



## Endosafe<sup>®</sup> Nexus<sup>™</sup>

### Operational Benefits and Features

- High-throughput capability, testing 48-60 samples per run
- Automated dilution and sample handling with the ability to suspend current run
- Small footprint: 30" H x 20" W x 54" L (76 x 51 x 137 cm)
- Utilizes FDA-licensed PTS<sup>™</sup> cartridges
- Enhanced data management with barcoding technology
- Results obtained via Nexus<sup>™</sup> integrated software
- Ideal for central lab water and product testing

The Endosafe<sup>®</sup> Nexus<sup>™</sup> is the first completely automated robotic system designed specifically for endotoxin testing in the central QC lab, unlocking the full potential of our unique PTS<sup>™</sup> cartridge technology. Ideal for high-volume water testing or samples that require dilutions, consistent testing with the Nexus<sup>™</sup> reduces variability and the need for subsequent investigations (see Figures 3 and 4). The Nexus<sup>™</sup> utilizes innovative LAL cartridge technology, a state-of-the-art liquid handling system and simple data management software to test 48 to 60 samples with minimal preparation and supervision.

Performing endotoxin testing on large numbers of samples using traditional methodologies can be both time consuming and vulnerable to outside influences such as technician errors and standard curve anomalies. The time required to prepare standards and samples can often exceed the assay time while simultaneously tying up valuable resources, namely the analysts involved. The training required for an analyst to become proficient in running these assays is also considerable and adds to the overall cost and complexity of performing endotoxin testing. Additionally, the possibility always exists that an error may be discovered at the end of an assay, necessitating investigation and retesting.

The Endosafe<sup>®</sup> Nexus<sup>™</sup> eliminates the complications, lost time and potential for error associated with traditional high-volume endotoxin testing. With minimal training and involvement required to run the assay, technicians simply load the deck, confirm the sample bar codes have been read correctly, and walk away while the Nexus<sup>™</sup> does the rest.

EVERY STEP OF THE WAY

## Primary Components

### **Endosafe®-PTS™ LAL cartridge technology**

The disposable Endosafe®-PTS™ cartridges contain precise amounts of LAL reagent, chromogenic substrate and control standard endotoxin (CSE). They are manufactured in accordance with rigid QC procedures and have been approved by the FDA for in-process and final product release testing. The disposable cartridge contains four channels: two channels with CSE and LAL, which serve as the positive control channels, and two channels with LAL for testing of samples. To perform the test, add 25  $\mu$ l of sample (at a non-interfering dilution) into all four sample reservoirs. The reader's internal pump moves the sample along the channels' reagent stations for mixing, then into the optical cells of the cartridge to be read kinetically.

### **Endosafe®-MCS™ multi-cartridge system**

The MCS™ uses LAL kinetic chromogenic methodology that measures color intensity directly related to the endotoxin concentration in a sample. This multi-cartridge system was designed to be compliant with global pharmacopeia methods, meet the BET criteria for photometric techniques and be consistent with the FDA's PAT initiative.

### **Nexus™ integrated software**

The software is consistent with FDA requirements and performs requisite calculations and batch reports for product release. For added protection, it generates secure data files and audit trails on all actions involving test data. The program was designed with flexible configuration capabilities and networking and performance options to facilitate gains in operational efficiency.

### **Hamilton Microlab® NIMBUS**

The Microlab® NIMBUS is a compact, automated liquid handler, offering speed, flexibility, ease of use, and superior pipetting performance. The small footprint, proven and precise air displacement pipetting, and flexible deck layout make it ideal for central lab endotoxin testing.

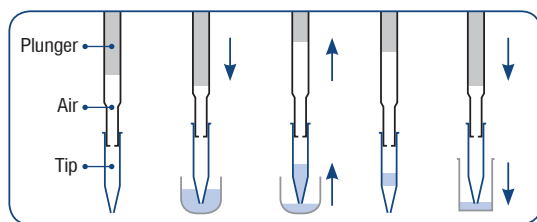
## Product Features

### **Air displacement pipetting**

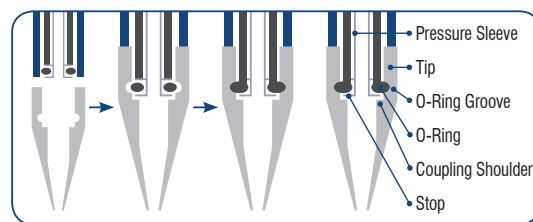
The Nexus™ utilizes an air displacement pipetting process (Figure 1) instead of traditional water-based pipetting, as this reduces risk of contamination or sample dilution. A plunger/piston drives air downward, creating a vacuum. As the plunger moves upward, the sample is aspirated into the tip, while maintaining an air buffer. When the plunger moves back downward, the sample is dispensed, creating high pipetting accuracy and precision from sub- $\mu$ L to large (> 1 mL) volumes. With no system liquids, diluters, valves or complicated tubing, no maintenance by the user is required.

### **Compressed O-ring expansion tip attachment (CO-RE technology)**

CO-RE technology attaches disposable pipetting tips using a highly robust lock-and-key-style mechanism (Figure 2). This enables a positional precision of +0.1 mm on all axes. The system requires virtually no vertical force for tip attachment or ejection, thus eliminating mechanical stress and minimizing cross-contamination caused by the production of aerosols. Reduced stress also improves overall system reliability and throughput.



**Figure 1.** The Nexus™ utilizes an air displacement pipetting process instead of traditional water-based pipetting. A plunger/piston drives air downward, creating a vacuum. As the plunger moves upward, the sample is aspirated into the tip, while maintaining an air buffer. When the plunger moves back downward, the sample is dispensed.



**Figure 2.** In the CO-RE technology, O-rings expand into grooves within the tip to secure it in place. Contracting the O-rings allows the tip to be ejected. This creates less stress on the system and improves performance.

### Shift-and-scan barcode

Eliminating the need to manually enter sample information, the universal 1D barcode scanner provides a positive sample ID prior to inventory of samples. The current configuration contains two sample racks per deck with either 12 mm-13 mm tubes (total of 60 samples on deck) or 15 mL Falcon tubes (total of 48 samples on deck), with the ability to use different tube types in separate racks.

### Cartridge gripper

The iSWAP gripper mechanism has custom fingers specifically designed to handle the precise movement of the cartridges from the cartridge dispenser to insertion into the MCS™ and disposal after testing.

### Cartridge dispenser

The cartridge dispenser contains a removable lid to limit environmental exposure and can hold three stacks each of 20 cartridges and three desiccants (from multi-pack cartridge pouch) to ensure cartridge stability.

### Endosafe® Nexus™ Process Flow:

1. Analyst loads required cartridges, consumables and samples on deck and starts software.
2. Barcode on sample tube is scanned for sample information and confirmed by analyst.
3. Robotic gripper adds cartridge to MCS™ slot.
4. Pipetting arm adds sample to cartridge wells and prompts MCS™ to begin assay.
5. When assay is complete, gripper takes cartridge out of MCS™ and discards into bin.
6. Steps 3 and 4 are repeated until all samples are tested.
7. Analyst reviews test results using Nexus™ integrated software and can print or send to LIMS for further analysis.

## Performance Data

	Cartridge #	Sample Value (EU/mL)	Sample CV	Spike Recovery	Spike CV
0.5 EU/mL Endotoxin Standard	1	0.579	17.7%	81%	2.0%
	2	0.368	1.2%	97%	3.9%
	3	0.514	4.7%	121%	3.6%
	4	0.387	0.8%	100%	2.0%
	5	0.434	2.2%	115%	5.6%
	6	0.510	5.1%	147%	3.8%
	7	0.441	3.1%	104%	0.7%
	8	0.569	1.0%	127%	4.5%
	9	0.621	0.0%	148%	1.6%
	10	0.510	6.1%	121%	2.2%
	11	0.497	1.8%	107%	1.4%
	12	0.514	4.7%	138%	1.5%
	13	0.444	0.0%	80%	1.9%
	14	0.384	2.9%	136%	2.2%
	15	0.497	6.5%	132%	3.7%
	<b>Average</b>	<b>0.485</b>	<b>3.9%</b>	<b>117%</b>	<b>2.7%</b>
MAX	0.621	17.7%	148%	5.6%	
MIN	0.368	0.0%	80%	0.7%	

**Figure 3.** Performance data for the Endosafe® Nexus™ using standard curves prepared at 0.5 EU/mL Endotoxin Standard

	Cartridge #	Sample Value (EU/mL)	Sample CV	Spike Recovery	Spike CV
0.5 EU/mL Endotoxin Standard	1	0.177	1.8%	77%	0.6%
	2	0.193	3.2%	96%	5.5%
	3	0.154	1.7%	69%	6.0%
	4	0.237	3.1%	119%	9.3%
	5	0.196	0.3%	114%	3.9%
	6	0.204	3.9%	119%	4.0%
	7	0.153	2.6%	85%	9.3%
	8	0.175	1.2%	91%	0.6%
	9	0.161	1.2%	80%	5.7%
	10	0.176	1.5%	110%	1.3%
	11	0.222	4.0%	119%	6.0%
	12	0.174	2.7%	97%	2.4%
	13	0.148	4.6%	66%	4.3%
	14	0.237	4.5%	124%	4.7%
	15	0.213	3.0%	97%	0.0%
	<b>Average</b>	<b>0.188</b>	<b>2.6%</b>	<b>98%</b>	<b>4.2%</b>
MAX	0.237	4.6%	124%	9.3%	
MIN	0.148	0.3%	66%	0.0%	

**Figure 4.** Performance data for the Endosafe® Nexus™ using standard curves prepared at 0.2 EU/mL Endotoxin Standard