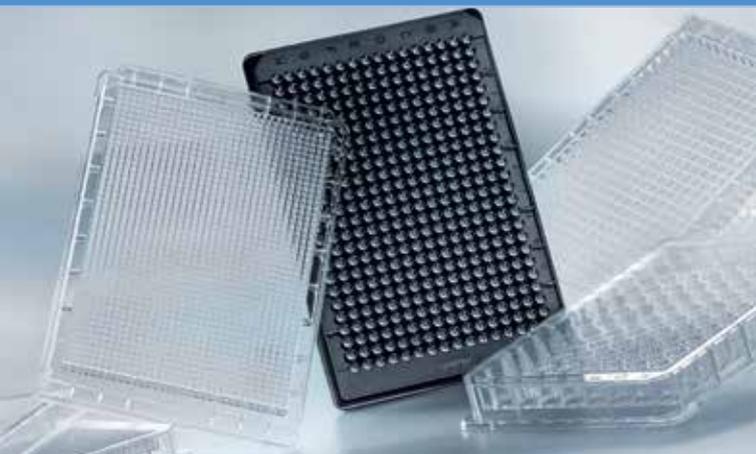




Performance. Throughput. Reliability.



**Technology is the Key!
Intelligent Solutions for
Sample Storage.**

Technology is the Key!

Microplates for Intelligent Sample Storage

Secure storage of samples and chemical substances is a fundamental part of biology, medicine, and active ingredient research. In addition to individual containers such as Cryo.s™, reaction vessels, and test tubes, microplates are frequently used for storing multiple sample arrays. They provide a convenient, small and standardised footprint and are readily handled by automated picking systems. Tissue samples, chemical substances, proteins, nucleic acids (DNA and RNA), and other organisms (nematodes, yeast, and bacteria) can be securely stored in microplates for long periods of time.

Exceptional storage...

- Compound libraries
- Nucleic acids (DNA, RNA, plasmid, etc.)
- Peptides, proteins
- Tissue samples
- Active ingredients
- Organisms (yeast, bacteria, nematodes, etc.)

With a prearranged matrix, alphanumeric well coding, and optional customised barcoding, microplates facilitate optimum mapping and monitoring of samples, even for large libraries of substances.



Barcodes facilitate organisation

All about the Plastic

Polypropylene

Single-use items utilised for laboratory sample storage are often made of polypropylene. Polypropylene is a partially crystalline substance with outstanding chemical and physical properties. Semi-transparent, it is resistant to many commonly used laboratory chemicals as well as highly resistant to cold and heat.

Cycloolefins

In recent years, cycloolefins have been gaining popularity for use in sample storage microplate manufacture. They are characterised by high clarity, transparency, rigidity, heat resistance, dimensional stability, low moisture absorption, and purity. Cycloolefins have a similar chemical structure to polyolefins, such as polypropylene and polyethylene. The transparency, DMSO resistance, and high degree of purity of cycloolefins render a well-suited material for microplate manufactures (Tab.1).

Since the advent of sophisticated technologies such as acoustic liquid dispensing, cycloolefin microplates have become increasingly important, especially for use in active pharmaceutical ingredient research.

	Polypropylene (PP)	Cycloolefin (COC/COP)	Polystyrene (PS)
Temperature stability	✓✓✓	✓✓	✓
Breakage resistance	✓✓✓	✓✓✓	✓
Chemical resistance	✓✓✓	✓✓✓	✓
Transparency	✓	✓✓✓	✓✓✓✓

Table 1: Material resistance of polypropylene and cycloolefin compared to polystyrene. A chemical resistance chart for various materials is contained within the Greiner Bio-One catalogue (Technical Appendix). This table is a general guide only. As many factors can affect the chemical resistance of a given product, its suitability for a specific application should be tested.



Performance

Microplates for Acoustic Liquid Handling

The latest technology utilises acoustic energy to transfer the smallest amounts of liquid from a storage plate into an assay plate (Fig. 1). The benefits: the method is rapid, extremely precise, reduces cost, and prevents cross-contamination.

For accurate and precise acoustic liquid handling, the storage or source microplate must perform an entirely new function: the microplate well bottoms must enable a uniform transfer of acoustic energy with as little restraint as possible.

Data and Facts

- Manufactured under strict production specifications with low tolerances
- Excellent for automation
- Individual bar coding on request
- May be used in both compound storage and screening assay applications
- Deionised, antistatic packaging

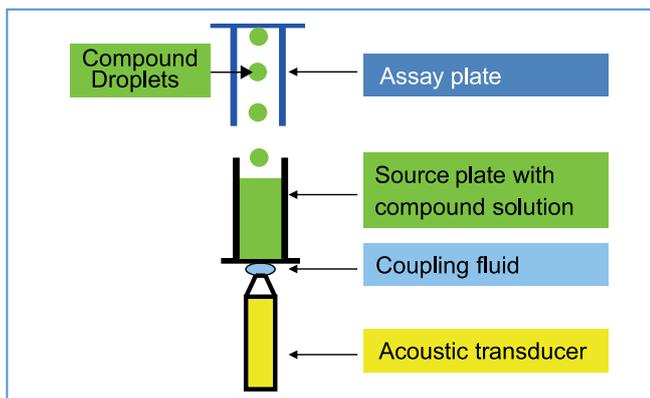


Figure. 1: Principle of acoustic liquid handling (acoustic droplet ejection):

The source microplate is positioned above the instrument acoustic transducer, and the recipient target assay microplate is positioned upside-down directly above the source microplate. The transducer transmits acoustic energy through the well bottom of a compound storage (source) microplate to induce formation of small liquid droplet. The expended energy is the exact amount needed to transfer the droplet to the target well bottom of the recipient assay microplate. Once transferred, the droplet remains attached within the upside-down recipient assay microplate well bottom due to surface tension.

Acoustic Liquid Handling Systems

Presently there are two acoustic liquid handling systems commercially available. The ATS-100 manufactured by EDC Biosystems Inc. is quite flexible, as it can be readily configured to allow use of a wide range of compound storage microplate manufactures (Fig. 2a).

ATS-100 Acoustic Liquid Handling System

EDC Biosystems Inc., Fremont, CA, USA

- 1536 Well COC Storage Plate | **Cat.-No.** 782 855
- 384 Well PP Storage Plate | **Cat.-No.** 781 201-906
- 384 Well UV-Star® Microplate | **Cat.-No.** 781 801
- 384 Well Small Volume™ UV-Star® Microplate
Cat.-No. 788 876
- 96 Well UV-Star® Microplate | **Cat.-No.** 655 801

Figure 2a: Compatible storage microplates for ATS-100 acoustic liquid handling system

Greiner Bio-One cycloolefin UV-Star® microplates feature a thin 135 µm film bottom, which demonstrates excellent performance for acoustic liquid transfers within the ATS-100, especially because of their low dead volume. UV-Star® microplates are available in different formats, surface treated upon request.

In contrast, the Labcyte Echo® system is standardised to use specific solid bottom microplates, generally pre-configured within the instrument (Fig. 2b).

Echo® Acoustic Liquid Handling System
Labcyte Inc., Sunnyvale, CA, USA

- 1536 Well COC Storage Plate | **Cat.-No.** 782 855
- 384 Well PP Storage Plate | **Cat.-No.** 781 201-906
- 384 Well Small Volume™ COC Storage Plate | **Cat.-No.** 793 855
- Further microplates after approval by Labcyte Inc.

Figure 2b: Compatible storage microplates for Echo® acoustic liquid handling system

Accuracy in Acoustic Liquid Handling

In cooperation with the pharmaceutical industry, Greiner Bio-One developed a 1536 well cycloolefin compound storage plate (cat.-no. 782 855) to fulfill the technical needs of this system. The homogeneity and the reproducibility of acoustic liquid transfers within this source microplate was monitored and proven in several real-time tests (Fig. 3).

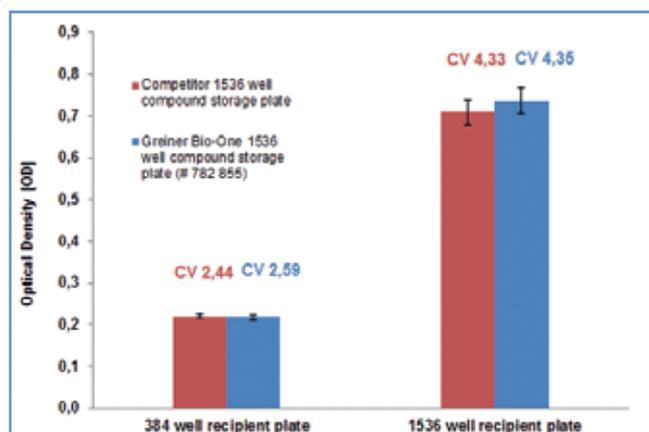


Figure 3: Transfer of 20 and 2.5 nL Tartrazine-DMSO-solution (50 mmol / l) from the new Greiner Bio-One 1536 well cycloolefin compound storage microplate into 384 and 1536 well assay microplates. Measurement of optical density for evaluation of the precision of the transfer process. The graph shows mean and standard deviation.

Microplate Design

The 1536 well cycloolefin compound storage microplate was designed with a tapered, flat bottom well to reduce dead volume (Fig. 4). The microplate top features a smooth surface without alphanumeric coding to facilitate automation and heat sealing (Fig. 5). With the standard 10.4 mm height of a 1536 well microplate, the new 1536 well cycloolefin compound storage microplate is easy to integrate with existing HTS systems (Tab. 2).

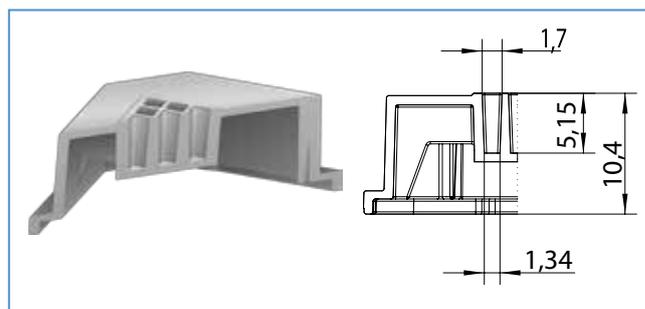


Figure 4: Well design of the 1536 well cycloolefin storage microplate (cat.-no. 782 855)

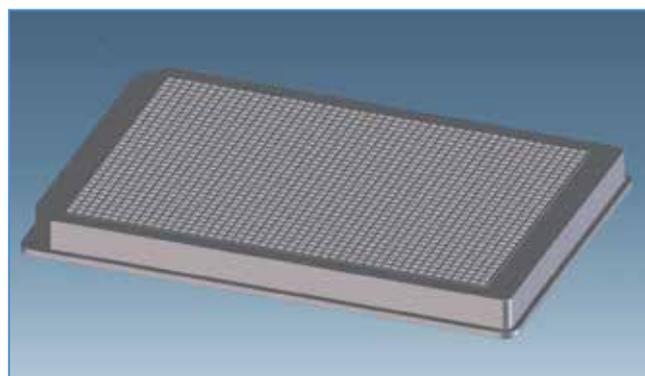
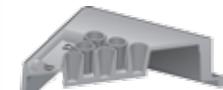


Figure 5: The 1536 well compound storage microplate for acoustic liquid handling features a smooth microplate top absent of alphanumeric coding to facilitate flush lid mounting and heat sealing

Cat.-No.	782 855	782 101
Well depth	5.15 mm	5.00 mm
Well diameter top	1.70 mm	1.70 mm
Well diameter bottom	1.34 mm	1.53 mm
Microplate height	10.40 mm	10.40 mm

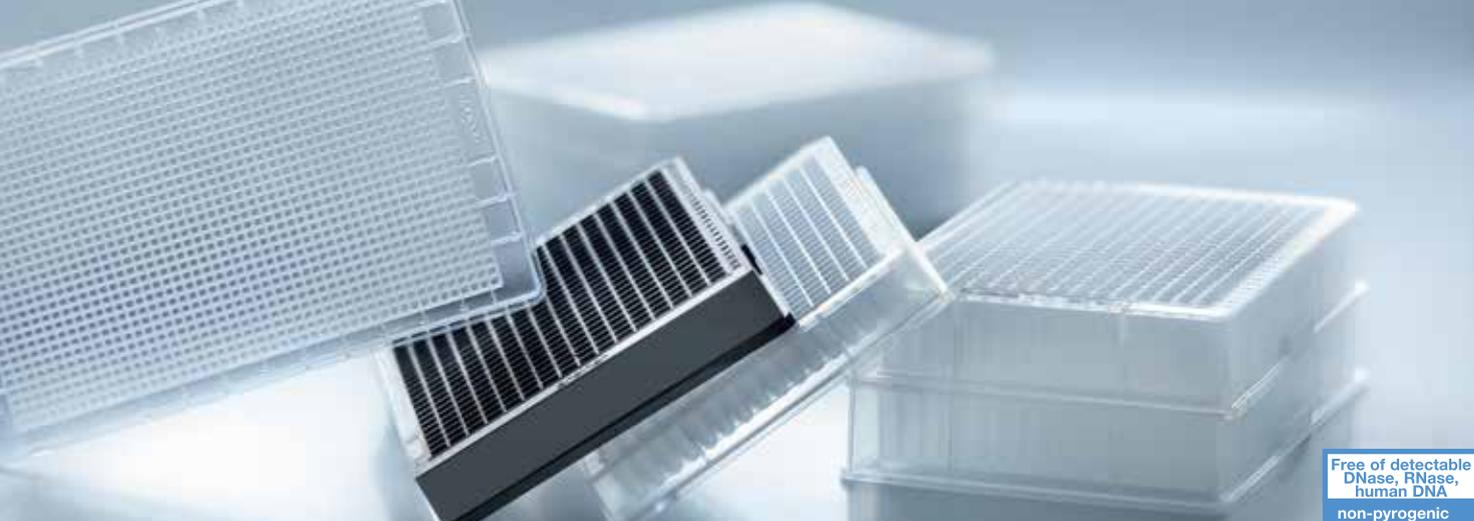
Table 2: Well geometry of the 1536 well compound storage microplate (cat.-no. 782 855) in comparison to a standard 1536 well PS microplate

Free of detectable
DNase, RNase,
human DNA,
non-pyrogenic

Product	3D	Well profile					
		H	D	Ø ₁	Ø ₂	V ₁	V ₂
96 Well UV-Star® (COC) Film Bottom suited for ATS-100 (EDC Biosystems, Inc.) Cat.-No. 655 801		14.4 mm	10.9 mm	6.96 mm	6.58 mm	25 - 340 µl	392 µl
384 Well UV-Star® (COC) Film Bottom suited for ATS-100 (EDC Biosystems, Inc.) Cat.-No. 781 801		14.4 mm	11.5 mm	3.7 mm	3.3 mm	15 - 110 µl	131 µl
384 Well Small Volume™ (COC) Film Bottom suited for ATS-100 (EDC Biosystems, Inc.) Cat.-No. 788 876		7.5 mm	5.5 mm	3.3 mm	1.84 mm	4 - 25 µl	28 µl
384 Well (PP) suited for ATS-100 (EDC Biosystems, Inc.) and Echo® (Labcyte Inc.) Cat.-No. 781 201 - 906		14.4 mm	11.5 mm	3.8 mm	3.6 mm	15 - 145 µl	152 µl
384 Well Small Volume™ (COC) Solid Bottom suited for ATS-100 (EDC Biosystems, Inc.) and Echo® (Labcyte Inc.) Cat.-No. 793 855		10.9 mm	5.5 mm	3.3 mm	1.84 mm	4 - 25 µl	28 µl
1536 Well (COC) F-Bottom suited for ATS-100 (EDC Biosystems, Inc.) and Echo® (Labcyte Inc.) Cat.-No. 782 855		10.4 mm	5.15 mm	1.7 mm	1.34 mm	1 - 10 µl	12 µl
1536 Well (COP) suited for ATS-100 (EDC Biosystems, Inc.) and Echo® (Labcyte Inc.) Cat.-No. 792 870-906		11.2 mm	6.5 mm	1.7 mm	1.47 mm	1 - 14 µl	16 µl

H = height of plate • D = well depth • Ø₁ = diameter of well top • Ø₂ = diameter of well bottom • V₁ = working volume • V₂ = total volume

The rights to the name of the listed manufacturers are held by the companies above.



Free of detectable
DNase, RNase,
human DNA
non-pyrogenic

Throughput

384 Well and 1536 Well Polypropylene Plates

Greiner Bio-One provides various solutions for technically challenging, scientific questions that require parallel analysis of sample arrays. Microplates with portrait orientation, such as 384 well or 1536 well formats, are chiefly used in automated processes where failures caused by poor plate quality can lead to high costs.

Greiner Bio-One 384 and 1536 well microplates are designed to allow simultaneous, rapid and efficient analysis of multiple targets under identical conditions. Virgin raw materials, precision engineering and pristine manufacture result in exceptional microplate integrity and flatness. Elimination of variances, stringent tolerances,

strict test criteria, and continuous product controls ensure a continuous quality to eliminate failures, facilitating uniform, consistent, and reproducible results.

Data and Facts

- Manufactured from medical-grade PP
- Excellent for automation
- Temperature stability (-196 °C to +121 °C)
- Well-suited for heat seals and adhesive films
- Alphanumeric well-coding
- Applications for use in storage or assay
- Customised barcoding performed upon request

Product	3D	Well profile					
		H	D	Ø ₁	Ø ₂	V ₁	V ₂
384 Well Microplate F-Bottom Cat.-No. 781 201 781 207 781 209		14.4 mm	11.5 mm	3.8 mm	3.6 mm	15 - 145 µl	152 µl
384 Well Microplate V-Bottom Cat.-No. 781 280 781 287 781 289		14.4 mm	11.5 mm	3.8 mm	3.8 mm	13 - 120 µl	130 µl
384 Deep Well MASTERBLOCK® Cat.-No. 781 270 781 271		22 mm	19.3 mm	3.8 mm	3.8 mm	20 - 225 µl	240 µl
384 Deep Well Small Volume™ Microplate Cat.-No. 784 201		14.4 mm	11.5 mm	3.8 mm	1.52 mm	1 - 90 µl	107 µl
1536 Deep Well Microplate Cat.-No. 782 270		10.4 mm	7.6 mm	1.7 mm	1.7 mm	3 - 15 µl	18 µl

H = height of plate • D = well depth • Ø₁ = diameter of well top • Ø₂ = diameter of well bottom • V₁ = working volume • V₂ = total volume



Free of detectable
DNase, RNase,
human DNA
non-pyrogenic

Reliability

96 Well Polypropylene Plates

Polypropylene is biologically inert, exhibits low binding characteristics, high temperature tolerance, and is chemically resistant. This enables applications that use more extreme conditions to be performed.

With unsurpassed quality manufacture, Greiner Bio-One's 96 well polypropylene microplate formats are ideal for applications where enhanced resistance and volumes are required, to include storage of active ingredients, biomolecules, and tissue samples, as well as automated fraction-collection. The MASTERBLOCK® feature extended well volumes for large sample sizes or repeated serial dilutions.

Data and Facts

- Manufactured from medical-grade PP
- Excellent for automation
- Temperature stability (-196 °C to +121 °C)
- Well-suited for heat seals, CapMats, and adhesive films
- Alphanumeric well-coding
- Applications for use in storage or assay
- Customised barcoding performed upon request

Product	3D	Well profile					
		H	D	Ø ₁	Ø ₂	V ₁	V ₂
0.5 ml MASTERBLOCK® Cat.-No. 786 201 786 261		27 mm	23.3 mm	7 mm	7 mm	0.03 - 0.65 ml	0.78 ml
1 ml MASTERBLOCK® Cat.-No. 780 201 780 215 780 261		41.5 mm	38.2 mm	7 mm	7 mm	0.05 - 1.1 ml	1.22 ml
2 ml MASTERBLOCK® Cat.-No. 780 270 780 271 780 285		44 mm	41 mm	8.2 mm	8.2 mm	0.1 - 2.1 ml	2.42 ml
96 Well Microplate U-Bottom Cat.-No. 650 201 650 261 650 207 650 209		14.6 mm	10.9 mm	6.96 mm	6.96 mm	50 - 300 µl	355 µl
96 Well Microplate V-Bottom Cat.-No. 651 201 651 209		14.6 mm	10.9 mm	6.96 mm	6.96 mm	50 - 335 µl	340 µl
96 Well Microplate F-Bottom Cat.-No. 655 201 655 207 655 209		14.6 mm	10.9 mm	6.96 mm	6.58 mm	25 - 370 µl	392 µl

H = height of plate • D = well depth • Ø₁ = diameter of well top • Ø₂ = diameter of well bottom • V₁ = working volume • V₂ = total volume



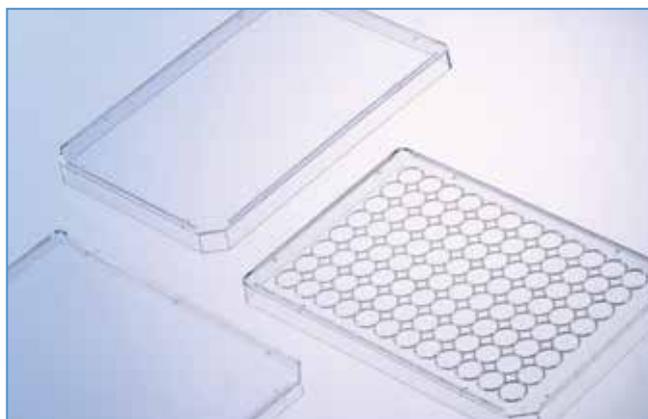
Sealing of Microplates in Long Term Workflows

A Brief Overview and Guideline

Compound stores usually have been collected over years and contain thousands of sometimes irreplaceable samples. They represent a high commercial value and their tight and long term sealing and protection is a major requirement.

In principle plates can be sealed using:

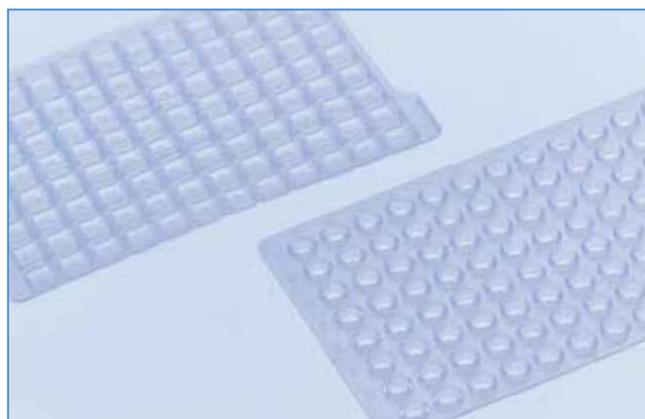
➤ Microplate Lids



➤ Adhesive Sealers



➤ CapMats



➤ Heat Sealing

Lids and CapMats

For workflows in High-Throughput Screening and all applications involving long term or cold storage, the methods using lids or CapMats are not appropriate, as lids will not seal tightly and CapMats cannot readily be handled in automation.

Adhesive Sealers

The use of adhesive seals can be used if storage conditions are not too harsh in terms of cold temperature and duration and the plates do not contain aggressive solvents. Adhesive seals have the advantage of leaving the plate undamaged.

However, adhesive sealing may not be sufficient in long term storage at, or below - 20 °C. Adhesives could dry out and sealing will be compromised. Furthermore, DMSO and alcohols have the potential to dissolve adhesives allowing substances to potentially leach out into the sample.

Heat Sealing

Heat sealing is widely acknowledged as the gold standard for long term and secure sealing, especially at low temperatures. A wide selection of materials exist which demonstrate excellent chemical resistance and allow different ways of re-access to the samples, such as piercing and peeling, without leaving traces of adhesive. Sealing materials are available to seal all plate materials, including polypropylene, polystyrene and cycloolefins. This way, any workflow can be reflected in terms of sealing, incubation and re-access.

When using a plate for the first time, sealing conditions need to be established to give the right balance between complete sealing and optimal preservation of the plate. Sealing conditions can be established quickly and reproducibly if a sealer is used showing high sealing pressure, precise control of temperature and excellent flatness. Once established, protocols can be stored and reused.

Establishment of Sealing Conditions

In Figure 6, we present the results of such an initial

experiment using a 1536 well COC compound storage microplate (cat.-no. 782 855) and the A4S™ Roll Sealer from 4titude® Ltd. (www.4ti.co.uk). The sealing material was 100 % DMSO resistant “peel seal” giving good results on microplates manufactured of polystyrene, polypropylene and cycloolefins.

The results show:

- Peeling of the seal and checking the pattern of the rims in outer positions gives a good indication of completeness of sealing: No open rims must occur.
- Checking both the plate and the seal for the diameter of the wells after sealing gives an indication of well damage if the plate has been oversealed. Well diameter must be still wide enough to give good access for robotic needles.
- Trials are started best at 175 °C for 2 sec. If outer positions are poorly sealed, temperature must be slightly increased. If well diameter is narrowed, the temperature must be lowered.

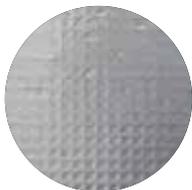
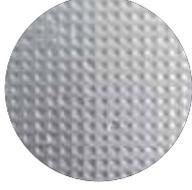
	sealed microplate	pattern of the rims	Comment
 Temperature 172 °C			With 172 °C and 1 seconds sealing time ➤ mild conditions ➤ no warpage or damage to plate ➤ some outer positions show imperfect sealing
 Time 1 s			
 Temperature 172 °C			With 172 °C and 2 seconds sealing time ➤ mild conditions ➤ no warpage or damage to plate ➤ some positions show imperfect sealing
 Time 2 s			
 Temperature 180 °C			With 180 °C and 2 seconds sealing time ➤ complete sealing ➤ no warpage or damage to plate
 Time 2 s			
 Temperature 180 °C			With 180 °C and 4 seconds sealing time ➤ complete sealing ➤ Narrowing of well diameter may obstruct pipetting with tips
 Time 4 s			

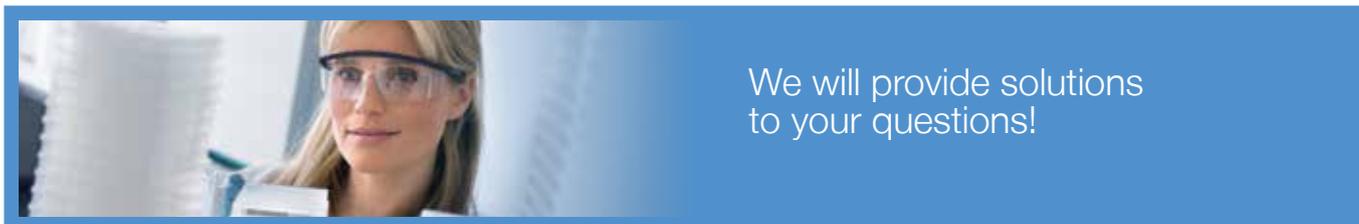
Figure 6: Establishment of sealing conditions on a 1536 well COC Microplate (Cat.-No. 782 855)

So That Nothing Gets Lost HTS Sample Management

Customised Microplate Barcode Services

When large quantities of samples and information are being processed, automated identification offers much needed organisation as means of sample / assay management. This is especially important for applications in High-Throughput Screening. Maximise time-efficiency

and reduce the risk of manual transcription errors with barcoded microplates from Greiner Bio-One. Combining product excellence with superior value, customised barcoding provides another quality service to our HTS customers.



We will provide solutions to your questions!

Don't lose track!

An Overview of Greiner Bio-One Storage Plates

96 Well Polypropylene Microplates										
Well profile				Sterile	Colour				Cat.-No.	Quantity per bag/case
U	V	W	X		natural	clear	white	black		
X					X				650 201	10/100
X				X	X				650 261	10/100
X							X		650 207	10/100
X								X	650 209	10/100
		X			X				655 201	10/100
		X					X		655 207	10/100
		X						X	655 209	10/100
	X				X				651 201	10/100
	X							X	651 209	10/100

96 Well MASTERBLOCK®										
Well profile				Sterile	Colour				Cat.-No.	Quantity per bag/case
U	V	W	X		natural	clear	white	black		
Volume 0.5 ml										
	X				X				786 201	8/80
	X			X	X				786 261	1/80
Volume 1 ml										
X					X				780 201	1/50
X					X				780 215	5/50
X				X	X				780 261	1/50
Volume 2 ml										
	X				X				780 270	1/50
	X			X	X				780 271	1/50
	X				X				780 285	5/50



Don't lose track!

An Overview of Greiner Bio-One Storage Plates

384 and 1536 Well Polypropylene Microplates										
Well profile				Sterile	Colour				Cat.-No.	Quantity per bag/case
U	V	W	X		natural	clear	white	black		
384 Well										
		X			X				781 201	10/100
		X					X		781 207	10/100
		X						X	781 209	10/100
	X ¹				X				781 270	6/60
	X ¹			X	X				781 271	6/60
	X				X				781 280	10/100
	X						X		781 287	10/100
	X							X	781 289	10/100
			X ^{1,2}		X				784 201	10/100
1536 Well										
	X ¹				X				782 270	15/60
Special Forms – Acoustic Liquid Handling										
Well profile				Sterile	Colour				Cat.-No.	Quantity per bag/case
U	V	W	X		natural	clear	white	black		
96 Well UV-Star® (COC)										
		X				X			655 801	10/40
384 Well Compound Storage Plate (PP)										
		X			X				781 201-906	10/100
384 Well UV-Star® (COC)										
		X				X			781 801	10/40
			X ^{2,3}					X	788 876	10/80
384 Well Compound Storage Plate (COC)										
			X ²			X			793 855	15/60
1536 Well Compound Storage Plate (COC)										
		X				X			782 855	15/60
1536 Well Compound Storage Plate (COP) Novartis Design / Low Evaporation										
		X				X			792 870-906	15/60

X¹ Deep Well Plate X² Small Volume™ Design X³ surface treated plates available on request



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