



MVS® SPECIFICATIONS

DESCRIPTION

The Artel Multichannel Verification System (MVS®) consists of equipment, software, aqueous solutions and highly characterized microtiter plates. The system is suitable for liquid volume measurements from 0.1-350.0 µL in a 96-well plate format or from 0.01-55 µL in a 384-well plate format. A mobile workstation allows for portable, convenient verification of equipment in multiple locations.

Employing a unique, dual-dye photometric method, the Artel MVS conveniently measures the dispensed volume from any 1-, 2-, 4-, 8-, 12-, 96-, and 384-channel liquid delivery device in less than ten minutes. The accuracy and precision performance of each dispensing channel is independently calculated and displayed with summary statistics by well, by row and by column. When using the MVS Verification Plates, the Artel MVS supports an unbroken chain of traceability to the National Institute of Standards and Technology (NIST).

Results are saved in a secure database on the system's portable computer using the MVS Data Manager software and are available for printout or export to HTML or XML formats.

SYSTEM PERFORMANCE

	STANDARD	ADVANCED
	96-well plate	96- and 384-well plate
Volume Range, 96-well plate	0.100-350.0 µL	0.100-350.0 µL
Volume Range, 384-well plate	N/A	0.0100-55.00 µL
Time Requirements	Less than 5 minutes	Less than 10 minutes
Tip Configurations	96-well: 1, 2, 4, 8, 12, and 96	96-well: 1, 2, 4, 8, 12, and 96 384-well: 1, 8, 12, 96, and 384
Inaccuracy, 96-well plate*		
2 µL-350 µL	Less than 2 %	Less than 2 %
0.1 µL-2 µL	Less than 3 %	Less than 3 %
Imprecision, 96-well plate*		
2 µL-350 µL	Less than 0.5 % CV	Less than 0.5 % CV
0.1 µL-2 µL	Less than 0.7 % CV	Less than 0.7 % CV
Inaccuracy, 384-well plate	N/A	Less than 10 %
Imprecision, 384-well plate	N/A	Less than 3% CV
Operating Temperature	18 to 28°C	18 to 28°C
Traceability to national standards using Artel Verification Plates	Yes	Yes

*Stated specifications apply when MVS Plate Reader is used.

MVS PLATE READER

Size	Depth 42 cm, Width 38 cm, Height 18 cm
Weight	8 kg
Keypad	25 keys
Display	2 x 24 alphanumeric
Light source	Tungsten gas filled bulb
Metal oxide interference filters	Center wavelengths: 520.2 nm (bandwidth at half-max = 6.2 nm) 730.5 nm (bandwidth at half-max = 10 nm)
Additional filters	405 nm, 450 nm, 490 nm
Printer output	Parallel
Serial input/output	RS232

MVS CALIBRATOR PLATE

The MVS Calibrator Plate is a unique, highly sensitive device used to normalize the absorbance measurements made by the MVS Plate Reader to correlate with those made by a NIST-traceable reference spectrophotometer at the Artel Laboratory. It is composed of a set of five sealed, custom-manufactured, precision cuvettes. These standards are manufactured to strict specifications to cover the entire absorbance range of the system. Neutral density glass is included to monitor any change in the standards over time.

The Data Manager software obtains critical information from the plate bar code concerning the absorbance standards used in the Calibrator Plate and compares and adjusts the readings of the Plate Reader accordingly.

Storage	18 to 28°C in protective case, out of direct light
Recertification	Periodic factory recertification required
Shelf life	1 year

MVS TITER PLATE SHAKER

The Big Bear Titer Plate Shaker is interfaced with the MVS Portable Computer to ensure consistent mixing of the MVS solutions.

Dimensions	Depth 12.8 cm, width 8.5 cm, height 3.1 cm
Amplitude	2.0 mm orbital
Shaking Speed Range	60 to 3570 rpm, 4 clips installed to secure the plate

MVS BAR CODE READER

The IMAGETEAM™ 3800 PDF417 is a high performance hand held bar code scanner using an innovative feedback design. It allows for easy recall of liquid handler devices and ease of use to enter valuable MVS bar code data into the Data Manager software.

MVS PORTABLE COMPUTER

Processor	1.0 GHz, minimum
Memory	128 MB, minimum
I/O Ports	2 USB Connectors, minimum
Network	10/100 Ethernet and 802.11b Wireless
Storage	24x CD-ROM, minimum 20 GB Hard Drive, minimum
Operating System	Microsoft Windows® 2000 or XP Professional

MVS MOBILE WORKSTATION

The mobile workstation allows for convenient verification of equipment in multiple locations throughout your facility. The mobile workstation is equipped with two easy to clean shelves and an enclosed bottom shelf with locking door to secure supplies.

Approximate dimensions	Depth 51 cm, width 104 cm, height 97 cm
Accessories	Surge protector with 12 ft. cord

MVS DATA MANAGER SYSTEM SOFTWARE

The MVS Data Manager software guides the user through the verification procedure and retrieves the data from the MVS Plate Reader and Bar Code Reader. The data are used to determine liquid handler performance relative to set targets and pass/fail tolerance limits. Out-of-tolerance values are automatically flagged. The data output is automatically stored in a database and can be easily exported for further use in other commercially available software programs via HTML or XML formats.

Software Features:

- 21 CFR Part 11 compliance ready.
- Immediate display of pass/fail, dispense patterns via heat map, and volumetric results for each channel.
- Automatic flagging of all deliveries exceeding tolerance limits.
- Compatible with Microsoft Windows® 2000 or XP Professional.
- Easy exporting of data for analysis or viewing with other programs.
- Ability to re-evaluate data visually by modifying the pass/fail criteria after analysis.
- Test the performance of multiple liquid delivery devices using a single plate.
- Ability to use popular conventional microtiter plates when traceability is not a factor.
- Ability to verify and optimize a volume dispensing instrument using specific test solutions such as Dimethyl sulfoxide (DMSO).

MVS SOLUTIONS AND VERIFICATION PLATES

MVS Solutions and Verification Plates are provided as a complete pack or as individual components to satisfy the volume measurement requirements of the user. Each individual component is encoded with a bar code containing required performance information to permit all components, whether purchased separately or together, to be interchanged for added flexibility and convenience.

MVS Verification Plates

- MVS Verification Plates are optical quality, flat bottom plates which are dimensionally characterized.
- Each verification plate comes with a bar code containing the lot number and a unique identifier.
- Verification Plates are statistically sampled and measurements are obtained with a Coordinate Measuring Machine that provides results that are traceable to NIST to determine the bottom radius and taper angle of each well. These values are embedded in the bar code and are used in the calculations to determine the dispensed volume.
- Plates are supplied in packages of 25.

MVS Solutions

Baseline Solution	Specially formulated clear buffer solution to determine baseline readings.
Diluent Solution	Diluent Solution containing blue dye and used to ensure a working volume in all Plate Types. Working volumes for each Plate Type: 96 Well Standard Profile: 200 µL 384 Well Standard Profile: 55 µL 384 Round Well Low Volume: 28 µL 384 Well Low Profile: 20 µL
Range HV Sample Solution	Volume Range for 96 Well Plates: 96 Well Standard Profile: 200.1 to 350.0 µL
Range A Sample Solution	Volume Ranges for each Plate Type: 96 Well Standard Profile: 50.00 to 200.0 µL 384 Well Standard Profile: 10.00 to 55.00 µL 384 Round Well Low Volume: 4.00 to 28.00 µL 384 Well Low Profile: 4.00 to 20.00 µL
Range B Sample Solution	Volume Ranges for each Plate Type: 96 Well Standard Profile: 10.00 to 49.99 µL 384 Well Standard Profile: 2.500 to 9.999 µL 384 Round Well Low Volume: 0.9500 to 3.999 µL 384 Well Low Profile: 0.9500 to 3.999 µL
Range C Sample Solution	Volume Ranges for each Plate Type: 96 Well Standard Profile: 2.000 to 9.999 µL 384 Well Standard Profile: 0.500 to 2.499 µL 384 Round Well Low Volume: 0.1900 to 0.9499 µL 384 Well Low Profile: 0.1900 to 0.9499 µL

Range D Sample Solution	<p>Volume Ranges for each Plate Type:</p> <p>96 Well Standard Profile: 0.500 to 1.999 μL</p> <p>384 Well Standard Profile: 0.1500 to 0.4999 μL</p> <p>384 Round Well Low Volume: 0.0800 to 0.1899 μL</p> <p>384 Well Low Profile: 0.0800 to 0.1899 μL</p>
Range E Sample Solution	<p>Volume Ranges for each Plate Type:</p> <p>96 Well Standard Profile: 0.100 to 0.499 μL</p> <p>384 Well Standard Profile: 0.0300 to 0.1499 μL</p> <p>384 Round Well Low Volume: 0.0190 to 0.0799 μL</p> <p>384 Well Low Profile: 0.0100 to 0.0799 μL</p>
Stock Solution 1	<p>Used to prepare Alternative Solutions.</p> <p>Approximate Volume Ranges of prepared Alternative Solutions using Stock 1 for each Plate Type:</p> <p>96 Well Standard Profile: 0.4 to 10 μL</p> <p>384 Well Standard Profile: 0.1 to 2.5 μL</p> <p>384 Round Well Low Volume: 0.05 to 1.5 μL</p> <p>384 Well Low Profile: 0.04 to 1.5 μL</p>
Stock Solution 2	<p>Used to prepare Alternative Solutions.</p> <p>Approximate Volume Ranges of prepared Alternative Solutions using Stock 2 for each Plate Type:</p> <p>96 Well Standard Profile: 10 to 50 μL</p> <p>384 Well Standard Profile: 2.5 to 10 μL</p> <p>384 Round Well Low Volume: 1.5 to 4 μL</p> <p>384 Well Low Profile: 1.5 to 4 μL</p>
Shelf Life	Baseline, Diluent, Range A, B, C, D, E, HV, Stock Solution 1 and Stock Solution 2 are stable for 15 months from date of manufacture.
Storage	At 18 to 28°C in closed box, out of direct light.

PATENTS

U.S. Patents	6,741,365, 7,061,608, and 7,187,455; other U.S. patents pending
European Patents	Pending
Japanese Patents	Pending