Agr International, Inc.

OmniLab® Testing System

Agr International, Inc.

Industry 4.0?

Wikipedia:

"Industry 4.0 is a name for the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing[1][2][3][4] and cognitive computing. Industry 4.0 creates what has been called a "smart factory". Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time, and via the Internet of Services, both internal and cross-organizational services are offered and used by participants of the value chain.[1]"

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Statistical Process Control

Wikipedia:

"Statistical process control (**SPC**) is a method of quality control which employs statistical methods to monitor and control a process. This helps ensure the process operates efficiently, producing more specification-conforming product with less waste (rework or scrap). SPC can be applied to any process where the "conforming product" (product meeting specifications) output can be measured. Key tools used in SPC include run charts, control charts, a focus on continuous improvement, and the design of experiments. An example of a process where SPC is applied is manufacturing lines.
An advantage of SPC over other methods of quality control, such as "inspection", is that it emphasizes early detection and prevention of problems, rather than the correction of problems after they have occurred.
In addition to reducing waste, SPC can lead to a reduction in the time required to produce the product. SPC makes it less likely the finished product will need to be reworked or scrapped.

Agr International, Inc.

OmniLab® Testing System

As tool to gather statistical relevant information as part of a Statistical Process Control System and Industry 4.0

OmniLab Testing System

Advanced Process Control

Combining Agr's:

- Dimensional Sampling Gauge
- Sampling Pressure Tester

Measurement Capabilities

- Dimensions
- ID and Bore
- Pushup
- Weight
- Pressure
- Thickness
- Volume

Measure the Difference with OmniLab

- High measurement accuracy and repeatability
- Superior bottle handling
- Throughput of up to two bottles per minute *(highest in the industry)*
- Inside finish depth and profile
- High-accuracy pushup and weight measurements
- Lean at multiple heights
- Multi-axis wall thickness measurement
- Accurate pressure testing
- Positive displacement volume measurement
- Automatic system performance checks

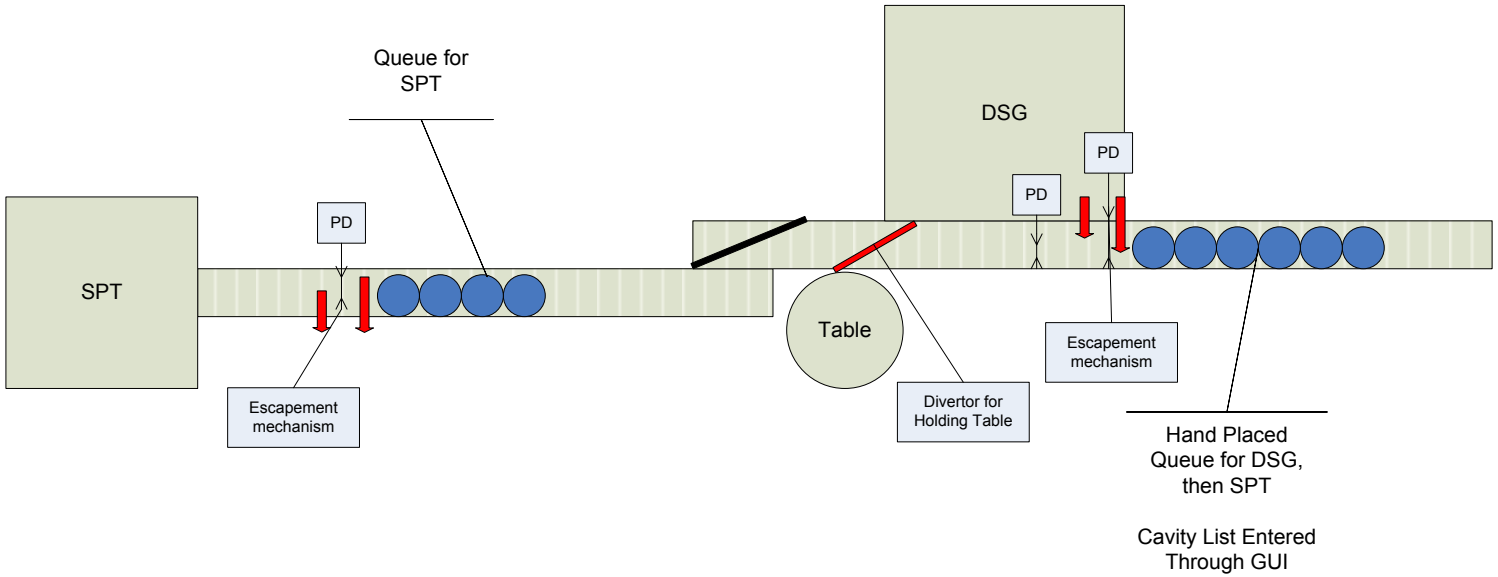
Proven solution adopted by leading glass container manufacturers around the world!

Configurations

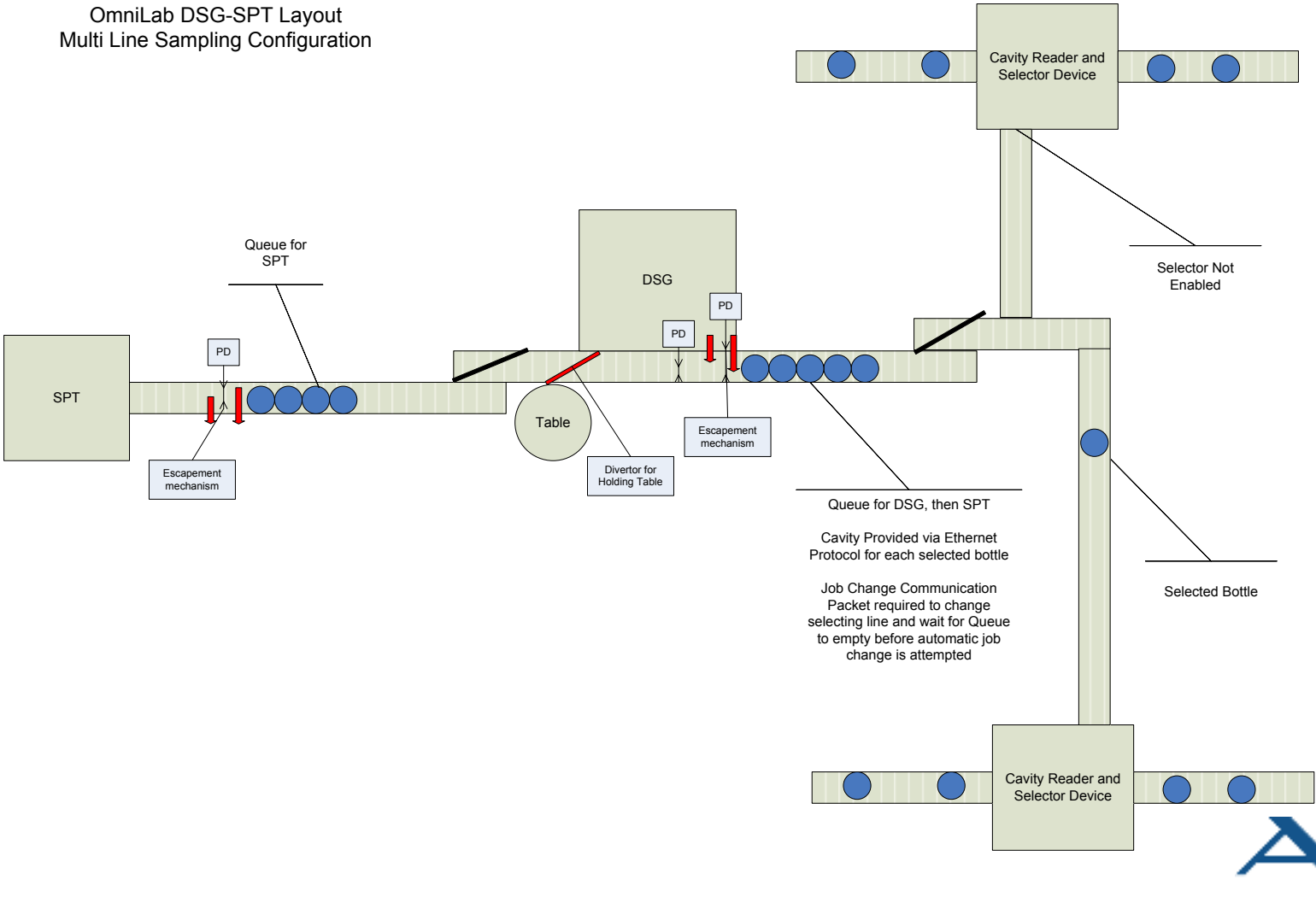
- Available in two configurations
  - Automated sampling system
    - Connected to single or multiple production lines
  - Stand-alone testing station
    - Operated along side the manufacturing line or in the laboratory

OmniLab Testing System Layout

OmniLab DSG-SPT Layout
Hand Feed Configuration



OmniLab Testing System Layout



Dimensional Sampling Gauge

High-precision, automated dimensional measurement system for glass containers of a wide range of shapes and sizes

Dimensional Sampling Gauge

- Comprehensive measurement - with un-matched accuracy for finish, body dimensions, ID/bore, pushup and weight . . . . in one compact unit
- Telecentric optics for precise measurement - on round and non-round bottles up to 127 mm wide
- Mold correlation of all measurement data
- Simple setup and operation
- Multiple configurations available
- World-class precision, throughput <30 seconds/bottle
- Seamless integration of Agr's dimensional measurement system with pressure testing (OmniLab®)

Key Features

- Versatility in job setup and measurement
- Simple job configuration
- Measurement of round and non-round (oval, rectangular, square) containers
- Simultaneous optical measurement
- Flawless handling of round and non-round containers
- Continuous operator feedback
- Data output
  - RS232
  - Ethernet
  - USB stick

Modular Station Design

- Handles and measures a wide variety of shapes and sizes
- Simultaneous measurements in all three stations allows for throughput of up to two bottles per minute
- Placement in the laboratory or at the production line (as part of a sampling system)

Robotic Handling

Compact, multi-axis robotic gripper precisely places and centers round and non-round containers in inspection stations

- Precise bottle positioning, every time
- Automatic centering
- Tool-less adjustment
- Handles bottles up to 2 kg

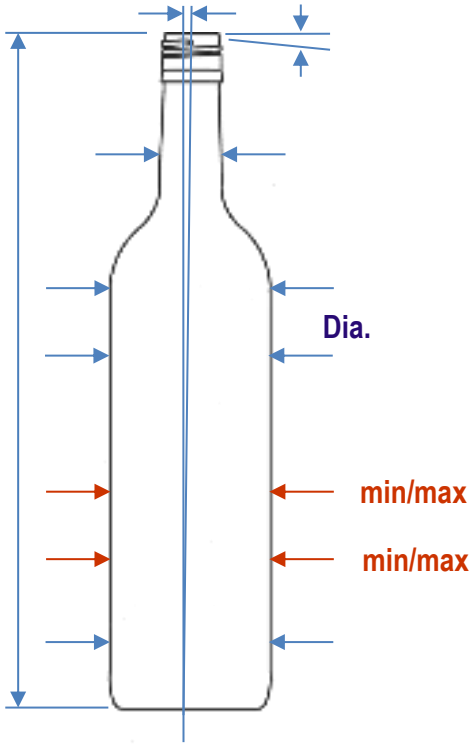
Optical Measurement

Two high-resolution mega-pixel cameras with telecentric optics and lighting for complete bottle capture:

- Body camera captures images for body and overall dimensions
- High-precision finish camera provides precise imaging for critical finish measurements

- 360º imaging, captured every 1º provides highly accurate results

Measurements – body and other



Body Diameter/width – unlimited measurements . . . anywhere on the body

Diameter Min/Max - anywhere

Searchable Min/Max – gives ability to search for min and max values within a defined area or panel

Label panel bulge and sink – multiple routines for determination of min. and max., label clearance

Height – overall container

Finish Tilt

Lean – multiple definable areas available (i.e. body, neck and total bottle)

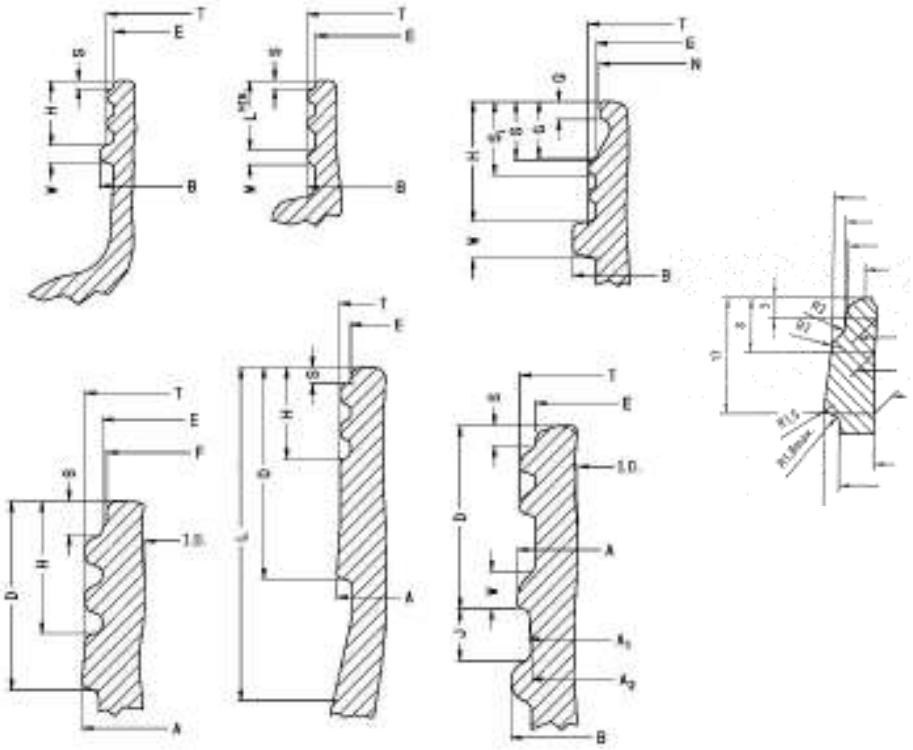
Bent Neck

DSG permits an unlimited number of each measurement to be programmed

Measurements – finish

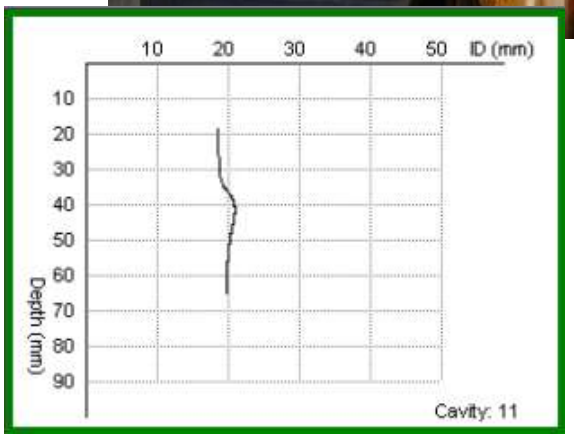
Designed to measure a wide variety of finish dimensions:

- T, E, A, B, F, D, H, L, W, S, K, ID, Lug start, Lug diameter . . . . .
- Radius and angle
- Knockout and flange detection and classification
- “T” diameter on non-overlapping threads
- Multiple thread starts
- Finishes up to 127 mm



Measurement – ID/Bore

- Complete inside finish profile and diameter measurements
- Programmable depth up to 90mm for measurement on multiple levels or a continuous scan
- Measurement at up to 10 different heights
- The DSG creates a graph representing the contour of the Inside Bore



Measurement - thickness

Thickness 360™ Gauge

- Non-contact measurement - automated for sidewall and critical location thickness
- Single or multiple horizontal scans for measurements at defined heights
- Ability to perform a complete circumferential thickness profile
- Measurement of non-round containers for panel and corners thickness

Measurements – push up and weight

Pushup Measurement

- Stationed with the ID/bore
- Adjustable to work on all types of containers
- Up to 76.2 mm (3”)

Weight Measurement

- Measured with a high-accuracy scale
- Data is correlated with other data

Specifications

Container Range		
		DSG-P
Height	1.5 – 16 inch (38 – 406 mm)	1.5 – 16 inch (38 – 406 mm)
Round container diameter	1.0 – 5.0 inch (25.40 – 127mm)	0.78 – 2.75 inch (20 to 70mm)
Non-round containers:	1.0 – 5.0 inch (25.4 to 127mm) Max diagonal: 5.0 inch (127 mm)	0.78 – 2.75 inch (20 to 70mm) Max. diagonal: 2.75 inch (70mm)
Finish ranges	OD: 17.8 – 127 mm ID: 15.7 – 50.8 mm	OD: 17.8 – 77 mm ID: 11.0 – 50.8 mm
Empty package weight	Empty container ≤ 2 kg	
Color	Opaque, transparent, translucent – all colors	
Throughput	50 containers in 30 min. (dependent on actual inspections)	

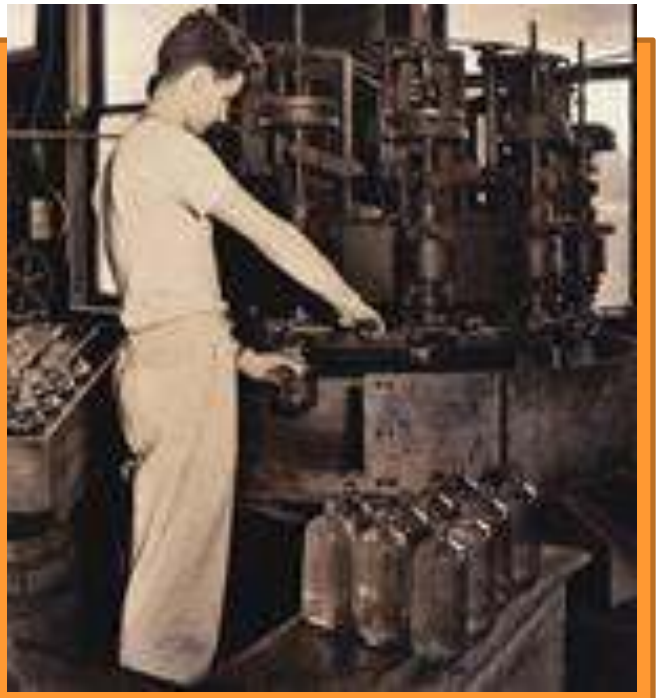

SPT2
Agr®

Automated Pressure and Volume Measurement System

from

Agr®

Pioneers in pressure testing



In the 1940's Agr, known then as Preston labs and later as American Glass Research, applied their expertise in glass fundamentals towards evaluating and understanding why some glass bottles fail prematurely under pressure.

The first commercial pressure tester for glass bottles was born from this work – the "Preston Hydrostatic Pressure Testing Machine" used dead weights to apply the load for a one minute length of time.

Long history of pressure testing innovation and experience

Preston hydrostatic pressure testers

Ramp Pressure Tester - first continuous pressure rate tester

Ramp Pressure Tester 2 – advanced pressure tester with computer control

1940 1950 1960 1970 1980 1990 2000

Increment Pressure Tester - first electronic pressure tester

Sampling Pressure Tester - first automated pressure tester

SPT2 Pressure testing the right way

Offering a new level of . . .

- Flexibility – no job change
- Efficiency – highest industry throughput of 270 BPH
- Precision – most accurate measurements

Leading to . . .

- Multi-line capabilities
- Manual testing concurrent with sampling

Pressure testing the right way

SPT2 offers the most precise, controlled pressure testing available over a wide range of ware

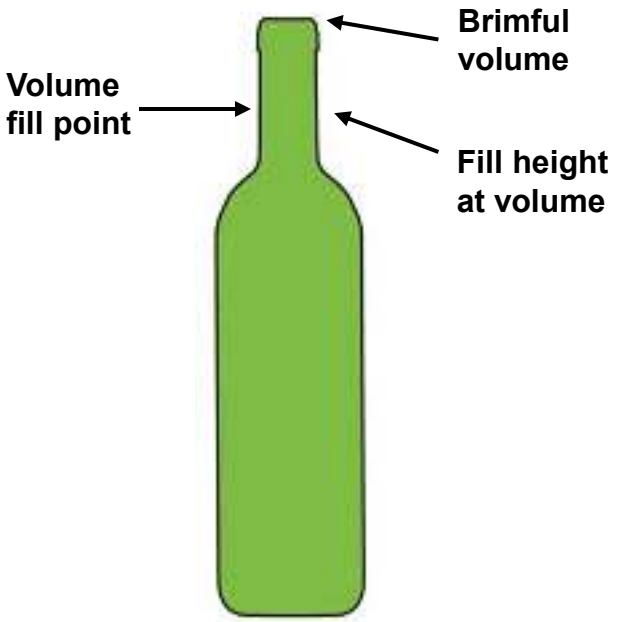
- Proven ramp rates
  - One minute equivalent pressure validated through math and extensive testing, from 1.4 to 69 bars (20-1000 psi)
- Optimal pressurization accuracy throughout the range
  - Better than 1% of full scale
- Superb low pressure management with differentiation between leaks and low pressure breaks
  - Accurate low-end pressure control and measurement as low as 1.4 bars (20 psi) - eliminates 40 psi shut down
- Advanced electronics and control systems
  - Facilitate a tight control of the ramp

Volume measurement the right way

SPT2 volume measurement system offers efficiency

3 volume measurements with one test

Vol@Height	Vol@Brim	Height@Vol
362.7 ml	377.6 ml	28.1 mm
361.8 ml	377.0 ml	27.1 mm
363.2 ml	378.5 ml	28.6 mm
362.9 ml	377.7 ml	28.3 mm
362.2 ml	377.4 ml	27.7 mm
362.3 ml	377.7 ml	27.9 mm



Volume measurement the right way

Volume measurement with laboratory precision . . . on the plant floor!

incorporating leading edge, positive-displacement technology

Controlled fill – for precise volume or fill height measurements

Measurement accuracy - not affected by the water density

- +/- 0.5 ml Volume accuracy*
- +/- 0.2 mm Fill Point accuracy*

Volume and fill measurements - at any point within fill process

Measurements in accordance with ISO 8106

*up to 1000 ml

Advanced features simplify bottle testing

Support of multiple production lines offers added value

- Multiple line support
- Robotic infeed – handles ware from multiple lines even with:
  - Different finish sizes
  - Different diameters
  - Different heights

Advanced features simplify bottle testing

Versatile bottle management simplifies setup and supports a wide range or ware . . .

. . . with NO JOB CHANGE

- Universal bottle clamps – handle bottles with finishes up to 38 mm O.D.
- Automatic height adjustment – makes it possible to test bottles of different heights from 127 to 406 mm (5-16”)

Advanced features simplify bottle testing

Comprehensive diagnostics . . .

- Simplifies troubleshooting
- Provides live status of all system functions

Advanced features simplify bottle testing

Seamless integration with Agr's OmniLab System

- Direct bottle transfer and information exchange
- Single location for job setup and management through OmniLab UI
- Consolidated data management and reporting of cavity correlated pressure, volume and dimensional data
- Single test report and information export to plant data management system

Pressure testing the right way

Product Specifications	
Pressure Testing	
Finish ID = 15-20 mm:	69 bars (1,000 Psi) 1 minute equivalent
Finish ID > 20mm:	41 bars (590 Psi) 1 minute equivalent
Pressure accuracy:	+/- 1% of full scale
Throughput	Up to 270 bottles per hour *
Volume Measurement	
Volume Accuracy	+/- 0.5 ml (250 -1000 ml) +/- 1.25 ml (1000 – 2000 ml)
Volume Repeatability	+/- 0.4 ml at 99% confidence level
Fill Height Accuracy & Repeatability	+/- 0.2 mm
Ware Range	
Height:	127 – 368 mm (5.0 – 14.5 inches) 165 – 406 mm (6.0 – 16 inches)
Diameter/width:	45 to 127 mm (1.8 - 5 inches)
Finish:	15 – 48 mm (15 mm min. ID)
Capacity:	250 ml to 2 liter (67.5 oz.)
* 330 ml bottle – pressure only	