

Spark-Stack™

integrated microplate stacker.

Technical Note



ENHANCING PRODUCTIVITY IN THE LAB WITH AUTOMATED BATCH PROCESSING



INTRODUCTION

Increasing throughput and optimizing and standardizing workflows are crucial in today's drug discovery and life sciences research laboratories. Microplate stackers can help to reduce analysis times, increase throughput and improve reliability for routine applications.

The Spark-Stack is a compact, versatile and field-upgradeable microplate stacker for the Spark® multimode reader, offering walkaway automation and enhancing productivity in the lab. Its patent-pending design helps to automate typical workflow steps – including plate loading, unloading and restacking – for absorbance-, fluorescence- or luminescence-based measurements in the Spark reader. It is compatible with all non-lidded ANSI/SLAS-format 6-1536-well plates.

Spark-Stack can be equipped with dark covers to protect light-sensitive assays inside the plate magazines, such as Alpha technology-based assays and fluorophore-transfected cells. In addition, it is ideal for assays that require pre-incubation at room temperature before measurement – e.g. HTRF® and LanthaScreen™ – or batch-type cell assays using lysed samples, such as the CellTiter-Glo® cell viability assay.

Spark-Stack can be combined with any Spark instrument configuration, including readers equipped with the Te-Cool™ temperature control module or the integrated injector/dispenser system (Figure 1).



Figure 1: Spark-Stack configurations.

Plate loading, unloading and restacking

Spark-Stack offers scalable plate capacity with a choice of two magazine sizes to accommodate 30 or 50 plates (Figure 2A). Both magazine sizes can also be equipped with dark covers for full light protection throughout the experimental period (Figure 2B).

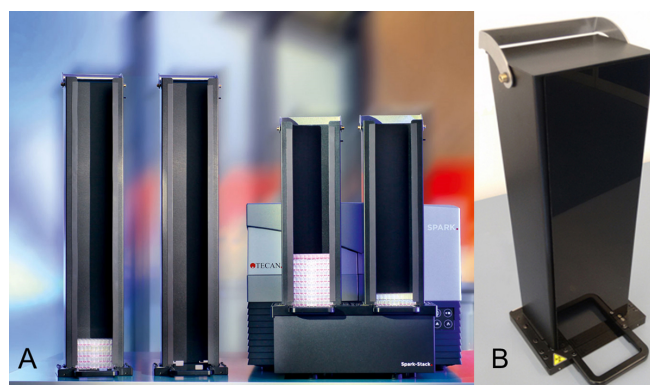


Figure 2: (A) Scalable plate capacity with magazines for 30 or 50 plates. (B) Dark covers provide full protection from ambient light.

Spark-Stack facilitates both endpoint and kinetic assays. For kinetic assays, it provides automated re-stacking of microplates from the output back into the input magazine, – with a fast restacking time of around 15 seconds per plate – ensuring that the plates are always measured in the same sequence throughout the duration of the assay. In addition, the Spark reader can be equipped with a barcode reader that keeps track of each plate and assigns the results of every measurement cycle to the appropriate samples.



Spark-Stack has been designed for safe operation, with a mechanical stop in each magazine to prevent plates dropping in the event of a power outage. Self-checks during initialization and sensor-controlled loading and unloading of plates also help to ensure reliable performance for every single test plate.

SOFTWARE

Spark-Stack can be operated via the SparkControl™ or SparkControl Magellan™ software packages, allowing straightforward and flexible set-up of virtually any measurement protocol and, in the case of Magellan, comprehensive data analysis (Figure 3).

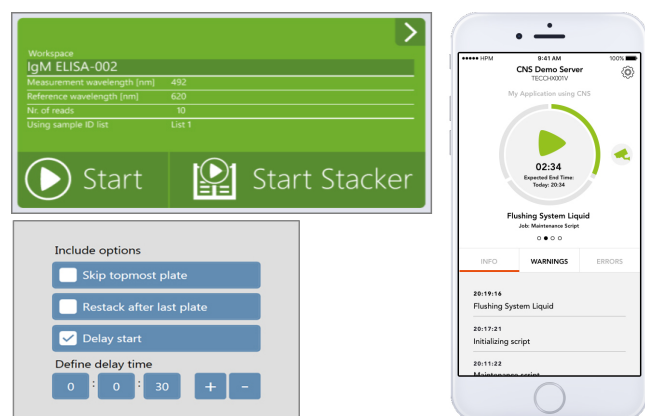


Figure 3: Spark-Stack can be operated using SparkControl or SparkControl Magellan software, and remotely controlled via the Tecan CNS app.

A delayed start function enables room temperature pre-incubation of plates inside the Spark-Stack. This makes it ideal for typical assay workflows requiring room temperature incubation inside the plate magazines before starting a stacker run automatically. To shorten time to results, the Spark-Stack can run overnight with the SparkControl™ software scheduling incubation and measurement steps.

Furthermore, the system's status can be monitored and controlled remotely using a smart phone with the free, dedicated Tecan CNS app and Spark Control Magellan software. This mobile interface allows full remote monitoring of measurements and control of Spark-Stack's functions, enabling true walkaway automation of the stacker run.

Spark-Stack with dark covers

Exposing assay plates to ambient factors in the laboratory – such as light and fluctuating temperatures – can affect samples and potentially distort the resulting data^[1]. We therefore evaluated the capacity of the Spark-Stack's dark

covers to protect highly light-sensitive fluorescent beads from photobleaching^[2].

While unprotected plates in Spark-Stack magazines without dark covers showed significant signal intensity loss and results variation, plates that had been loaded into a magazines protected with dark covers remained largely unaffected by ambient factors (Figure 4), with the tenth consecutive plate exhibiting almost no signal loss or CV increase compared to the first plate. In contrast, the unprotected plates (no dark covers) showed a similar initial CV (3.57%) in the first plate, but a significantly higher CV in the tenth plate (8.18%), and an average signal intensity loss of more than 20% (Table 1).

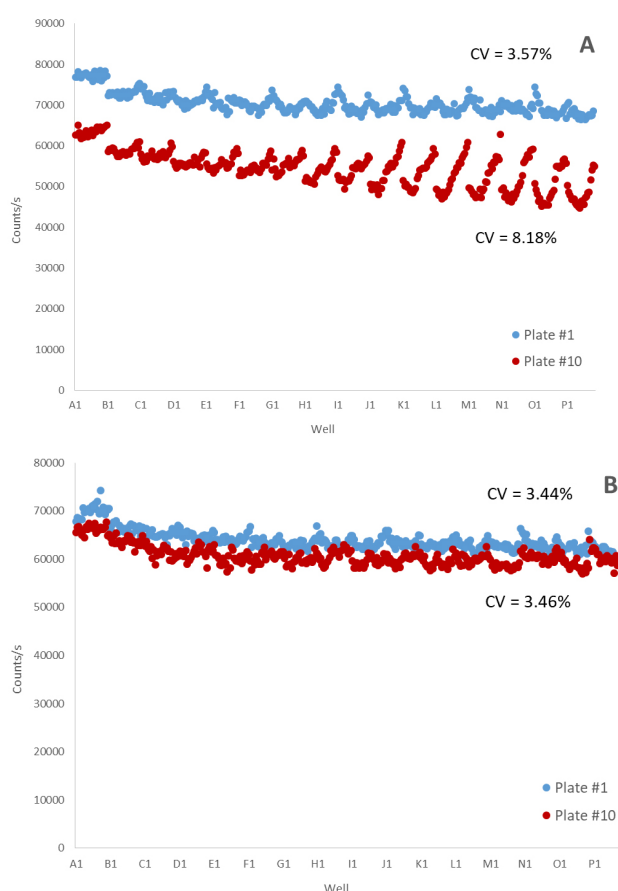


Figure 4: Effect of dark covers on photobleaching and resulting data variation. Signal intensities of all wells of 384-well plates processed in the Spark-Stack with Te-Cool module (A) without and (B) with dark covers.

While unprotected plates in Spark-Stack magazines without dark covers showed significant signal intensity loss and results variation, plates that had been loaded into a magazines protected with dark covers remained largely unaffected by ambient factors (Figure 3).



In the latter case, the tenth consecutive plate exhibited almost no signal loss and no CV increase compared to the start plate. In contrast, the unprotected plates showed a similar initial CV (3.57%) in the first measured plate but a significantly higher CV in the tenth plate (8.18%), and an average intensity loss of more than 20%.

	without dark cover		with dark cover	
Plate	plate #1	plate #10	plate #1	plate #10
Signal intensity [average cps]	70409	54444	63936	60707
% initial intensity	100%	77%	100%	95%
% CV across all wells	3.57%	8.18%	3.44%	3.46%

Table 1: Effect of dark covers on photobleaching and resulting data variation.

CONCLUSION

Spark-Stack is a compact and versatile solution for automated batch processing using the Spark multimode reader. It takes care of routine batch testing workflows, allowing you to reclaim your time for higher value work. The optional dark covers also ensure reliable results for light-sensitive experiments by providing light protection while the plates are waiting to be processed. Spark-Stack is straightforward and intuitive to operate via Tecan's established software solutions, and offers various options – including dark covers, barcode reading and scalable plate capacities – to help increase productivity and throughput in the lab. Integrated self-checks and sensor-controlled operation ensure safe and reliable automation to standardize typical biochemical and cell-based assay workflows.

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ABBREVIATIONS

CNS	Common Notification System
cps	Counts per second
CV	Coefficient of variation
SLAS	Society for Laboratory Automation and Screening / Society

REFERENCES

- 1) A Practical Guide to Working with AlphaScreen
(<https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/hts/documents/AlphaScreenPracticalGuide.pdf>)
- 2) Omnibeads Kit
(http://www.perkinelmer.com/Content/TDLotSheet/6760626_6760626R_2201560.pdf)

About the author

Dr. Katrin Flatscher is an application scientist at Tecan Austria. She studied molecular biology at the University of Salzburg and focused on cell biology and immunology research during her PhD. She joined Tecan in 2007 and has been involved in the development of the Infinite as well as the Spark multimode reader series.

