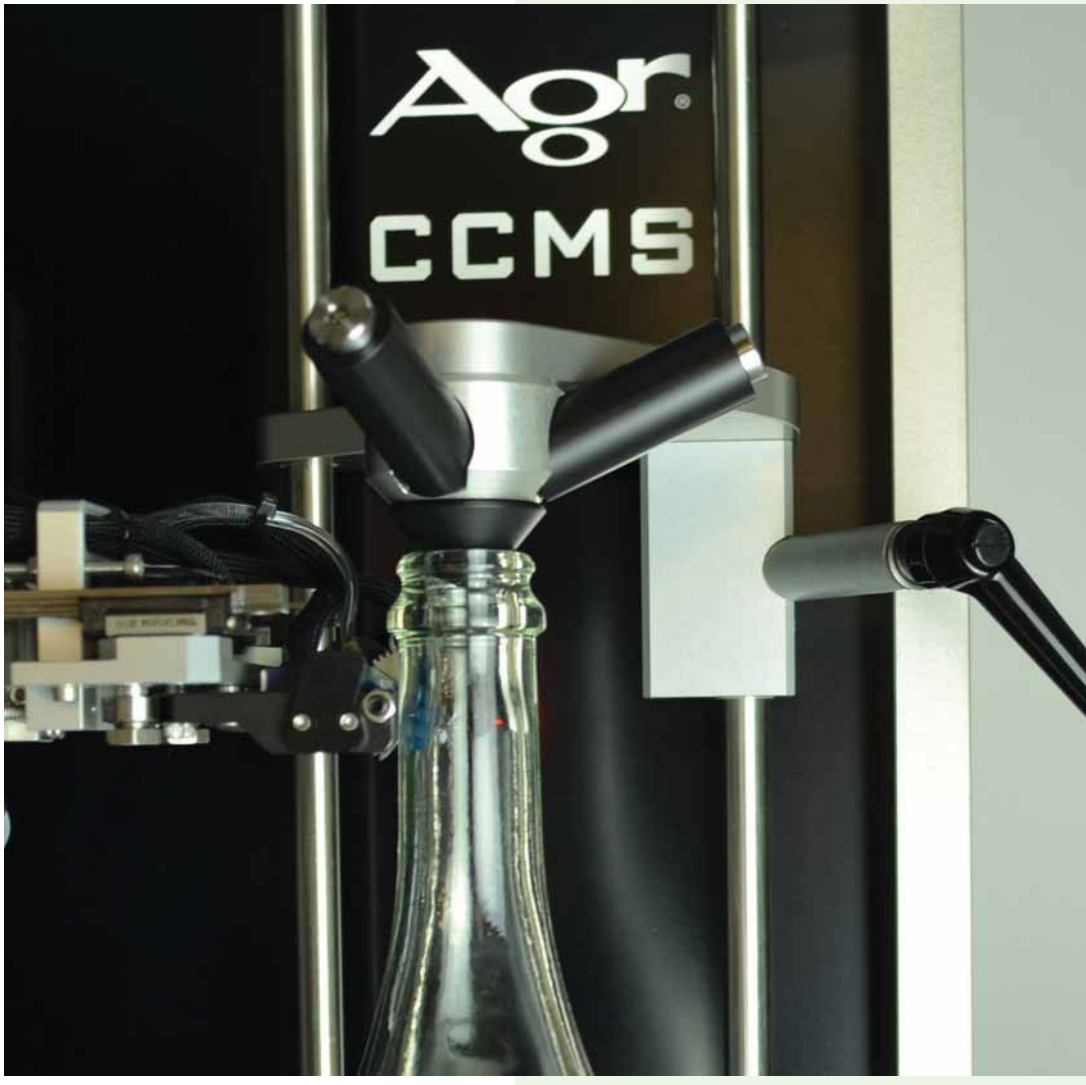
PRESSURE TESTING

The first available commercial pressure tester was one of the earliest testing devices introduced by Preston Laboratories. The introduction of this device gave bottle makers a means to address and prevent liability issues due to bursting bottles. With a pressure tester in plant, bottle producers could sample and test production ware and identify any potential pressure deficiencies.

Agr continues to offer a line of pressure testers based on the science of Preston Laboratories. The latest model in its line of pressure testers, the SPT2, offers an automated testing station that is designed to provide critical pressure strength and volume performance data for glass containers, on a sampling basis, on the production floor. Integrated into the production line, the SPT2 can automatically test and collect pressure and volume data on bottles selected for sampling, without operator intervention, on a 24/7 basis at a rate of up to 270 bottles per hour.

The high throughput rate and continuous, hands-free operation offer a real advantage when it comes to testing efficiency and frequency of sampling. More frequent sampling translates into faster detection of pressure related issues. With early detection, corrections can be made faster and, as a result, the amount of held or discarded ware can be reduced. Automated or hands-free operation (in sampling configuration) permits testing of sample sets on a regularly scheduled basis with testing data fully documented, regardless of the time of day or availability of manpower.

The combination of volume measurement along with pressure testing also offers advantages. Of significance is the savings resulting from the automation of the labour intensive and time-consuming task of volume measurement. No less important, however, is the ability of the SPT2 to perform routine volume measurement outside of the laboratory, on the plant floor in a regular plant environment.



Close proximity to production improves testing efficiency and makes it practical to perform volume and fill-level measurement, more often, on a regular and timely basis. As a result, plant operators are able to closely measure volume and fill level with high precision, on a regularly scheduled basis throughout the production run, making it possible to better manage and meet customer quality requirements.

COATING MEASUREMENT

The measurement of hot end coating on a bottle was also found to be a necessity in the production of quality ware. Over the years, Agr continued to develop models of coating measurement systems for use in the laboratories of worldwide bottle manufacturers. The latest version, the Combined Coating Measurement System (CCMS), provides operators with a one-stop, single operation testing station for measuring tin oxide coatings applied to the container body and finish during the production process.

This system utilizes Agr's proven reflective coating measurement technology as a foundation and features a fully automated measurement approach. By incorporating a number of technological advances in combination with automation, Agr has been able to achieve a 33 per cent improvement in testing throughput and a 70 per cent improvement in precision with this device over previous coating measurement systems. The CCMS provides the industry with a leading-edge system with measurement precision needed for process management requirements, while reducing the labour intensity of coating measurement.

In order to achieve maximum precision on finish and body measurements, the CCMS incorporates dedicated measurement heads for each of the finish and body regions. One head is optimized to operate with the precision necessary for the limited area of the finish region. The second head is configured for body measurements where larger areas and heavier coatings are encountered. The advanced electronics of the system, in conjunction with dedicated measurement heads for finish and body, make it possible to precisely identify the presence of very small amounts of coating in the finish region while measuring heavier coating levels applied to the body of the container, all in one operation.

DIMENSIONAL GAUGING AND THICKNESS MEASUREMENT

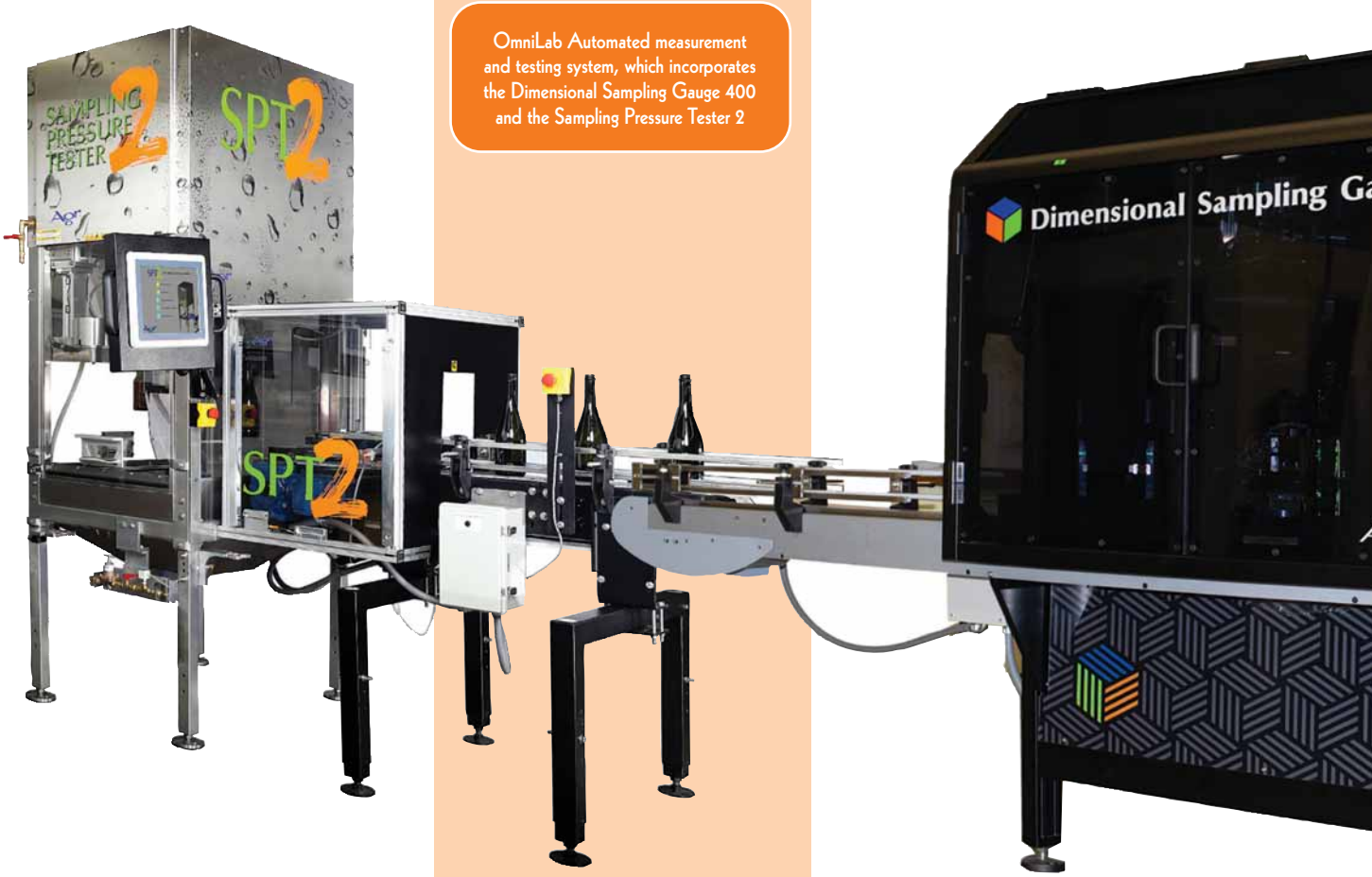
Along the lines of supplying glass container manufacturers with the necessary tools to produce quality bottles that fall within specification, Agr also has continually developed and enhanced dimensional gauging systems to ensure that the finish and body dimensions fell in line with the manufacturer's specifications.

The Dimensional Sampling Gauge, Series 400 (DSG400) is the latest generation in the line of high-precision dimensional gauging systems designed by Agr. While the DSG400 retains much of the look and feel of previous versions of Agr's Dimensional Sampling Gauge, this version incorporates a multiplicity of new hardware, features and capabilities that further expand the handling, throughput, precision, communication and measurement functions of the DSG product line.

Some of the most prominent features incorporated in the DSG400 include advanced high pixel density, USB 3 camera technology with optimized lensing and telecentric optics; expanded measurement algorithms for multiple critical measurements; hands-free job change; and positive table positioning for enhanced thickness measurement.

A major emphasis for the DSG400 is measurement precision. Enhanced telecentric lighting provides for improved edge shadow for the highest dimensional precision and repeatability. This improvement is of major significance as it provides for more distinct categories and lowers the percent of process variation for individual measurements.

When measuring thickness, it is important to be able to measure material distribution over the complete bottle profile including sidewall, shoulder and angled areas. The DSG400 provides



OmniLab Automated measurement and testing system, which incorporates the Dimensional Sampling Gauge 400 and the Sampling Pressure Tester 2

OmniLab automated measurement and testing system

The OmniLab® system offers a means to consolidate and automate critical container testing and measurement activities in a single location, on one automated system. The OmniLab incorporates two powerful Agr sampling and measurement devices, the Dimensional Sampling Gauge 400 and the Sampling Pressure Tester 2, into one totally integrated testing station. The OmniLab system can be configured to operate as a stand-alone testing station, where operators can load the station with up to 48 containers for hands-free testing, or interconnected with the production system to receive bottles automatically from upstream selection devices.

Measurement/Testing Capabilities:

- Comprehensive dimensional measurements
- Weight
- Thickness
- Pressure testing
- Volume Fill/Height Measurement

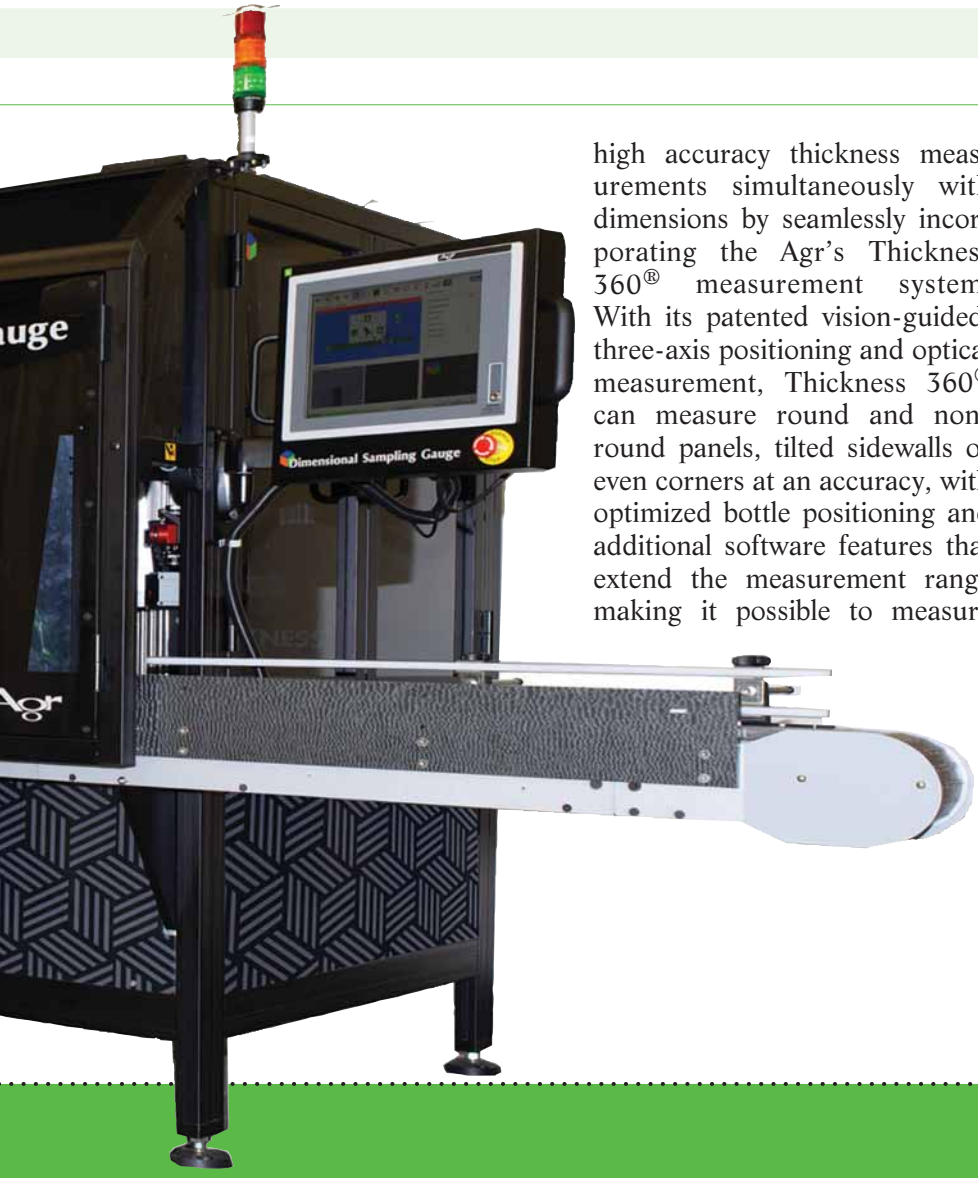
Features:

- All data is mould correlated and presented in a single consolidated report
- Single user interface for all measurement and testing operations
- Capture, display and correlation of data from multiple devices, in one location
- Hands-free sample management
- Configurable for automated sampling or stand-alone operation, on the plant floor or in the lab
- Industry 4.0 ready communications for existing commercial process control systems

Dimensional Measurements that meet the most stringent dimensional measurement requirements of container manufacturers are performed.

- Superior precision and repeatability for all measurements
- High image capture rate to define the smallest features, with high repeatability
- Precision 10x greater than typical container design specifications

Measurement operations included:



high accuracy thickness measurements simultaneously with dimensions by seamlessly incorporating the Agr's Thickness 360® measurement system. With its patented vision-guided, three-axis positioning and optical measurement, Thickness 360® can measure round and non-round panels, tilted sidewalls or even corners at an accuracy, with optimized bottle positioning and additional software features that extend the measurement range making it possible to measure thickness over the complete body sidewall particularly on small pharmaceutical ware.

AGR TODAY

Today, Agr's operations span the globe, employing over 200 people. Its headquarters and main manufacturing facility sit on a large campus in Butler, PA, USA, with a network of worldwide sales and services offices. Agr maintains several representatives around the world as well.

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Finish
- 360° imaging for each finish measurement
- Standard measurements for T, E, A, B, F, D, H, L, W, S, K, ID, lug start, lug diameter, radius and angle on a wide variety of finish types

ID/Bore
- Complete inside finish profile and diameter measurements with contour graph

Overall Container Dimensioning
- Body diameter/width, diameter min/max, searchable min/max, label panel bulge and sink, height, finish tilt, lean, bent neck and more
- Pushup

Thickness Measurements are performed seamlessly within the systems to provide high-precision thickness measurement over the entire bottle sidewall regardless of shape or location.
- Patented vision-guided, three-axis positioning and optical measurement (always 'normal to surface') ensures accuracy regardless of measurement location
- Accurate measurement on any portion of sidewall including tilted regions, corners, panels, neck and shoulder

Pressure and Volume Measurements are performed in an integrated station offering automated volume and pressure testing that is consistent, reliable and meets the most stringent industry requirements.

Volume Measurement:
- Hands-free volume testing on the plant floor with laboratory precision
- Three volume measurements in one; brimful, fill point, volume to fill height

Pressure Testing:
- Testing to 69 bars
- Low-pressure break alert
- No job change, featuring universal seals and self-adjusting inserts