

## BIOplastics BV

Europe based BIOplastics BV is the innovative high quality injection moulding manufacturer of (q)PCR consumables supplying the molecular (diagnostic) (q)PCR marketplace (MDX). BIOplastics with its sole headquarter and manufacturing facility in Landgraaf, The Netherlands is a member of the privately owned BIOzym Holding group, which is comprised of CYCLERtest BV, GENO-ironics BV, BIOzymTC BV, BPCTi Inc. (USA), Hendrixx Ltd. (China) and CelsiusLabs. BIOplastics offers the most superior range of (q)PCR plastics globally. BIOplastics pursues the vision to design and manufacture plastic consumables in particular for use in MDX and related application fields as well as to supply MDX kit manufacturers. BIOplastics superior quality and highly reproducible consumables allows ease of use with maximum reproducibility of results. BIOplastics products are, in addition to being integrated into MDX kits, offered through a worldwide network of selected distributors and resellers.



## BIOplastics BV Strategic Views

The molecular (diagnostics) marketplace is rapidly growing and requires superior, independent and complete supply of (q) PCR disposables. These demands require generation of accurate, consistent, and reproducible results to manage and reduce variations in the (q)PCR process.

BIOzym Holding, the Netherlands, the parent company of BIOplastics and its sister company CYCLERtest, support and commit to these demands and strategically organize all members to develop new products whose end result is to comply with these "manage and reduce variations in the (q)PCR process" demands.

While CYCLERtest supplies independent ISO17025 accredited (q)PCR cyler tools and calibrations for all models and brands of (q)PCR cyclers, BIOplastics manufactures Extreme Uniform q(PCR) disposables, and has been able to reduce to the use of just two products for those who require the lowest variability, the number of to be used products to a minimum of two.

BIOplastics is proud to be categorized as global innovative leader and we are obligated and eager to maintain this position.



Michael T. Hendrixx. CEO BIOplastics BV



# Ordering Information

## Head Quarters and Sales Offices

### Head Quarters & Manufacturing

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### Please have the following information available when ordering:

1. Shipping and invoice address
2. Contact person
3. Telephone number
4. Purchase order number
5. Catalogue number and description of product(s)
6. Quantity and size of the product(s)
7. VAT number / TAX ID

### Liability and Warranty

Data supplied with products are correct and reliable to the best of our knowledge and belief. Under no circumstances will BIOplastics BV be liable for consequential damage arising from the use of its products. BIOplastics BV is liable exclusively and restrictively to replace defective products. BIOplastics BV warrants its products to be free of defects in material and workmanship. BIOplastics BV will replace any products that are found to be defective, at no costs.

## Webshop

[www.bioplastics.com](http://www.bioplastics.com)

Register at our website as a customer and be facilitated to the use of the web shop and product prices.

Search engines (interactive) at the website for e.g.:

- Product to (q)PCR instrument(s)
- (q)PCR instrument(s) to product(s)
- Pipette to tip and/or tip to pipette
- Filter search to any single or multiple selected product characteristics
- Convert current (competitor's) product# to BIOplastics' alternative product#



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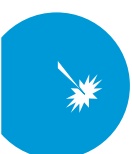
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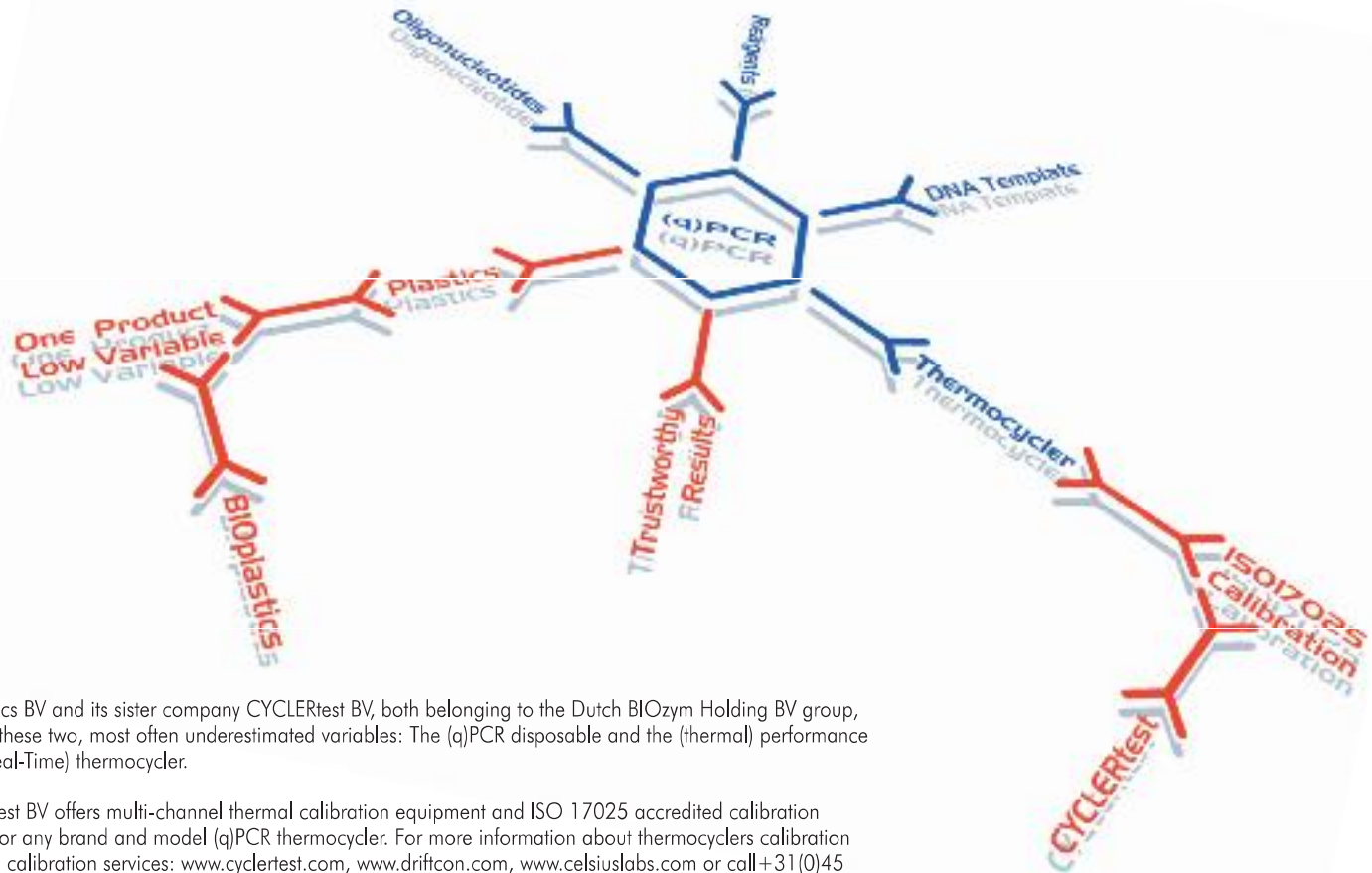
# Features, Advantages, Benefits

PRODUCT	FEATURES	ADVANTAGES	BENEFITS
<b>(q)PCR tube/strip &amp; plates</b>	<b>Special blend of polypropylene</b>	<b>Anti-static tubes</b>	<b>Maximum sample recovery</b>
	Uniform wall thickness	Tubes non sticking for biomolecules Flexible non cracking tubes Uniform heating No risk of cracking Minimize evaporation	Low copy detection No loss of sample Consistent reaction conditions No loss of sample Consistent reaction conditions Consistent reaction conditions Optimal reaction conditions Consistent reaction conditions Consistent reaction conditions "Finger" friendly and reduce RSI Consistent reaction conditions Highly reproducible results Always best fitting plastics Lower copy detection Low copy detection Consistent reaction conditions Increased flexibility/lower cost Consistent reaction conditions Easy transport and positioning Optimal reaction conditions Traceability samples Traceability samples Traceability samples Traceability samples Traceability samples Avoid mix-up samples & trays Easy orientation Easy to handle, stable shape Easy positioning and handling Economic usage Pipette in 96 well format, use in 8 well or multiple of 8 well format Minimize cross contamination Enables specific qPCR cycle fit Easy use in robotics Combined compatibility use (eg. ABI & Roche) thermocyclers Easy and fast handling Set-up in 96 well format and use in 8 strip format
	Uniform closure part tube/strip/plate Thin wall lower part tube Thick wall upper part tube Sealing band in cap Clever design cap	Uniform closure & interchangeability Maximal heat transfer Minimal evaporation Minimal evaporation Easy opening and closing Minimal evaporation No "finger touch" while closing	
	Wide area indented caps Wide range of (q)PCR products Frosted plates and tubes White plates and tubes	Always a product to fit any thermocycler Higher signal/noise ratio Highest signal/noise ratio Avoid signal contamination from block Allow adjustment of required wells	
	Breakable plates Low Profile tubes Asymmetric holes in strips Optimal tube-block contact angle Alpha numeric markings Auto-orientation holes Frosted writing areas Laser embedded marking and coding	Minimal evaporation Make your own plate Better heat transfer Easy sample location Easy orientation Easy sample marking Easy sample identification Uniquely coded Pipetting marker lines	
	Extra robust strips	No twisting, wrapping or bending In line and no breakage	
	Tear Off Format	Use of multiples of 8 wells	
	Compatibility with Shell Frame Grid	Removal of individual rows of a plate Enabling to make specific sub skirted plates	
	Closure with Tear Off cap strip mat	Simultaneous closure of complete tube strip mat Possible to separate closed 8-Tube strips	
<b>Filtertips and Tips</b>	<b>Special blend of polypropylene</b>	<b>Anti-static tips</b>	<b>Maximal sample recovery</b>
	Beveled Orifice (45°) Graduated Extended length 18 micron filter Gradient filter Extended filter length Modular composed tip racks	Tips non sticking for biomolecules Flexible non cracking Natural and extremely clear Easy soft-fit and release from pipette Improve sample ejection accuracy Quick volume check Avoid pipette to tube contact Superior protection Increases protection barrier Increases protection barrier Multi application useable racks	Low copy detection Good fit & no loss of sample Easy view of contents Reduce RSI Consistent pipetting conditions Minimize incorrect settings Minimize cross contamination Minimize cross contamination Minimize cross contamination Minimize cross contamination Environment friendly
<b>Micro Centrifuge tubes</b>	<b>Special blend of polypropylene</b>	<b>Anti-static tubes</b>	<b>Maximum sample recovery</b>
	Clever design cap (inner round) Graduated	Easy opening & closing Flexible non cracking No corners in "inner part" Quick volume check	Reduce RSI No loss of sample Maximal sample recovery Helpful to avoid incorrect volumes
<b>Screw Cap Tubes &amp; Caps</b>	<b>Special blend of polypropylene</b>	<b>Anti-static tubes</b>	<b>Maximum sample recovery</b>
	Clever design cap	Easy opening & closing Wide applications range & temperature Absence of rubber O-ring No corners in "inner part" triangular shaped cap Color catch of tube and cap	No loss of sample No need for cryo tubes No leakage or breakage Suitable for organic solutions work range -200 °C to 100 °C Maximum sample recovery No rolling of tubes Minimize cross contamination
<b>Work and Cryo Racks</b>	<b>Special blend of polypropylene</b>	<b>One hand opening &amp; closing</b>	<b>Increase flexibility</b>
	Clever design	Flexible non cracking Wide applications range & temperature Modular composed racks Stackable	No loss of samples No need for "special" cryo racks Multi application usage Space saving

# Controllability of (q)PCR

## Controllability of (q)PCR

Accurate and reproducible results in (q)PCR are obtained when being in control of all variable parameters of this process. So being in traceable control of these parameters such as reagents, oligonucleotides, template DNA, disposables and thermocycler, next to other operational parameters, is crucial in achieving trustworthy results.



BIoplastics BV and its sister company CYCLERtest BV, both belonging to the Dutch BIOzym Holding BV group, targeted these two, most often underestimated variables: The (q)PCR disposable and the (thermal) performance of the (Real-Time) thermocycler.

CYCLERtest BV offers multi-channel thermal calibration equipment and ISO 17025 accredited calibration services for any brand and model (q)PCR thermocycler. For more information about thermocyclers calibration tools and calibration services: [www.cyclertest.com](http://www.cyclertest.com), [www.driftcon.com](http://www.driftcon.com), [www.celsiuslabs.com](http://www.celsiuslabs.com) or call +31 (0)45 533 8733.

BIoplastics BV manufactures Extreme Uniform plastic disposables, enabling control of the plastic consumable aspect of the (q)PCR process. BIoplastics focuses on (q) PCR plates, strips and tubes. For customers who require lowest variability, the number of the to be used products can be reduced to a minimum of two. Next to that BIoplastics manufactures products used in the pre- and post-(q)PCR process; more specifically filtertips, pipette tips, sampling tubes, racks, (cryo) storage tubes and racks, kit content reactions vessels and micro centrifuge tubes.

## Extreme Uniform Plastics

To control your (q)PCR in the best possible way and to obtain the most reproducible and accurate results, BIoplastics developed a state-of-the-art range of (q)PCR disposables called: Extreme Uniform (q)PCR plastics. These plastics are characterized by Extreme Uniformity in:

- Wall thickness
- Low evaporation rates
- High thermal conductivity (if applicable)
- Low binding
- High liquid retention (if applicable)
- High signal to noise ratios
- Full interchangeability between used products (fit, binding and chemistry)

These characteristics lead to extreme uniform reaction conditions in (q)PCR, whereas the latest BIoplastics development enables to reduce the number of "different" products to a minimum of two, regardless the wide variety of brands and models in a laboratory.

BIoplastics manufactures not only Extreme Uniform (q)PCR disposables but has reduced, for those who require lowest variability, the number of to be used products to a minimum of two.

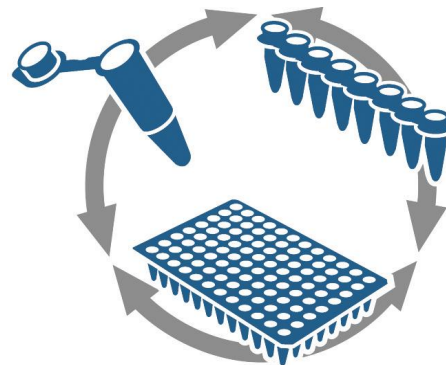


## Interchangeability of products and processes

BIOplastics has assembled a range of products which are fully interchangeable with each other.

A (q)PCR process optimized in one of the BIOplastics strips, tubes or plates can simply be transferred to any other BIOplastics strip, tube or plate. The fact that BIOplastics offers products for ALL BRANDS and models of (q)PCR cyclers enables end-users to “one time only” optimize the (q)PCR process in its, at that moment in time, preferred BIOplastics model. Once optimized you can simply swap to a different BIOplastics format without re-optimizing or re-validating the process, since you are benefiting from our identical and interchangeable model and raw material properties plastics with the same properties. Using the same protocol on a different cycler is easily done by selecting the designated BIOplastics product for that model of cycler.

No need for re-optimizing the whole process since BIOplastics’ plastics characteristics are exactly the same for the whole range of the (q)PCR product line. Thermal performance difference between cyclers, cycler models, and brands can be accurately determined using CYCLERtest calibration service or CYCLERtest DRIFTCON® temperature calibration tools. See also “Normalizing Standard Operation Procedures (SOP) for (q)PCR applications” (page 22). Did you optimize your (q)PCR process in tube strips and need more or less capacity? Just start using BIOplastics plates, single tubes or even 384 well plates without the requirement of adjusting your protocol.



## Shell Frame Grids

Shell Frame Grids are designed to combine designated BIOplastics (q)PCR vessel formats with an interchangeable and rigid skirt. This smart design enables to reduce the total amount of used plates or strips: to a minimum of 2, regardless the variety of your (q)PCR cycler range.

- Simply make your selection of low profile (0.1 ml) and/or regular profile 0.2 ml.
- Select your preferable format e.g. cut-able plate, tear-off strip mat, 8 tube-strips or 8 tube-strip with attached caps.
- Decide your preference for Ultra Clear, Frosted or White.

Your selected product(s) enable you to perform any (q)PCR on any (q)PCR cycler platform regardless cycler-range and assortment.

Outcome: superior accurate, uniform and interchangeability of results and limiting variables in MDX or experiments.



## Saving costs on reagents

Low evaporation properties enables (q)PCR in low volumes which greatly reduces reagent costs (up to 60%). BIOplastics does not recommend its products to be used with volumes below 5 µl.

White plates and strips do allow significant signal enhancement in qPCR. In some cases the reagent usage can be reduced due to the much higher signals achieved.



## One (q)PCR disposable only to fit your cycler assortment

Why continue to use a number of different products to equip your (q)PCR cycler assortment if a “one product does it all” is at your fingertips. The use of BIOplastics’ Shell Frame Grid fit-able products as Tear Off Strip Mat or cut-able Plate are designed for “one product only” strategy which enables you to equip your whole 0.1 ml or 0.2 (q)PCR cycler assortment with one product only.

## Reduce the number of products and vendors.

“One product does it all” BIOplastics (q)PCR products are designed to fit the majority of PCR and qPCR cyclers and our latest Shell Frame Grid fitting products even enables reduction of your usual (q)PCR disposables selection to one or two, regardless the cycler platform(s). Benefit buying from one vendor, using one product and one chemistry strategy, and grant your laboratory and its customers superior and consistent results. Related products as filter and pipette tips, micro centrifuge tubes etc. can be added to support your consistent results as well as to focus on a one vendor/superior quality laboratory strategy. We recommend using the dynamic search engine at our website to find the correct product for your application(s), opt for “Shell Frame Grid fitting” products or use our website “current competitor product” to BIOplastics superior products converter. If not sure or too much of a hassle, just contact BIOplastics for the best recommendation suiting your needs.



# BIOplastics Helpful Smart Solutions for your Lab

## Eliminate ID# errors by irreversible coding

BIOplastics' BPLPM technology results in a non removable, uniquely marked and coded product. No writing with markers, no mistakes, no removal of marks, no double identification numbers, just use the unique ID# at the beginning of your process. Link the unique ID to your Lab LIMS system. BPLPM technology is currently used in a selected range of products. BPLPM technology is particular useful for accredited labs and in Pre-diagnostics and Diagnostic settings allowing improvement of procedures and reducing risks of label failures. Custom layouts and customized codes, whether in 1D or 2D can be added on demand. Several options (including your own coding) are available and particularly useful for kit manufacturers, enabling full traceability of products and applications.



## Chip incorporated (q)PCR strips and plates(RFID)

Molecular Diagnostics requires traceability and BIOplastics already has full trace ability for its products. Designated products are even unique and irreversible ID-ed and coded. For those customers who would like to go beyond, BIOplastics enables the possibility for incorporating a programmable, scan able and readable chip (RFID) in its products. RFID or Radio Frequency Identification refers to a system for automatically identifying objects. The easiest way to understand RFID is to imagine a type of BARCODE which is able to exchange information by radio, and update itself over a period of time. In the coming years we expect lots of innovative applications with RFID. BIOplastics products with an RFID chip might be particular interesting for monitoring and streamlining workflows, diagnostic kits, diagnostic testing, combining instruments and applications or other parameters. Contact BIOplastics for information and options.



Programmable, scannable and readable RFID chip

## Avoid orientation mistakes

BIOplastics strips and plates are not symmetrical; many BIOplastics strips have off-center holes at top and centered holes at the bottom which provides easy orientation. Tubes strips and plates can be clicked in Shell Frame Grids permitting the assembly of your own plate or to perfectly fit your specific instrument. Frosted marking areas enable easy marking of strips. Extra robust strips will not break and enable straight forward positioning of the strips into the cyclor. Strip caps are available in extra robust formats and allow easy positioning, opening and closing. Indented optical areas reduce "touching" the optical area while closing.

## Reduce CO<sub>2</sub> emission, environmentally friendly plastics

We at BIOplastics are, as many people, concerned about the environment in relation to the use of plastics. BIOplastics is often contacted in the assumption to have the solution for biodegradable-degradable plastics as these are also called "bioplastics". At BIOplastics, we do monitor the development of these biodegradable plastics carefully and are open for incorporating these plastics into our product portfolio. The current technology and the type of applications, typically (q)PCR, does not (yet) allow us the use of biodegradable plastics. However to reduce the unnecessary pollution of our environment, BIOplastics has designed products that are interchangeable and can be use in a different lab application after serving the primary function. Some examples: filtertips and tip racks can be reused as (freezer) storage containers for tubes, plates and strips. You can use the rack to "pipette on ice" etc.. Furthermore the latest Tear Off plate mats and cap mats provide highest efficiency while very costs effective. Products fit able Shell Frame Grids offers superior reproducibility of results and allow using a minimize amount of product.



## Standardize and improve reproducibility

BIOplastics manufactures the widest range (q)PCR disposables globally. We offer products for ALL BRANDS of PCR and qPCR cyclers and integrate full interchangeability between these products. (see also "Interchangeability of products and processes"). No need for shopping at different cycler manufacturers or vendors who are typically not the manufacturer. Enjoy the benefits and ease of use of superior quality (q)PCR vessels which all have the same raw material compositions. Combine this with the extreme uniform wall thickness of the products and you actually have standardized and improved the reproducibility of your results by excluding variables in uniformity, material composition and properties.

## Reduce cross contamination, color coded screw cap tubes

Unlike other screw cap tube (SCT) manufacturers, BIOplastics manufactures not only natural screw cap tubes but also colored screw cap tubes. Reduce possible cross contamination in your lab by only using color matching tubes and caps. Ultimately one can opt using 1 or 2D irreversible bar-coded products, as e.g. screw cap tubes, our custom coding service or even laser code designated BIOplastics products by yourself.





## Low copy detection

BIOplastics customized medical polypropylene blends are designed for low copy DNA, RNA and protein molecule detection through low binding characteristics. Polypropylenes are chemically inert, but still exhibit charged groups, static properties and hydrophobic areas. Different types or blends of polypropylene therefore do differ in binding characteristics and consequently charged groups like DNA, RNA, proteins and ions can bind in low amounts to polypropylene. BIOplastics (q)PCR products as well as pipette tips and micro centrifuge products are developed with a specific blend of PP. The blend is designed to maximize product functionality and application while providing extremely low binding characteristics to DNA, RNA and proteins. Due to these extremely low binding PP properties, products are superior for detecting low copy numbers of DNA, RNA and proteins. This blending enables reagent components such as ions and enzymes to be solely used for the reaction process and prevents sticking to the vessel surface. The binding (sticking) ratio of charged molecules like DNA, RNA and proteins between BIOplastics optimized PP blend and regular PP is typically 1:7 (1 to 7). (See also Anti Static tips PIPETTE TIPS, why, how and when they become favorable, page 17).



## Flat stackable non-nesting plates

All BIOplastics plates are flat when purchased, which allows not only easy removal from a stack but also easy pipetting, positioning and removal from cyclers. Plates are stackable in a way that they do not nest or stick together. This is appreciated by those who do not want to waste time and effort into de-stacking plates as well as those who require liquid handling automation without de-stacking failures. Some plates are cut-able, some are breakable, some have "Tear Off" features, and some are additionally also assigned to fit Shell Frame Grids. Most plates have 12 centered and 12 non-centered holes which provide easy orientation for a plate or parts of a plate if it is cut or torn off. BPLPM technology provides "in product" permanent black markings (A-H, 1-12) as well as uniquely permanently coded plates (Number and/or 1D and/or 2D Laser-mark).



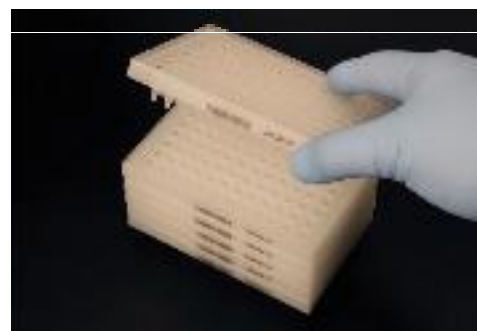
## Ease of use

As a manufacturer, BIOplastics' focus has been to design products with superior primary functionality, and where possible, add ease of use and alternate use into the products. Below are several ease of use ideas.

Extreme low binding characteristics of BIOplastics' polypropylene blend

## One hand closure of Single Tubes

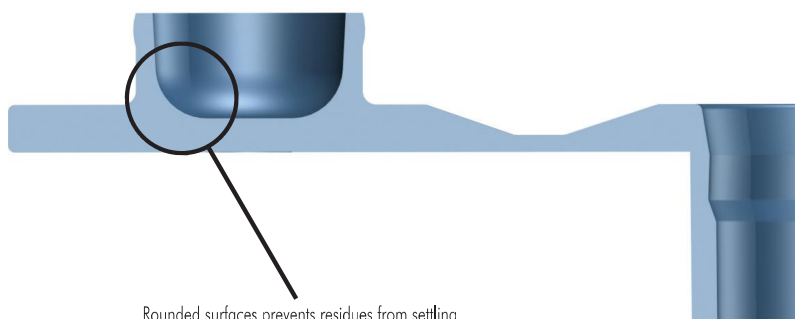
Single tubes can be easily opened and closed by only using one hand. Single tubes can be placed in a BIOplastics Shell Frame Grid. The grid has functionality as a transport medium to and from cyclers and can be positioned into the cycler. The X - Y format remains the same avoiding requirements of individual tube labeling!



Non nesting plates, ideal for pipetting and robotic applications

## High molecule recovery, by product design

The design of the caps of BIOplastics tubes is different when compared to other supplier's caps. To prevent any residue settling in the cap, regardless opened or closed, BIOplastics designed all its caps without any grooves, notches or cavity numbers. This design increases the recovery of liquid and its containing molecules. Furthermore, by nature of the design, liquid will automatically "drip down" to the bottom if the lids are in their closed position. Combining the above mentioned design features with BIOplastics polypropylene optimized blend properties, one ends up with maximum product functionality while providing extremely low binding characteristics to DNA, RNA and proteins and so highest molecule recovery.



Easy one hand opening and closing of single tube

# BIOplastics Superior Technology transferred in Superior Quality

## Extreme uniform moulds

In the design and development stage BIOplastics pays considerable attention to a strategy that provides maximum mould and manufacturing accuracy. We outline precise product specifications, minimize mould cavities and define product thresholds, resulting in superior and reproducible products with, in the case of (q)PCR vessels, an average wall thickness of 0.30 mm for tubes and strips and 0.35 mm for plates both with a maximum tolerance of 0.05 mm.



Average wall thickness of 0.30 mm for tubes and strips and 0.35 mm for plates.

## Low-cavity moulds

To manufacture qPCR products, tips and tubes with the highest uniformity possible, a low-cavity mould should be used. This means only a few products are moulded during one cycle, after which the next few are moulded. Manufacturing from low cavity moulds is more time consuming, and is therefore more costly than using high multi-cavity moulds from which 32, 64 or even 128 products are released in one cycle. Competitor's products are often manufactured using high-multi-cavity moulds and therefore differ severely in tolerances and quality due to this production parameter. Manufacturing parameters of low cavity moulds are better controllable versus high cavity moulds. Injecting the polymer into a high multi-cavity mould (pressure/temperature) increases mould imbalance issues and consequently product inconsistencies. This can result in batches of products with extreme differences in wall-thickness, closure, orifice and fit, which will influence the reproducibility of your experiment. BIOplastics products are manufactured using single, low- and semi-low cavity moulds.



injection moulding mould

## Extreme uniform manufacturing conditions

During the injection moulding process all physical, chemical and mechanical parameters are fine-tuned to obtain an Extreme Uniform plastic. Our superior in-house expertise allows us to determine the optimum balance between injection temperature of the polypropylene, the temperature of the mould itself during the cooling process, the injection time and the shrinkage time. We benefit from the knowledge of our sister companies CYCLERtest and GENO-tronics both well-known as manufacturer of the MTAS® and Driftcon® systems as well as provider of ISO17025 accredited (q)PCR cyler calibration (On-Site) services. BIOplastics has incorporated modified temperature multi-sensor systems to monitor and control moulds and injections moulding machines. The manufacturing process takes place in a dedicated cleanroom under GMP and hands-free conditions to ensure the absence of detectable levels of DNA, RNA, DNase, RNase, proteins, pyrogens and ATP.



injection moulding mould

## Extreme uniform raw material blends

The polypropylenes used are of the highest medical grade polypropylene, which ensures no release of metals or other contaminants into the reaction mix. The carefully selected types of medical grade polypropylenes are "in house blended" to well-defined proprietary ratios. This specific fine tuned blend supports achieving the highest product and user performance properties. BIOplastics avoids the use of softeners, coatings and mould releasing agents.



Granules of medical grade polypropylene

## Non cracking (q)PCR tubes, strips and plates

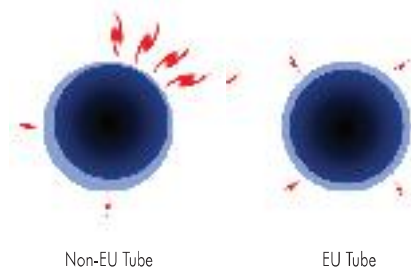
The careful selection of different types of polypropylenes combined with extreme uniform wall thickness benefits BIOplastics products in a way that they do not crack easily. BIOplastics products can therefore withstand mechanical pressure and are impervious to possible small, microscopic, hairline cracks not visible with the naked eye.

So fact: EU products are strong, flexible and reliable and do not crack and are to easy handle!



## Wall uniformity

Extreme Uniform wall thickness leads to even heating of the sample and more homogenous reaction conditions, leading to more reproducible results. Extreme Uniform wall thickness also leads to lower evaporation rates and therefore more consistent (q)PCR results. In case of optical detection by optical reading through side of the tubes, an extreme wall uniformity increases signal consistency.



Cross section of a (q)PCR tube

## Wall thickness and gas tightness

Polypropylene (PP) is not completely gas tight and evaporation through the walls is inevitable. Sample loss through the wall is proportional to the wall thickness and is also related to the type of PP. BIOplastics BV designs its (q)PCR vessels with thin walls at the bottom, to allow optimal maximum heat transfer, and thicker walls at the top to minimize evaporation through the PP which consequently leads to more reproducible results.

Thin Wall Thickness of BIOplastics products is defined as, and measured, 3 mm from the bottom, where as:

Single tubes and strips :	0.30 mm +/- 0.05 mm
Plates:	0.35 mm +/- 0.05 mm



Regular Profile Tube

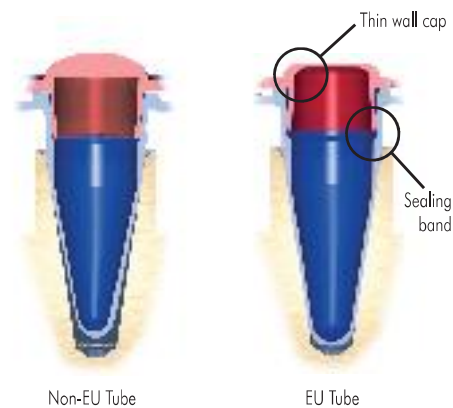
Low Profile Tube

## Tube angle, optimized for best fit

Different thermocycler brands and models have slightly different block well angles. BIOplastics uses its sister company's (CYCLERtest) competence and knowledge of (q)PCR cyclers during the (q)PCR vessel design. BIOplastics (q)PCR vessels features a tube angle optimized to fit all main brands and models of (q)PCR thermocyclers, thus allowing maximum heat transfer for superior optimal and reproducible results.

## Low, regular and high profile products

In low profile tubes there is a smaller "air" volume above the reaction mix than in regular and high profile tubes. This allows less reaction mix to go into gas phase, leading to more concentration of the samples, less change in reaction conditions and therefore more reproducible results. Fast (q)PCR cyclers accept low profile, also called 0.1 ml tubes, strips and plates. Regular (q)PCR cyclers accept regular profile products whereas (q)PCR cyclers with height adjustable lids accept low, regular and high profile products (tubes, strip-tubes and plates).



Non-EU Tube

EU Tube

## Easy opening and closure; cap design

Clever design and sealing bands around the tube closure points provide a leak-free seal, reducing evaporation and leading to more reproducible results. The superior sealing properties allows running (q)PCR reactions with volumes as low as 5 µl. The cap design allow minimum pressure for closure and opening which is highly appreciated by users and minimizes RSI risks.

## Tear Off 8-Tube Strip Mat

The Tear Off 8-Tube Strip Mat can be considered as a flexible plate composed of 12 robust 8-tube strips which are connected to each other by thin bands. Part of the "plate" or one of multiple robust 8-tube strips can be easily and effortlessly torn off. Enjoy the benefit of full flexibility and use the format required for your application or cycler. Tear Off 8-Tube Strip Mats as a whole or in partitions can be "clicked in" Shell Frame Grids. Why not use one format only and enjoy the benefit of full flexibility.



Required strips can be easily torn off from the Tear Off Strip 8-Tube Strip Mat

# BIOplastics Superior Technology transferred in Superior Quality

## qPCR caps and indented optical areas

The caps of EU tubes and cap-strips are designed to enable fluorescent signals to pass through to the optical detection unit of a Real-Time thermal cycler. For the closure of EU strips and plates BIOplastics offers a range of EU wide optical area cap strips along with the "Opti-Seal" adhesive seals. The EU optical caps strips have maximum optical areas (12.6 mm<sup>2</sup>) and the thickness of the "optical lens" is reduced to 0.30 mm, which minimize light absorption by the plastics. BIOplastics' designers have positioned the "optical area" indented in the cap surface which prevents "touching" the optical area during the whole (q)PCR process. EU wide area optical cap strips can be used on any of the (q)PCR tubes, strips and plates. The robust design prevents any deformation; applying and removing these cap-strips is easy.

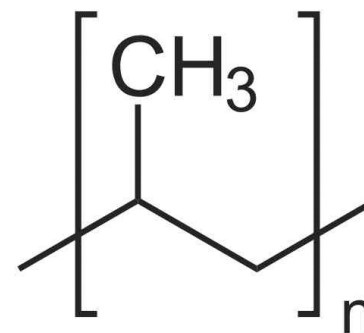


Indented qPCR Cap, the optical area is recessed into the optical cap surface to prevent "touching" the optical area.

## Type and blend of polypropylene, low binding characteristics

Although polypropylenes are chemically inert, they still exhibit charged groups, static properties and hydrophobic areas. Different types and blends of polypropylene therefore show differences in binding of ions like magnesium, proteins, DNA and other charged groups which may influence your results. BIOplastics offers 3 different blends of polypropylene, these being O-type, A-type and M-type material. The O-type material is an optimal material used in (q)PCR grade reaction vessels. O-type material is composed by blending multiple polypropylenes specifically designed for (q)PCR applications. A-type material resembles the classic polypropylene mix, has better chemical resistance properties when compared to O-type and is available for some of the (q)PCR reaction vessels. M-type material is a more robust material which is mainly used for 0.5 ml, 1.5 ml and 2 ml tubes and pipette tips.

For (q)PCR applications we recommend O-type material for optimal results, as it is non-binding and shows the highest thermal conductivity. O-type and M-type material blends are specifically selected for non-binding characteristics to DNA, RNA and proteins.



Basic structure of polypropylene (PP)

## In product coding and labeling with BIOplastics BPLPM technology

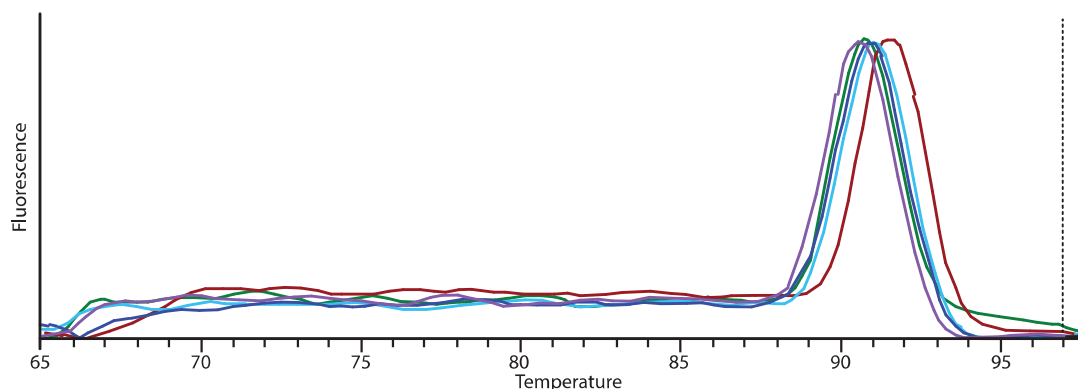
BIOplastics innovated the incorporation of micro particles in (q)PCR and related products. These BPLPM technology (BIOplastics particle mix) products are offered in a majority of (q)PCR products. BPLPM enables indelible IN PRODUCT labeling and identification. While others use stickers, ink, stamps, or dyes containing organic solutions, BIOplastics' BPLPM technique results in a irreversible, non-removable, uniquely marked and coded product. No writing with markers, no removal of marks, no double identification numbers; just use the unique ID#, barcode or 2D code at the beginning of your process. Link the unique ID#, barcode or 2D code to your Lab LIMS system and samples. BPLPM technology is particularly useful for accredited labs in MDX and reduce risks of label mistakes and failures. Custom layouts and customized codes can be requested and applied to the required products by BIOplastics or even applied by your own institute if correct laser mark units are available. These types of unique coding prove to be appealing for (MDX) kit manufacturers to effectively trace products and applications. See also Chip incorporation (RFID)



Indelible in product labeling of a 384 well plate using BIOplastics' BPLPM technology

## High Resolution Melting Curves (HRM) and regular melting curves

BIOplastics' focus ensure maximum mould and manufacturing accuracy with precise product specifications, resulting in superior and reproducible products. BIOplastics' (q)PCR vessels have a maximum tolerance of 0.05 mm. These extremely tight tolerances lead to extraordinary uniform and reproducible products. Consequently, reproducible melting and high resolution melting curves, typically used in the post qPCR process, are generated using BIOplastics' extremely uniform products. HRM curves can be normalized, i.e. "cyler fingerprint" adjusted, by using CYCLERtest® ISO17025 accredited cyler calibration services and calibration tools ([www.cycler-test.com](http://www.cycler-test.com)). See also page 151.



Shift of melting curves of one amplified fragment in qPCR. Shift caused by difference in qPCR plates as well as un-uniformity of the qPCR cyler

## Gradient filter in filtertips

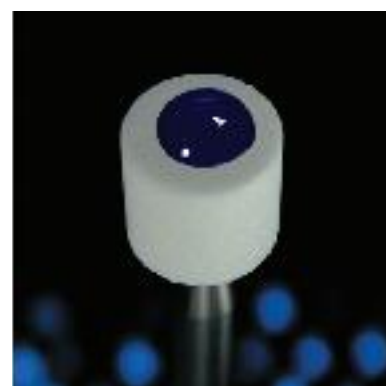
The filter in a filtertip eliminates the formation of aerosols in the shaft of the pipette, since it blocks the air-to-liquid interface between the sample and the pipette shaft. This simple idea has evolved in numerous types and brands of filtertips and filter materials. Most filters are made of 3-dimensional cross-linked HMPE (Polyethylene), which is totally inert. The pore size should be smaller than 25 microns to generate a "reasonable protection" and not smaller than 14 microns to still allow an accurate airflow required when pipetting. The filtering capacity of a certain filter is defined as the ratio of filter length and pore size. The longer a filter is, the better it filters. This relation is almost linear. BIOplastics filters are the longest available in the market with a superior 18 micron pore size gradient whereas other suppliers use shorter length and 25 to 30 micron filters! By applying a gradient into the filter, BIOplastics' filtertips have an extended airflow and a balanced optimal aerosol protection due to its pore size and filter length, with a minimum compromise of pipetting accuracy.



Gradient 18 micron filter with extended airflow and balanced optimal aerosol protection

## Pipette tips

BIOplastics tips have a very fine orifice for complete, reproducible pipetting. The pipette tips are extremely clear to allow content examination if required. Tips are extremely uniform, flexible and soft, to secure a good leak-free fit around with the shaft of the pipette. The soft, ultra-clear medical grade material also reduces RSI since the force to attach and release the tip from the pipette is significantly reduced. The fine orifice assures reproducible pipetting. Tips marked with the beveled orifice icon have a special 45° beveled orifice to guide the ejection of the fluids even better. Furthermore the raw material used in pipette tips has very low binding properties to biomolecules and has superior retention/recovery properties when pipetting ion-containing solutions.



## Screw Cap Tubes (SCT)

BIOplastics' smart secure closure technology results in superior screw cap tubes. The screw caps are designed in a way that the use of "old fashioned" rubber rings has become obsolete. The absence of a rubber ring assures that the closure is not affected when in contact with organic solvents nor that leakage occurs due to hardening and unbalanced shrinkage caused by low and high temperatures and pressure. The smart secure closure design allows frequent opening and closing, even in extreme conditions, without compromising the closure and also avoiding leakage (working range -200 °C - +100 °C). Screw Cap Tubes are available in low binding and extreme robust formats which even allow severe bead beating procedures.

## Unique coded tubes, strips and plates

Due to BIOplastics' BPLPM technology, products can be individually and uniquely coded. These products are available for the qPCR product range as well as for micro centrifuge tubes and screw cap tubes. Each tube can have a unique ID#, 1D or 2D code. Specific codes or customized marking of any BIOplastics product are available on demand.



Pipette tip with fine orifice for complete, reproducible pipetting



## qPCR signal enhancement

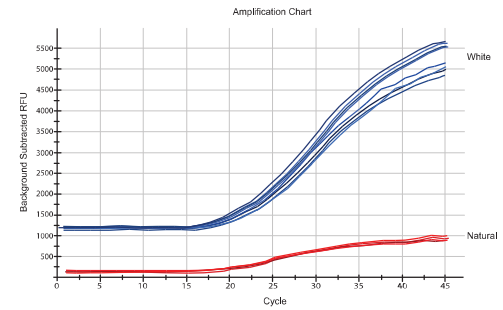
### White, frosted products and ultra clear products

A number of qPCR cyclers brands and models are available in the marketplace. Although they have a lot in common they also differ from each other. There are two major differences a user has to understand in making the best choice in the disposables as well for generating superior results.

The two major differences are:

- Some brands are using low profile (LP) also called 0.1 ml plates/tubes instead of regular profile (RP) 0.2 ml plates/tubes
- Most cyclers do their optical reading from the top of the plates/tubes, while some do the optical reading through the side of the plate/tubes

For differences in low profile (LP) 0.1 ml plates/tubes, regular profile (RP) 0.2 ml plates/tube see section "Differences in Low Profile, Regular Profile and High Profile products" at page 16.

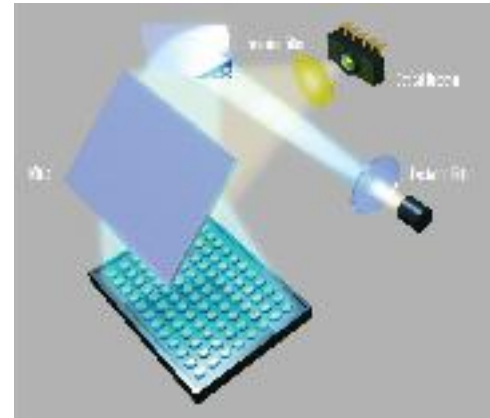


### Optical reading through the caps

qPCR signal to noise ratios can be significantly increased by using frosted qPCR tubes, strips and plates. Frosted products will generate higher signal to noise ratios (S/N ratios) up to 40% compared to transparent ones. By using frosted products both content visibility and high signal/noise ratio are achieved. White products are superior for enhancing signal to noise ratios. White products greatly enhance signal/noise ratios up to 90% compared to transparent ones and up to 50% compared to frosted products. Possible block pollution of dyes, differences in coatings, and inconsistent coatings can influence qPCR signals. White products will eliminate these interferences while frosted products will reduce the inconsistencies when compared to natural transparent products. Micro-particles, by nature, increase signal to noise ratios in Real-Time PCR applications. BIOplastics BPLPM technology incorporates micro-particles that increase signal to noise ratios in Real-Time PCR applications.

So optical reading through the cap:

- |                      |                     |
|----------------------|---------------------|
| White products       | High S/N ratios     |
| Frosted products     | Moderate S/N ratios |
| Ultra Clear products | Poor S/N Ratios     |



Optical reading through the caps



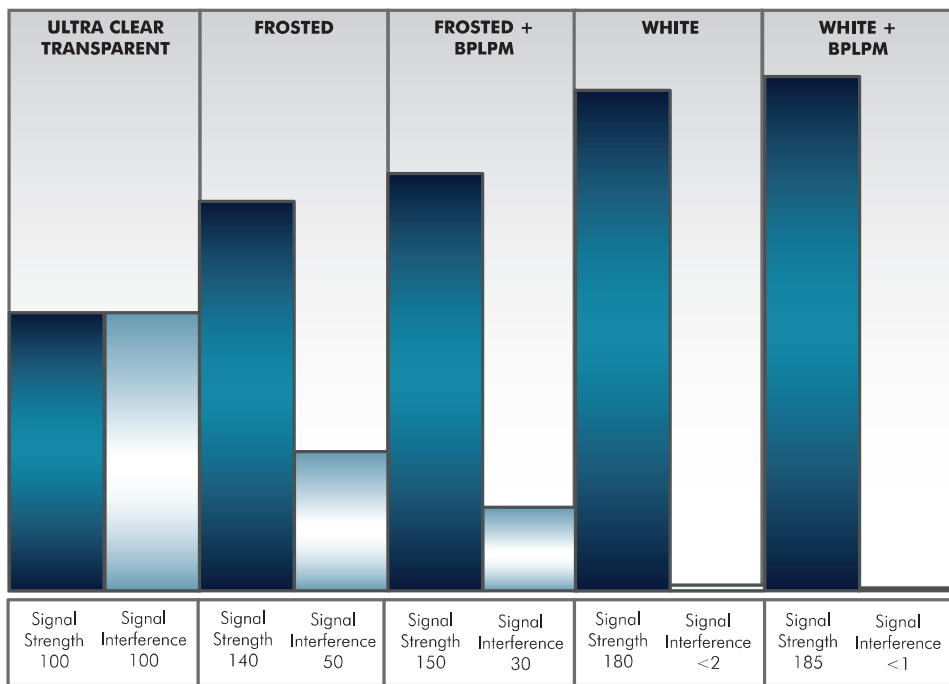
White tube with transparent optical cap  
High S/N Ratios



Frosted tube with transparent optical cap  
Moderate S/N Ratios



Transparent with transparent optical cap  
Poor S/N Ratios



Comparison of Real-Time signals when using Ultra Clear, Frosted and white BIOplastics products. Based on (q)PCR optical measurements through the cap.

Product Type	Signal Strength	Signal Interference Probability (Block pollution and/or condition)
Ultra Clear Transparent	100	100
Frosted	140	50
Frosted + BPLPM	150	30
White	180	< 2
White + BPLPM	185	< 1

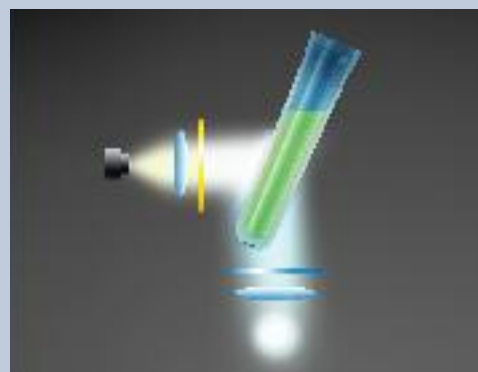
## Optical reading through side of the Tubes

While many cyclers use the principle of optical reading through the cap, some cyclers generate an optical detection by optical reading through the sides of the tubes. In this case the highest signals are achieved using Ultra Clear (UC) transparent qPCR tubes, strips and plates. Preferably one needs the ultra clear feature at the conical part of the tubes. Beneficially the straight upper part of the tube could be frosted, where as the use of a white cap provides an additional increase of signal to noise ratios (S/N). Frosted products will generate lower signal/noise ratios compared to Ultra Clear transparent ones. White caps are superior for enhancing signal/noise ratios compared to transparent ones. White caps enable reflection of "lost fluorescence" resulting in increased signals.

So Optical reading through side of the tube:

- Ultra Clear Conical part of tube and white caps
- Ultra Clear Conical part of tube and caps
- Frosted tube products

- Highest S/N ratios
- High S/N ratios
- Moderate/poor S/N ratios



Optical reading through side of the Tube



Ultra Clear tube with white cap



Ultra Clear tube with Ultra Clear optical cap



Frosted with Frosted cap

# General information BIOplastics and (q)PCR applications

## Differences in Low Profile, Regular Profile and High Profile products

Although low profile tubes were introduced in the marketplace back in 2000, some companies have renamed the original low profile 0.2 ml vessels description to 0.1 ml "vessel". Low profile (0.1 ml) products are used in "fast cyclers" from ABI, Roche 480 cyclers as well in (q)PCR cyclers with height adjustable lids. The difference between low profile 0.1 ml vessels and regular profile products is the height of the product and consequently the volume it can hold. More than half of a regular-profile strip remains above the thermal block level. In low profile tubes there is a smaller "air" volume above the reaction mix than in regular and high profile tubes. This allows less reaction mix to go into gas phase, leading to less concentration of the samples, less change in reaction conditions and therefore to more reproducible results. Most fast cyclers accept low profile tubes, strips and plates. Most regular PCR cyclers accept regular profile and high profile file products. (tubes, tube-strips and plates). Thermal cyclers without height-adjustable heated lids accept only one type, mainly regular profile products. BIOplastics products are available in all profile versions. The differences between low profile (0.1 ml), regular profile and high profile products are shown in the illustrations and photographs below.

## Low Profile (LP), Regular Profile (RP), High Profile (HP), Fast Cycler, 0.1 ml, 0.2 ml tubes?

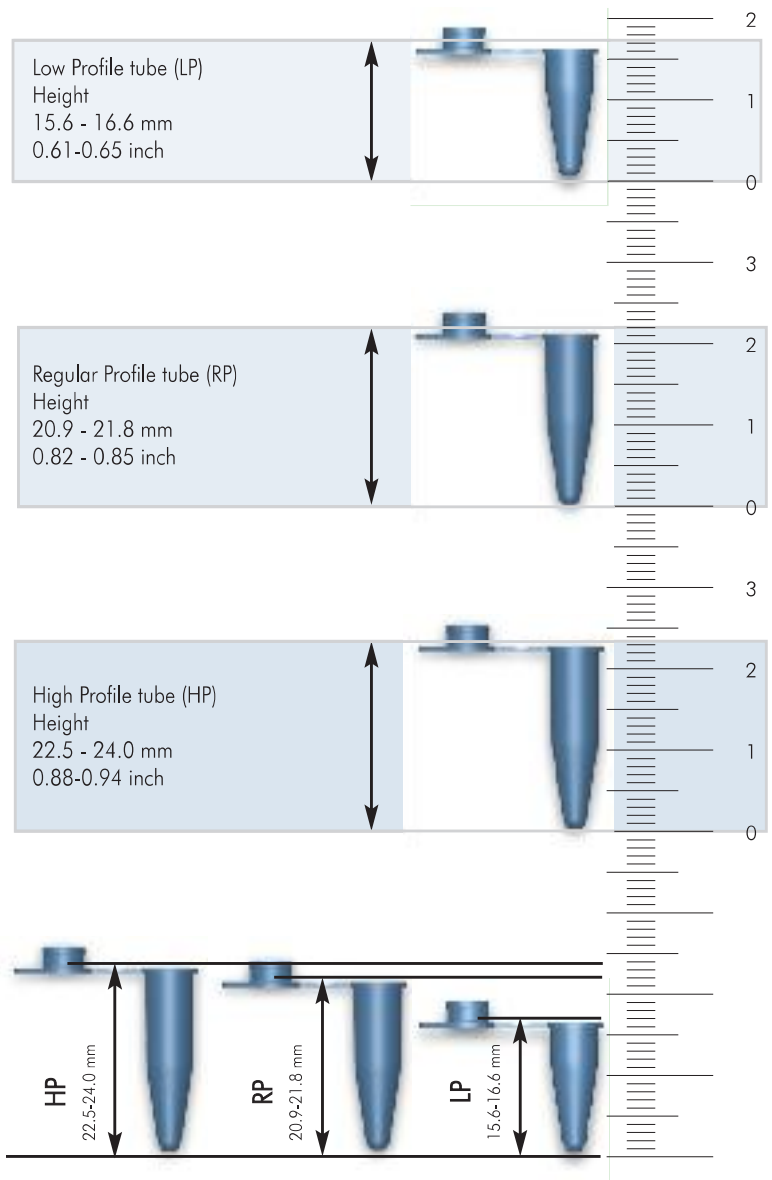
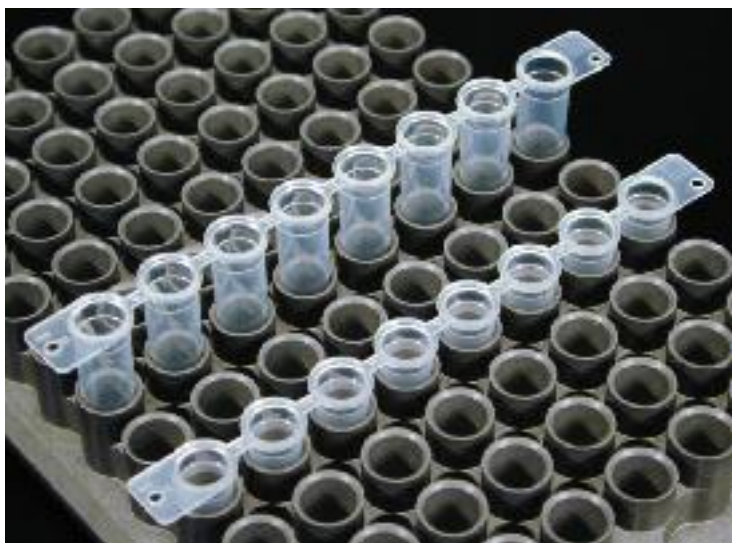
The industry did muddle the issue and customers are confused about "what is what".

Find the similarities and differences below:

Low Profile (LP)	= 0.1 ml tube/plate	height without closure: 15.6-16.3 mm
Regular Profile (RP)	= 0.2 ml tube/plate	height without closure: 20.9-21.5 mm
High Profile (HP)	= 0.2 ml tube/plate	height without closure: 22.5-24.0 mm



The difference between low, regular and high profile strips





# General information BIOplastics and (q)PCR applications

## Raw material and product properties

The polypropylenes used are of the highest medical grade polypropylene, which ensures no release of metals or other contaminants into the reaction mix. The carefully selected types of medical grade polypropylenes are "in house blended" to well-defined proprietary ratios. This specific fine tuned blend supports achieving the highest product and user performance properties.

Table BIOplastics Raw material composition properties

Type of vessel	Application	Competitor vessel	BIOplastics tubes (M type)	BIOplastics (O type)
(q)PCR tubes, strips, plates	Binding to DNA %	Up to 2%	NA	< 0.3%
	Binding to proteins %	Up to 4%	NA	< 0.8%
	Temperature work range °C	mainly -20 to 100 °C	NA	-30 to 100 °C
Microcentrifuge tubes 0.5, 1.5 & 2 ml	Binding to DNA %	Up to 5%	< 0.6%	< 0.3%
	Binding to proteins %	Up to 6%	< 0.6%	< 0.6%
	Pop-Open at 99 °C	yes > 80%	No	No
Screw cap tubes 0.5, 1.5 & 2 ml	Temperature work range °C	mainly -20 to 99 °C	-80 to 100 °C	-80 to 100 °C
	Binding to DNA %	Up to 5%	< 0.6%	< 0.3%
	Binding to proteins %	Up to 6%	< 0.6%	< 0.6%
Titer dilution and storage tubes	Accept organic solutions	No > 95%	Yes	Yes
	Temperature work range °C	mainly -25 to 100 °C	-200 to 100 °C	-80 to 100 °C
	Binding to DNA %	Up to 4%	< 0.6%	NA
Titer dilution and storage tubes	Binding to proteins %	Up to 4%	< 0.6%	NA
	Temperature work range °C	mainly -25 to 100 °C	-180 to 100 °C	NA

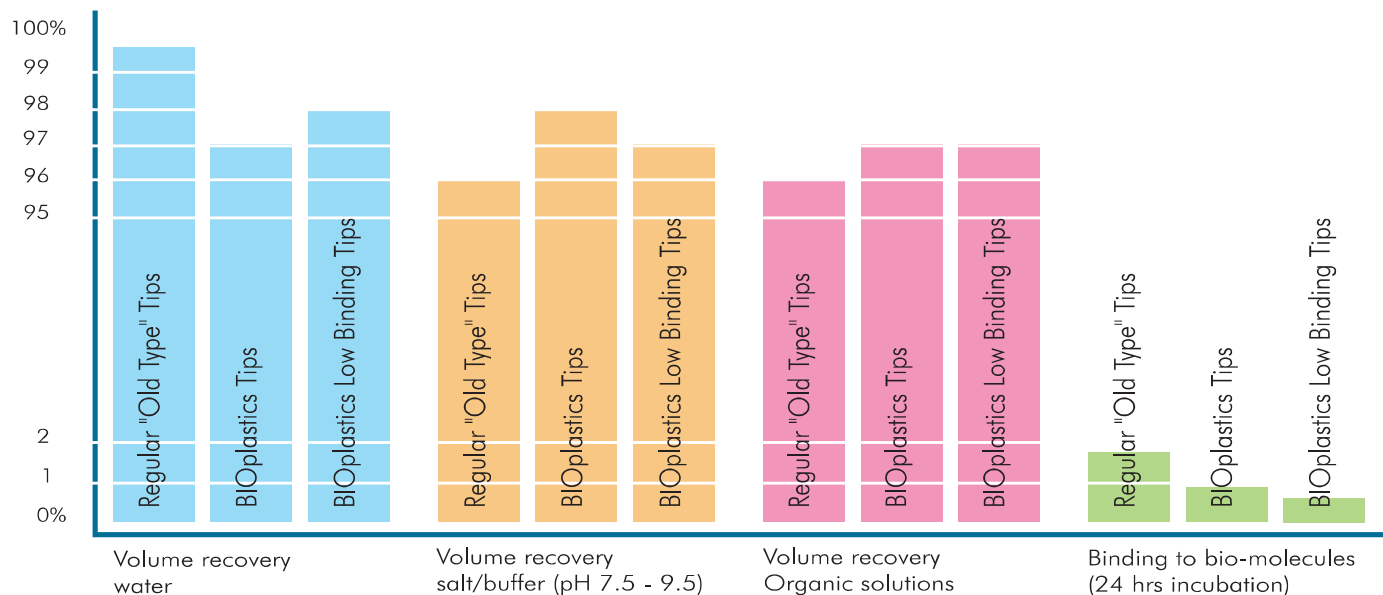
## The EU Gold Standard for (q)PCR

BIOplastics BV has set the EU Gold Standard for (q)PCR by being in control of all variables in the process starting from the principle design up to the final packaging, with products of superior performance relative to signal, closure, evaporation, and reproducibility.



## Anti-static pipette tips. Why, how, and when they become favorable.

BIOplastics pipette tips are designed for use in molecular biological applications and more specifically for pipetting DNA, RNA, proteins and solutions commonly used in and around the (q)PCR process. BIOplastics has optimized its pipette and filtertips by means of design and raw material selection to meet the highest requirements. By selecting medical grade materials with anti-static properties BIOplastics has reduced the biological molecule binding to the lowest possible. BIOplastics pipette tips become favorable when pipetting slightly basic buffers, salt solutions and biological molecules (Proteins, DNA, RNA). Differences in hydrophobic and hydrophilic properties of solutions, raw material surface and biomolecules cause a pipetting difference "phenomenon" as shown below. If pipetting water contact us for regular "old type" tips.



# Quality and General information

## Purity and certifications

Product purity is, along with excellent design and functionality of products, an important and solid foundation that enables customers to generate reliable, reproducible and trustworthy results. BIOplastics products are fully traceable and frequently tested during production. BIOplastics products comply with the highest standards and requirements. Polypropylenes are medical grade and fully incoming quality controlled, prior to use in our proprietary blending methodology. All injection molding process parameters, QC tests and packaging are monitored, logged and fully traceable. If required, BIOplastics will provide batch certificates as well as individual certificates.

## Certificate of Analysis (COA)

All BIOplastics products are extensively process quality controlled and tested. Our QC-laboratory does the final testing prior release to the warehouse. A Certificate of Analysis can be requested at the BIOplastics website. Each request for COA will be re-traced in our fully traceable system prior to COA release.

## Traceability of products

BIOplastics has a fully compatible traceable system in place. This means that each bag can be traced from the incoming raw material through production to whom the product was sold. Traceability is 100% and based on more than 80 parameters.

## Cleanroom, “no hands on” manufacturing

BIOplastics products are molded and automatically collected, inspected, quality controlled and packaged in a Class 100,000 cleanroom environment. Manufacturing, packaging, in process and final release QC, operate as independent entities, each with independent responsibilities. Appropriate body protection, including masks and gloves are mandatory for all departments.

## ISO9001

BIOplastics' company procedures are similar to ISO9001 and GMP procedures. Although we formally do not have to carry an ISO9001 stamp we are scheduled to have an ISO9001 accreditation shortly.

## Yellow bags, why?

Although BIOplastics manufactures all its injection molding products, we do not manufacture the bags where the products are packed into. They are manufactured by an external blow molding company. Although the bags are guaranteed clean we still take extra precautions. We therefore sterilize all packaging material, in particular “zip lock” bags by means of cobalt<sup>60</sup>. Cobalt<sup>60</sup> irradiated plastics may lead to a slightly more brittle bag as well as slightly yellow discoloration. (may vary based on amount of radiation and batch of bags)

## Autoclave when, how and why?

All BIOplastics products are autoclavable except the easy closure screw caps. Autoclaving instructions: 15 minutes at 121°C and 2 bar pressure. A lot people confuse sterile products with DNa(se), RNa(se), Protein and DNA free products. BIOplastics (q)PCR products are manufactured free of any detectable levels of DNa(se), RNa(se), proteins and DNA. So the products do NOT REQUIRE any additional treatment. The AUTOCLAVING process DOES NOT REMOVE any DNA, RNA or proteins. It does however breakdown larger molecules and “kill” living organisms. So a sterile product is not necessarily a DNA, RNA free product whereas a DNa(se), RNa(se), Protein and DNA free product can by definition not be categorized as sterile. Bottom line for all BIOplastics products in general: Use them as they come!



Product is autoclavable when you see this icon

## What is sterility?

A sterile product is a product which is free of any living micro-organisms. Sterilization of BIOplastics products is accomplished by means of cobalt<sup>60</sup> irradiation. Irradiated products age faster than non-irradiated products; they are less flexible and break more easily, because cobalt<sup>60</sup> irradiation slightly changes the characteristics of the polymer material. Autoclaving the product yourself is a more gentle process, but when done several times it will also harden the polymer. One could argue whether it is necessary to autoclave or irradiate BIOplastics (q)PCR disposables at all, since our products are produced under cleanroom and “no-hands-on” conditions. See also autoclave when, how and why? (Page 18).



<sup>60</sup>Co irradiation exposed sticker as sterility indicator

## What is DNA(se), RNA(se) and pyrogen-free?

Producing products under strict cleanroom and “no-hands-on” conditions ensures the absence of DNA, RNA, and their breakdown enzymes. A sterile product is not necessarily DNA(se), RNA(se) and pyrogen-free. Only regular testing during and after the production process guarantees a DNA(se), RNA(se) and pyrogen-free product. You can recognize the DNA(se), RNA(se) and pyrogen-free plastics in this catalog when you see the “Thumbs-Up” icon.

## Human DNA and ATP absence?

Manufacturing products under strict clean and “no hands-on” conditions, as well as regular testing during and after the production process, ensures the absence of human DNA and ATP.



## What is metal-free?

The absence of metals in polymer products like tips and tubes is essential for laboratory use, as metals can interfere in (q)PCR and other reactions with ions as Mg<sup>2+</sup>. BIOplastics tips and tubes are made of PP (Polypropylene) of the highest medical grade quality available and guaranteed metal free.

## Why we do not work with lot#, but with individual trace ID# instead

Most companies work with so called Lot ID# (lot number). We at BIOplastics do not use the “lot ID” categorizations since raw material and time is involved in its definitions. Since we prefer to have more exact and precise data, we have narrowed the time factor down to a maximum range of 4 hours. It is for that reason that we use individual bag IDs which enable us to trace and isolate products to a manufacturing and packaging time frame of 4 hours maximum. Ultimately this is beneficial for you as a customer as it is for us. While this has not yet occurred, in any particular case it would enable us to recall products to a production time of 4 hours. Since we can trace to whom we sold individual bags, we would be able to precisely isolate products without interfering or disturbing non involved customers.

## Complaints

BIOplastics is proud that the number of product complaints is very low. Furthermore 97% of claims ever received could be traced back to a user related issue. Let’s be clear: We at BIOplastics aim for 100% product satisfaction. We feel obligated to achieve this goal and have a team of application specialists available to help and investigate. Should you have a complaint, then we will ask you to fill out a complaint form including details of your experiments, as well as returning the products in question if possible. In all cases we will counter investigate and report our findings and recommendations back to you. If a claim is granted by our specialist teams we will replace the product free of charge. If a claim is not granted we will contact you and provide you with details on how to solve your problem. We believe this to be a fair, functional, and “no nonsense” policy.



Example of product package label with individual bag ID

# Customized products and OEM requirements

## Customized products, MDX kit manufacturers OEM requirements

Due to BIOplastics BV experience in developing and manufacturing of superior products and the recognition of an excellent quality to price ratio, tailor-made products have become an additional aspect of BIOplastics BV.

BIOplastics BV can be a partner in the field of designing and manufacturing of:

- Custom Laser labeling, barcoding, 2D coding
- Custom product Chip incorporation (RFID)
- Custom raw material adjustment
- Large scale OEM (Original Equipment Manufactured) products
- New products
- Customized design

Other customized solutions are possible:

- Different material characteristics
- Different product properties
- Different colors
- Kit content solutions

Customized solutions and products are based on BIOplastics BV core competencies and innovative technologies. Products can be designed according to your specific requirements and manufactured based on either exclusivity and/or intended to sell under client's brand name.

Customized Coded products using BPLPM Technology:

- Any type of product related to BIOplastics' current portfolio

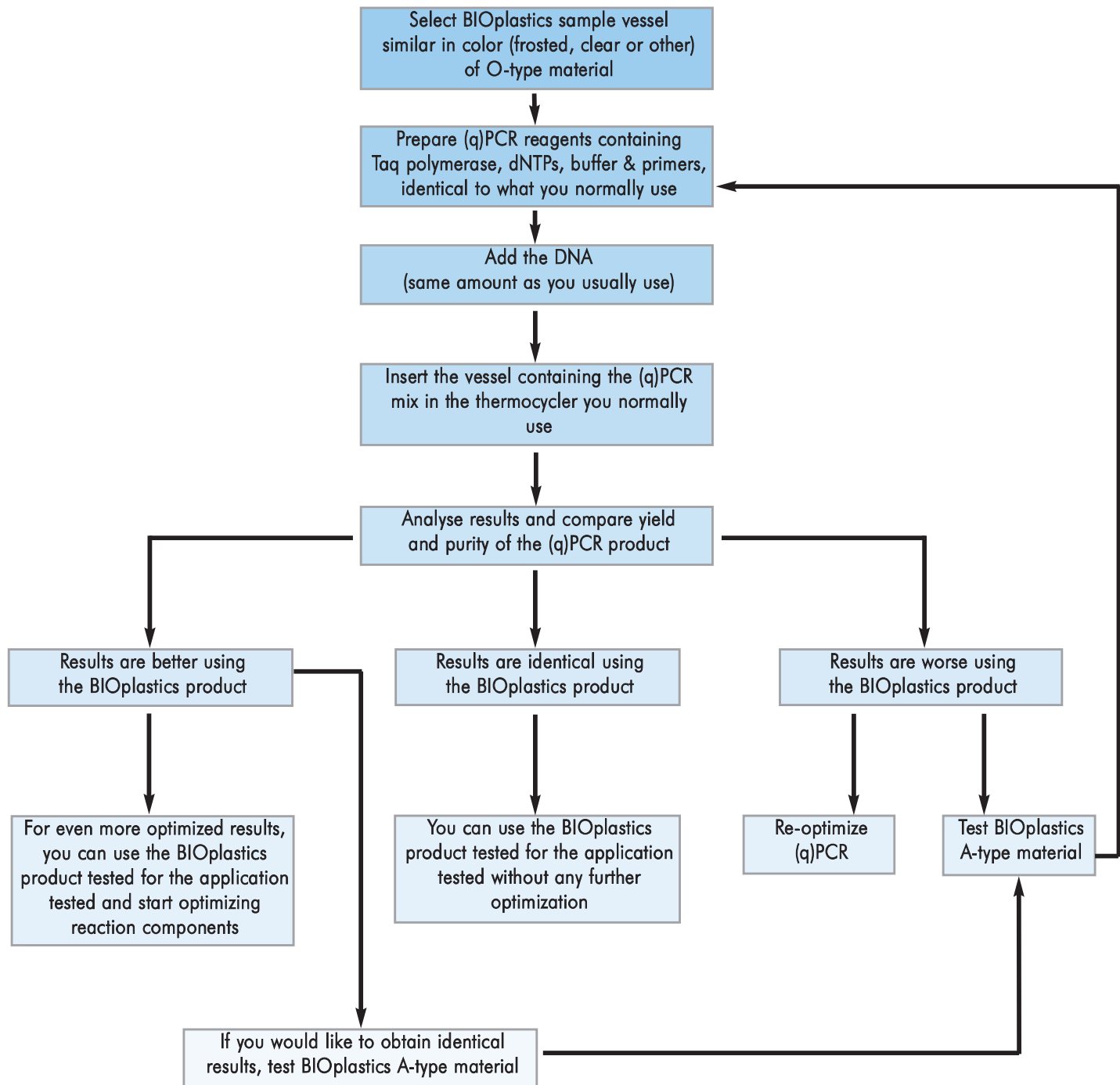
Customized products and OEM requirements consultation:

Contact BIOplastics BV headquarters in The Netherlands or send an e-mail to [OEM@bioplastics.com](mailto:OEM@bioplastics.com)



# Compare your BIOplastics sample to your current (q)PCR plastics

How to compare your BIOplastics sample with your currently used (q)PCR plastics



# Normalized SOP

## Normalized SOP's for (q)PCR applications

Many laboratories have SOP (Standard Operation Procedures) in place. Incorporation of new components in SOP's are generally labor and time consuming. In the (q)PCR process, variables as cyclers, plastic disposables, kit components and work procedures are typically described and incorporated in SOP's. BIOplastics and CYCLERtest® have formulated a strategy which enables exclusion of the cycler as well as the used disposable variable. This strategy actually provides users the ability to normalize their SOP.

### How does it work?

Since BIOplastics manufactures the widest and most uniform range of (q)PCR disposables which fit any brand or model of (q)PCR cycler, and since BIOplastics produces its products identical in raw material properties and uniformity, one can exclude the disposable variation by using BIOplastics disposables. So instead of using a variety of disposables from different vendors resulting in different compositions and designs, required to fit your cycler range you can opt for one source (BIOplastics) only. Your disposables will then have exactly the same properties for different models of cyclers. By doing so you exclude differences in disposables. Combine this knowledge with the CYCLERtest® calibration service or the purchase of a DRIFTCON® system which enables you to "fingerprint" your cycler thereby excluding the cyclers variable.

### So how do you normalize your SOP:

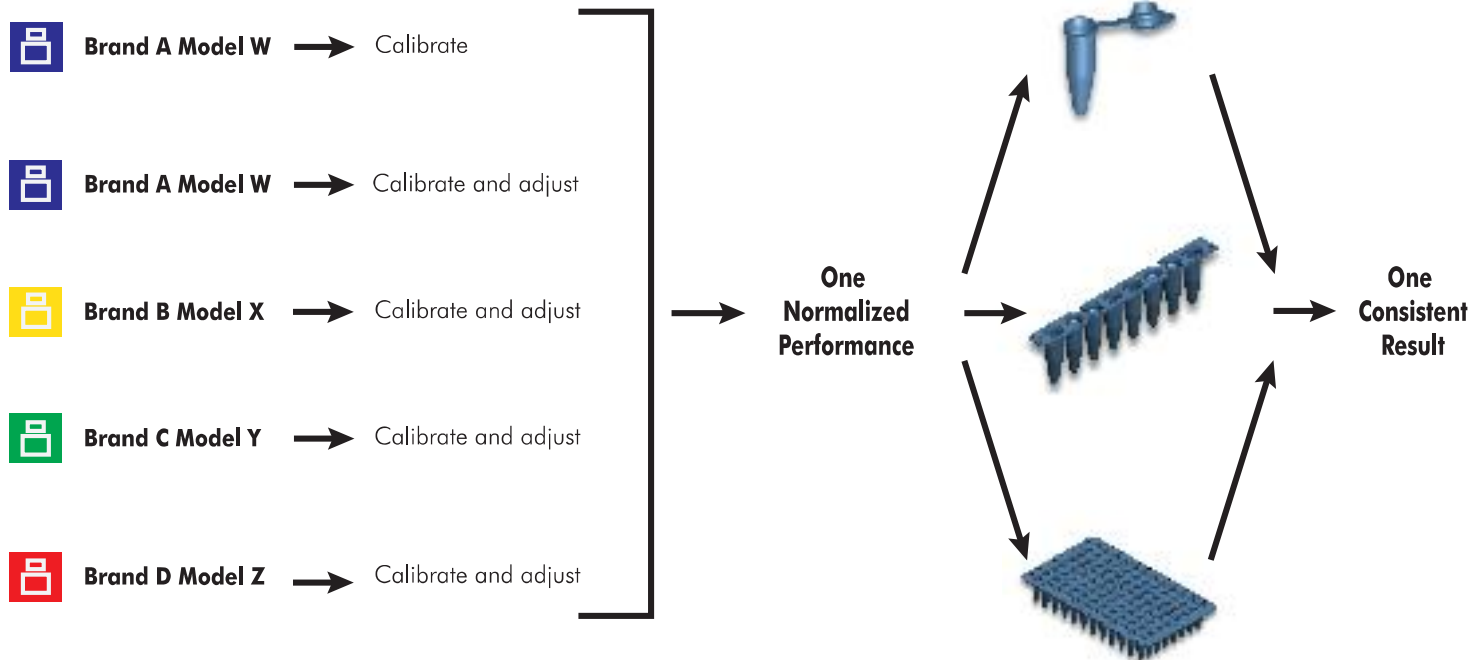
- A: categorize your most sensitive (q)PCR protocol
- B: Select your best cyclers which gives you superior results
- C: Select the BIOplastics (q)PCR disposable which fits your best, superior result, cycler
- D: Perform the same test to assure that the BIOplastics product is working on your "best cycler"
- E: Calibrate (DRIFTCON® or MTAS® service) your best cycler and define its temperature fingerprint.
- F: Calibrate (DRIFTCON® or MTAS® service) all other cyclers in your laboratory and define their temperature fingerprint.
- G: You have now the translation key of temperature fingerprint between all your cyclers
- H: Modify your cycler protocol (temperature) of any of your cyclers to match your best cycler fingerprint
- I: Purchase the required specific disposable for your other cyclers from BIOplastics assuring the same raw material composition and properties

RESULT: A UNIFORM SOP WHICH ASSURES IDENTICAL RESULTS REGARDLESS OF THE CYCLER USED

Problems in defining uniform SOP's? Just let BIOplastics or CYCLERtest® know and we'll guide you through this convenient solution!



ISO17025 accredited calibration of a qPCR cycler in process. The outcome is validated against defined requirements and is also used to normalize its performance.



## One Optimized Chemistry Strategy

Labs generally have an assortment of (q)PCR cyclers in their labs. The cycler assortment can consist of the same cycler model and brand, different models of the same brand or different models from different brands.

Regardless the (q)PCR cycler assortment composition, one can benefit from a smart but common sense strategy which is based on the described facts:

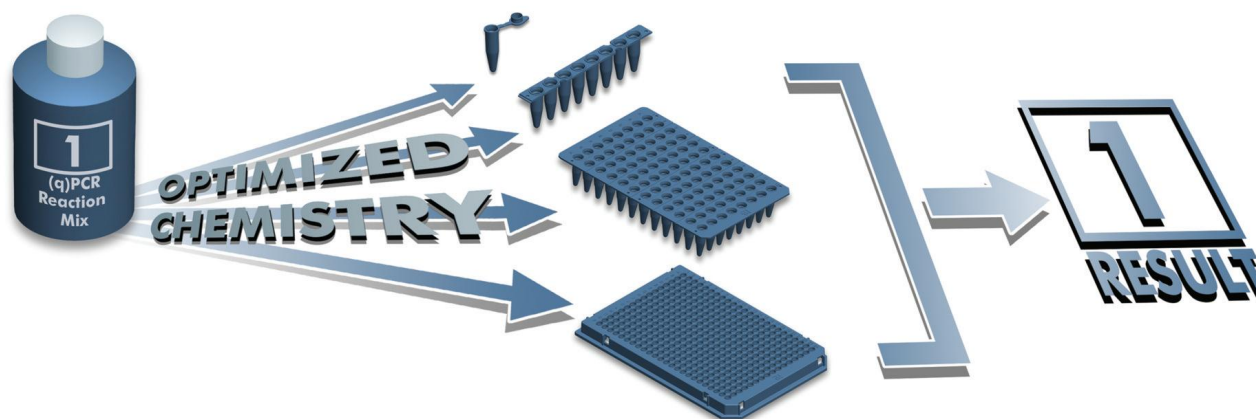
- 1 (q)PCR cyclers do either use Low Profile or Regular Profile products, whereas some can handle both.
- 2 The conical reactions part of Low Profile and Regular Profile products are identical.
- 3 Different disposables suppliers provide products which differ in raw material, binding and chemical characteristics compositions.
- 4 (q)PCR cyclers do vary, even within the same model and brand, in temperature and optical performances.
- 5 Beside BIOplastics, no other company provides a complete range of (q)PCR disposables serving any model and brand of (q)PCR cyclers.
- 6 BIOplastics (q)PCR products are composed of the same raw materials.
- 7 All BIOplastics products are interchangeable with each other (just like LEGO bricks).

With the knowledge mentioned above one can benefit from better lab performance and maximize accuracy, uniformity, and reproducibility, whereby interchangeability between of protocols and instruments are normalized.

This is how it works:

- 1 Select your preferred work format e.g. Tear Off Tube Strip Mat, Cut-able plate.  
Let's assume Tear Off Tube Strip Mat.
- 2 Select your most sensitive (q)PCR reaction.
- 3 Select your "best (q)PCR instrument" and check if it handles Low Profile or Regular Profile product.  
Let's assume Low Profile.
- 4 Run your protocol using BIOplastics' selected format, Tear Off Tube Strip Mat, Low Profile on the "best (q)PCR instrument" and judge your results.
- 5 If satisfied continue to the next step, if not optimize your reaction until you are satisfied.
- 6 Now use the same Tear Off Tube Strip Mat, or a part of it for all other cyclers which can handle Low Profile (0.1 ml) vessels. For some cyclers you may opt to use a Shell Frame Grid to position the Tear Off Tube strip mat or part of it.
- 7 If your other cyclers can not handle Low Profile (0.1 ml) vessels just select BIOplastics Regular Profile variant of the Tear Off Tube Strip Mat.
- 8 Use the same Regular Profile Tear Off Tube Strip Mat, or a partition of it for any other cycler which can handle Regular Profile (0.2 ml) vessels. For some cyclers you may opt to use a Shell Frame Grid to position the Tear Off Tube Strip Mat.
- 9 Since the raw material is the same your results should be exactly the same.
- 10 In case your results are reproducible but not the same, you proved that the cycler performance of the used cyclers are not identical.
- 11 If is the case, contact CYCLERtest BV or its distributor and calibrate both Cyclers under ISO17025 condition and standards.
- 12 Use the outcome of both calibrations and adjust one cycler program to perform identical to the other cycler. By doing so you normalize all your cyclers. See also guideline in appendix page 143.

**Outcome: One chemistry, one raw material, a maximum of two products which give identical results regardless your cycler assortment.**



# (q)PCR Product Synopsis



## Low Profile Products



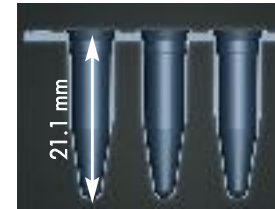
- Optimized for qPCR
- Fits all cyclers with height adjustable lid
- Fits all fast cyclers
- Fits all 0.1 ml cyclers
- qPCR approved, identical raw material, high reproducibility



## Regular Profile products



- Optimized for qPCR
- Fits all cyclers with height adjustable lid
- Fits all non fast cyclers
- Fits all 0.2 ml cyclers
- qPCR approved, identical raw material, high reproducibility



## Frosted products



- Higher signal to noise ratios in qPCR
- Available for all type of qPCR vessels
- qPCR approved and identical raw material, high reproducibility



## White products



- Superior and highest signal to noise ratios in qPCR
- Available for all type of qPCR vessels
- qPCR approved and identical raw material, high reproducibility



## Ultra Clear Transparent products



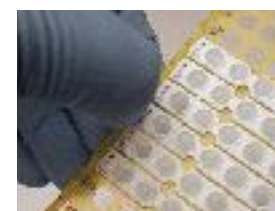
- Extremely transparent
- Available for all types of (q)PCR vessels and Shell Frame Grids
- Recommended if optical qPCR signal is obtained through bottom of the tubes
- qPCR approved and identical raw material, high reproducibility



## Shell Frame Grid assemblies



- Semi skirted, barcoded and optimized for automated work
- Extreme high efficiency, reproducibility
- Each 8 strip section unique coded
- Stackable
- Available in 3 grid versions: AB1 Regular Profile (universal), AB1 fast Low Profile and Roche Low Profile
- Equipped with Tear Off Tube Strip Mats or cut-able plates in white or frosted
- Can be disassembled and reassembled
- qPCR approved, identical raw material, high reproducibility







Shell Frame Grid fitting Products



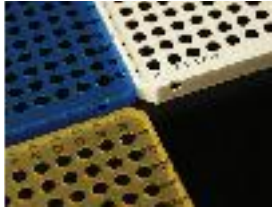
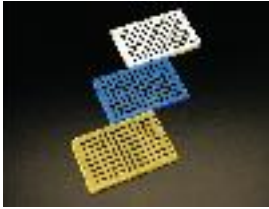
- Extreme high efficiency, reproducibility
- Can be assembled and disassembled
- Enables fit in any type of (q)PCR cyclers
- Stackable if assembled
- Allows partition assembly
- Available in Regular and Low Profile range
- qPCR approved, identical raw material, high reproducibility



Shell Frame Grid (SFG)



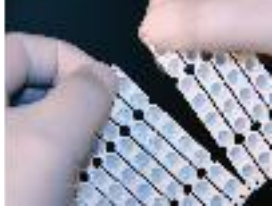
- Allows assembly and disassembly of Shell Frame Grid fitting products
- Available in 3 grid versions: AB1 Regular Profile (blue), AB1 fast (yellow) and Roche (white)
- Semi skirted, optimized for automated work
- Available in disposable or durable formats and Fully skirted formats (Robotics)



Tear Off 8-Tube Strip Mats



- Extreme Ultimate high efficiency
- Extra robust strips
- Available for all types of qPCR vessels
- qPCR approved and identical raw material, high reproducibility



Tear Off 8-Cap Strip Mats



- Extreme ultimate high efficiency
- Extra robust, indented optical cap
- Fits all BIOplastics (q)PCR vessels
- qPCR approved and identical raw material, high reproducibility



Cut-able products



- Extreme high efficiency
- Available for all types of qPCR vessels
- qPCR approved and identical raw material, high reproducibility



Laser Mark products



- Unique coded, irreversible
- Also available in 1D and 2D and OEM versions
- Available for all types of qPCR vessels in frosted and white versions
- qPCR approved and identical raw material, high reproducibility



Extra low DNA binding tubes



- Extreme high efficiency
- Low copy detection
- Maximum sample recovery
- qPCR approved and identical raw material, high reproducibility







# Compatibility Chart qPCR Cyclers & Sequencers



Manufacturer and Model	Block	Profile	Single Tubes		8-Tube Strip with attached caps						24 & 48 well Plates																	
			K(B)77201	K(B)59901	K(B)77001	B72711	K(B)59001	B76601	K(B)72810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B50751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805(0)(4)	A8059001(9)U(4)	B70671	B50340	B71601				
<b>Bioer</b>																												
Line-Gene I	33 x 0.2ml	RP																										
Line-Gene K	48 x 0.2ml	RP																										
Line-Gene 3310 / 3320	33 x 0.2ml	RP																										
Line-Gene 9600	96 x 0.2ml	RP																										
<b>DNA Technology</b>																												
TC 9443	32 x 0.2ml	RP																										
<b>DuPont Qualicon</b>																												
DuPont Qualicon BAX System Q7	96 x 0.2ml	LP		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<b>Illumina</b>																												
Eco Real-Time PCR System	48 x 25µl	NA																										
<b>TaKaRa</b>																												
TP850 Dice® Real Time System	96 x 0.2ml	RP																										
TP870 Dice® Real Time System MRQ	96 x 0.2ml	RP																										
<b>Thermo fisher/Finnzymes</b>																												
PikoReal 24-well	24 x 0.2 ml	LP	Y	Y	Y	Y	tpa	Y	cpa																	Y		
PikoReal 96-well		NA																										
<b>Xian Tianlong Science</b>																												
TL988 Real-time PCR 48	48 x 0.2ml	RP																										

## Sequencers

Manufacturer and Model	Block	Profile	Single Tubes		8-Tube Strip with attached caps						24 & 48 well Plates																	
			K(B)77201	K(B)59901	K(B)77001	B72711	K(B)59001	B76601	K(B)72810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B50751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805(0)(4)	A8059001(9)U(4)	B70671	B50340	B71601				
<b>Applied Biosystems</b>																												
310	96 x 0.2ml	RP																										
3100	96 x 0.2ml	RP																										
3130	96 x 0.2ml	RP																										
3700	96 x 0.2ml	RP																										
3730	96 x 0.2ml	RP																										
Solid3	96 x 0.2ml	RP																										
3500 Genetic Analyzer	8-capillary	RP																										
3500xL Genetic Analyzer	24-capillary	RP																										
<b>Beckman</b>																												
CEQ 8000	96 x 0.2ml	RP																										
CEQ 8800	96 x 0.2ml	RP																										
<b>GE Healthcare</b>																												
MegaBACE 1000	96 x 0.1ml	LP																								Y		
MegaBACE 4000	96 x 0.1ml	LP																								Y		
MegaBACE 500	96 x 0.1ml	LP																								Y		
<b>Transgenomics</b>																												
Wave MD System 4000	96 x 0.2ml	RP																										

LP: Low Profile  
 RP: Regular Profile  
 HP: High Profile  
 MP: Accepts all profiles  
 Y: Fits cycler  
 Va: Fits with adaptor  
 tpa: Tear off part of product fits  
 cpa: Cut off part of product fits  
 wp: Preference for white product  
 fp: Preference for frosted product  
 cp: Preference for clear product  
 B: Use blue grid to fit cycler  
 Y: Use yellow (ABI fast) grid to fit  
 WT: Use white (Roche) grid to fit

# Compatibility Chart qPCR Cyclers & Sequencers



Manufacturer and Model	Block	Profile	8-Tube Strips with attached caps												24 & 48 well Plates																	
			Single Tubes			8-12 Tube Strips			96 well Plates and assemblies						24 well Plates			48 well Plates														
			KB 72910	C78201	B79201	KB 77301	C789401	B79401	B79001	KB 69901	KB 77101	C79601	KB 58001	KB 56601	B79901	B7 50501-1	KB 58001	B7 50501	AB 9700	CB 75009 L	A5008001 9 L	CB 75033 A	A5038001 9 L	B50651	B70651	AB7500	B7 10 51 51 L	BB4 5 001	B50240 9	B7 501 9		
			RP	RP	HP	RP	RP	RP	HP	RP	RP	RP	RP	RP	HP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	384	X	RP	RP		
<b>Bioer</b>																																
Line-Gene I	33 x 0.2ml	RP				V																										
Line-Gene K	48 x 0.2ml	RP				V																										
Line-Gene 3310 / 3320	33 x 0.2ml	RP				V																										
Line-Gene 9600	96 x 0.2ml	RP	V			V				V	V		V			V	V	V														
<b>DNA Technology</b>																																
TC 9443	32 x 0.2ml	RP	V			V				V	V		tpa			cpa	tpa															
<b>DuPont Qualicon</b>																																
DuPont Qualicon BAX System Q7	96 x 0.2ml	LP																														
<b>Illumina</b>																																
Eco Real-Time PCR System	48 x 25µl	NA																														
<b>TaKaRa</b>																																
TP850 Dice® Real Time System	96 x 0.2ml	RP	V			V				V	V		V	V		V	V	V		V	V	V	V								V	
TP870 Dice® Real Time System MRQ	96 x 0.2ml	RP	V			V				V	V		V	V		V	V	V		V	V	V	V			V					V	
<b>Thermo fisher/Finnzymes</b>																																
PikoReal 24-well	24 x 0.2 ml	LP																														
PikoReal 96-well		NA																														
<b>Xian Tianlong Science</b>																																
TL988 Real-time PCR 48	48 x 0.2ml	RP	V			V				V	V	V	tpa			cpa	tpa														V	V

## Sequencers

Manufacturer and Model	Block	Profile	8-Tube Strips with attached caps												24 & 48 well Plates																	
			Single Tubes			8-12 Tube Strips			96 well Plates and assemblies						24 well Plates			48 well Plates														
			KB 72910	C78201	B79201	KB 77301	C789401	B79401	B79001	KB 69901	KB 77101	C79601	KB 58001	KB 56601	B79901	B7 50501-1	KB 58001	B7 50501	AB 9700	CB 75009 L	A5008001 9 L	CB 75033 A	A5038001 9 L	B50651	B70651	AB7500	B7 10 51 51 L	BB4 5 001	B50240 9	B7 501 9		
			RP	RP	HP	RP	RP	RP	HP	RP	RP	RP	RP	RP	HP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	384	X	RP	RP		
<b>Applied Biosystems</b>																																
310	96 x 0.2ml	RP								V	V		V			V	V	V														
3100	96 x 0.2ml	RP								V	V		V			V	V	V														
3130	96 x 0.2ml	RP								V	V		V			V	V	V														
3700	96 x 0.2ml	RP								V	V		V			V	V	V														
3730	96 x 0.2ml	RP								V	V		V			V	V	V														
Solid3	96 x 0.2ml	RP								V	V		V			V	V	V														
3500 Genetic Analyzer	8-capillary	RP								V	V		V			V	V	V														
3500xL Genetic Analyzer	24-capillary	RP								V	V		V			V	V	V														
<b>Beckman</b>																																
CEQ 8000	96 x 0.2ml	RP								V	V		V			V	V	V														
CEQ 8800	96 x 0.2ml	RP								V	V		V			V	V	V														
<b>GE Healthcare</b>																																
MegaBACE 1000	96 x 0.1ml	LP																														
MegaBACE 4000	96 x 0.1ml	LP																														
MegaBACE 500	96 x 0.1ml	LP																														
<b>Transgenomics</b>																																
Wave MD System 4000	96 x 0.2ml	RP								V	V		V			V	V	V									V					

LP: Low Profile  
 RP: Regular Profile  
 HP: High Profile  
 MP: accepts all profiles  
 V: Fits cycler  
 Va: fits with adaptor  
 tpa: tear off part of product fits  
 cpa: cut off part of product fits  
 wp: preference for white product  
 fp: preference for frosted product  
 cp: preference for clear product  
 B: use blue grid to fit cycler  
 Y: use yellow (ABI fast) grid to fit  
 WT: use white (Roche) grid to fit

For regular PCR cyclers see page 30 to 41. For the most precise selection and the latest updates see our website.

# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	Single Tubes		8-12 Tube Strips						8-Tube Strip with attached caps										24 & 48 well Plates						
			K(B)77201	K(B)59901	K(B)77001	B72711	K(B)59001	B76601	K(B)72810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B50751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805(0)A	A8059001(9)U(A)	B70671	B50340	B71601			
<b>Abbott</b>																											
m2000rt	96 x 0.2ml	RP																									
<b>AcuGen Systems</b>																											
AG-9600 thermal station	96 x 0.2ml	MP	V	V	V	V	V			V	V	V					V	V	V	V	V	V			V	V	
<b>Agilent</b>																											
SureCycler 8800 thermal cycler	96 x 0.2ml	RP																									
SureCycler 8800 thermal cycler	384-well	X																									
<b>Agilent/Stratagene</b>																											
Mx3000P™	96 x 0.2ml	RP																									
Mx3005P™	96 x 0.2ml	RP																									
Mx4000™	96 x 0.2ml	RP																									
<b>Analytik Jena/ Biometra</b>																											
TOptical	96 x 0.2ml	RP																									
qTower	96 x 0.2ml	RP																									
<b>Analytik-Jena</b>																											
FlexCycler	Monoblock 384	X																									
FlexCycler	Mono/Twin 0.2ml	MP	V	V	V	V	tpa		V	cpa							cpa								V	V	
Alpha SC	96 x 0.2ml	MP	V	V	V	V	V		V	V	V						V	V	V	V	V	V			V	V	
Alpha SC	48 x 0.2ml	MP	V	V	V	V	tpa		V	cpa							cpa								V	V	
SpeedCycler²	48 or 96 x 0.2ml	MP	V	V	V	V	tpa		V	cpa							cpa								V	V	
SpeedCycler 96	384-well	X																									
SpeedCycler 36	36 x 0.2ml	MP	V	V	V	V	tpa		V								cpa								V	V	
<b>Applied Biosystems</b>																											
GeneAmp PCR System 9700	96 x 0.2ml	RP																									
GeneAmp PCR System 9700	384-well	X																									
9800 Fast Thermal Cycler	96 x 0.2ml	LP	V	V	V	V	V	V	V	V	V	V						V	V	V	V	V			V	V	
GeneAmp PCR System 9600	96 x 0.2ml	MP	V	V	V	V	V		V	V	V						V	V	V	V	V	V			V	V	
GeneAmp PCR System 2700	96 x 0.2ml	RP																									
GeneAmp PCR System 2720	96 x 0.2ml	RP																									
GeneAmp PCR System 5700	96 x 0.2ml	RP																									
GeneAmp PCR System 9700	96 x 0.2ml	RP																									
GeneAmp PCR System 9700 Aluminum	96 x 0.2ml	RP																									
GeneAmp PCR System 9700 Gold	96 x 0.2ml	RP																									
Veriti 96-Well Thermal Cycler	96 x 0.2ml	RP																									
310	96 x 0.2ml	RP																									
3100	96 x 0.2ml	RP																									
3130	96 x 0.2ml	RP																									
3700	96 x 0.2ml	RP																									
3730	96 x 0.2ml	RP																									
Solid3	96 x 0.2ml	RP																									
Veriti 96-Well Fast Thermal Cycler	96 x 0.1ml	LP	V	V	V	V	V	V	V	V	V	V						V	V	V	V	V			V	V	
3500 Genetic Analyzer	8-capillary	RP																									
Veriti 384-Well Thermal Cycler	384-well	X																									
3500xL Genetic Analyzer	24-capillary	RP																									
GeneAmp PCR System 2400	24 x 0.2ml	RP																									

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 wp: Preference for white product  
 fp: Preference for frosted product  
 cp: Preference for clear product  
 B: Use blue grid to fit cycler  
 Y: Use yellow (ABI fast) grid to fit  
 WT: Use white (Roche) grid to fit



# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	Single Tubes		8-12 Tube Strips						8-Tube Strip with attached caps												24 & 48 well Plates					
			K(9)77201	K(9)59901	K(9)77001	B72711	K(9)59001	B76601	K(9)72810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B60751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805U(4)	A8059001(9)U(4)	B70671	B50340	B71601				
<b>Applied Biosystems / Life Technologies</b>																												
QuantStudio™ 12k Flex	96 x 0.2ml	RP																										
ViiA™ 7 qPCR system	96 x 0.2ml	RP																										
7000 ABI PRISM 7000 SDS	96 x 0.2ml	RP																										
7300 qPCR system	96 x 0.2ml	RP																										
7500 qPCR system	96 x 0.2ml	RP																										
7900HT qPCR system	96 x 0.2ml	RP																										
StepOnePlus™ qPCR system	96 x 0.1ml	LP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
ViiA™ 7 qPCR 96 x 0.1ml	96 x 0.1ml	LP		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
7500 Fast qPCR system	96 x 0.1ml	LP		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
7900HT Fast qPCR system	96 x 0.1ml	LP		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
QuantStudio™ 12k Flex Fast	96 x 0.1ml	LP		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
StepOne™ qPCR system	48 x 0.1ml	LP	V	V	V	V	tpa			V	cpa																V	V
ViiA™ 7 qPCR system	48 x 0.1ml	X																										
7900HT qPCR system	384-well	X																										
QuantStudio™ 12k Flex 384	384-well	X																										
<b>Beckman</b>																												
CEQ 8000	96 x 0.2ml	RP																										
CEQ 8800	96 x 0.2ml	RP																										
<b>Bioer</b>																												
GenePro/GeneQ/Life Express/Life Pro	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Line-Gene 9600	96 x 0.2ml	RP																										
GenePro/GeneQ/Life Express/Life Pro	48 x 0.2ml	MP	V	V	V	V	tpa			V	cpa																V	V
Line-Gene K	48 x 0.2ml	RP																										
GenePro/GeneQ/Life Express/Life Pro	384-well	X																										
Line-Gene I	33 x 0.2ml	RP																										
Line-Gene 3310/3320	33 x 0.2ml	RP																										
<b>Biometra / Analytik Jena</b>																												
T1 Thermocycler Combi	96-77 96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
T1 Thermocycler	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
TGradient	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
TProfessional	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
TRobot	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
UNO II	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
UNO-thermoblock	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
TPersonal Combi	48-18 48 x 0.2ml	MP	V	V	V	V	tpa			V	cpa																V	V
T1/T3/T3000/Personal/Professional/UNO	48 x 0.2ml	MP	V	V	V	V	tpa			V	cpa																V	V
TProfessional TRIO	48 x 0.2ml	RP																										
TProfessional	384-well	X																										
TRobot	384-well	X																										
UNO II	384-well	X																										
<b>Bioneer</b>																												
MyGenie 96 Gradient Thermal Block	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
MyGenie 32 Thermal Block	32 x 0.2ml	RP																										

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# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	Single Tubes		8-12 Tube Strips						8-Tube Strip with attached caps												24 & 48 well Plates						
			KQ877201	KQ859901	KQ877001	B72711	KQ859001	B76601	KQ872810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B50751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805U(4)	A8059001(9)U(4)	B70671	B50340	B71601					
<b>Eppendorf</b>																													
Mastercycler nexus eco	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Mastercycler nexus gradient	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Mastercycler nexus gradient eco	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Mastercycler pro	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Mastercycler pro S	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Mastercycler ep realplex Silver	96 x 0.2ml	RP																											
Mastercycler ep realplex Silver	96 x 0.2ml	RP																											
Mastercycler ep	384-well	X																											
Mastercycler pro 384	384-well	X																											
Mastercycler Personal	25-16 25 x 0.2ml	MP	V																										
<b>Finzymes Instruments</b>																													
TCA0096 Arktik	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V			V	V			
TCA0384 Arktik	384-well	X																											
Piko 24-well	24-wells	LP	V	V	V	V	tpa		V																	V			
TCA4848 Arktik	2 x 48 x 0.2 ml	MP	V	V	V	V	tpa		V																	V	V		
<b>GE Healthcare</b>																													
MegaBACE 1000	96 x 0.1ml	LP																										V	
MegaBACE 4000	96 x 0.1ml	LP																										V	
MegaBACE 500	96 x 0.1ml	LP																										V	
<b>Illumina</b>																													
Eco Real-Time PCR System	48 x 25µl	NA																											
<b>Kyratec</b>																													
SuperCycler	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V			V	V			
<b>Lab-Line Instruments</b>																													
Programmable Thermal Block	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V				V	V			
Programmable Thermal Block	30-48 48 x 0.2ml	MP	V	V	V	V	tpa		V	cpa																V	V		
<b>Labnet</b>																													
MultiGene 96	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V				V	V			
MultiGene Gradient	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V				V	V			
MultiGene OptiMax Thermal Cycler	96 x 0.2ml	RP																											
<b>LongGene Scientific Instruments Co.,Ltd.</b>																													
All 96 x 0.2ml models	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V				V	V			
All 48 x 0.2ml models	48 x 0.2ml	MP	V	V	V	V	tpa		V	cpa					cpa											V	V		
MyGene™ PCR	384-wells	X																											
<b>MJ Research Inc.</b>																													
See Bio-Rad	See Bio-Rad																												
<b>Peqlab</b>																													
peqSTAR and Primus	384-well	X																											
peqSTAR and Primus	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V				V	V			
peqSTAR 2X	48 x 0.2ml	RP																											
<b>Qiagen</b>																													
Rotor-Gene Q® Rotor 72 Rotor	72 X 0.1ml																												
Rotor-Gene Q® Rotor 36 Rotor	36 x 0.2ml																												

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For qPCR cyclers see page 26 to 28, for sequencers see page 28. For the most precise selection and the latest updates see our website.

# Compatibility Chart PCR Cyclers



				8-Tube Strips with attached caps												24 & 48 well Plates															
Manufacturer and Model	Block	Profile																													
			Single Tubes				8-12 Tube Strips				96 well Plates and assemblies																				
			KB172910	C78201	B79201	KB177301	C789401	B79401	B79001	KB169901	KB177101	C79601	KB158001	KB156601	B79901	B7150501-1	KB158001	B7150501	AB19700	CB1750091L	A5008001(9L)	CB175031(4)	A5038001(9L)	B50651	B70651	AB7500	B710151(1)	BB451001	B50240(9)	B71501(9)	
			RP	RP	HP	RP	RP	RP	HP	RP	RP	RP	RP	RP	HP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	RP	384	X	RP	RP
<b>Eppendorf</b>																															
Mastercycler nexus eco	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Mastercycler nexus gradient	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Mastercycler nexus gradient eco	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Mastercycler pro	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Mastercycler pro S	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Mastercycler ep realplex Silver	96 x 0.2ml	RP	V			V				V	V	V	V	V		V	V	V	V	V	V	V	V	V	V			V	V		
Mastercycler ep realplex Silver	96 x 0.2ml	RP	V			V				V	V	V	V	V		V	V	V	V	V	V	V	V	V	V			V	V		
Mastercycler ep	384-well	X																											V		
Mastercycler pro 384	384-well	X																											V		
Mastercycler Personal	25-16 25 x 0.2ml	MP				V	V	V	V																						
<b>Finnzymes Instruments</b>																															
TCA0096 Arktik	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
TCA0384 Arktik	384-well	X																										V			
Piko 24-well	24-wells	LP																													
TCA4848 Arktik	2 x 48 x 0.2 ml	MP	V	V	V	V	V	V	V	V	V	V	tpa		V		tpa													V	V
<b>GE Healthcare</b>																															
MegaBACE 1000	96 x 0.1ml	LP																													
MegaBACE 4000	96 x 0.1ml	LP																													
MegaBACE 500	96 x 0.1ml	LP																													
<b>Illumina</b>																															
Eco Real-Time PCR System	48 x 25 µl	NA																													
<b>Kyratec</b>																															
SuperCycler	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
<b>Lab-Line Instruments</b>																															
Programmable Thermal Block	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
Programmable Thermal Block	30-48 48 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	tpa			V		cpa	tpa												V	V
<b>Labnet</b>																															
MultiGene 96	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
MultiGene Gradient	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
MultiGene OptiMax Thermal Cycler	96 x 0.2ml	RP	V	V		V	V	V		V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V			V	V	
<b>LongGene Scientific Instruments Co.,Ltd.</b>																															
All 96 x 0.2ml models	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
All 48 x 0.2ml models	48 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	tpa			V		cpa	tpa												V	V
MyGene™ PCR	384-wells	X																										V			
<b>MJ Research Inc.</b>																															
See Bio-Rad	See Bio-Rad																														
<b>Peqlab</b>																															
peqSTAR and Primus	384-well	X																											V		
peqSTAR and Primus	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V			V	V	
peqSTAR 2X	48 x 0.2ml	RP	V	V		V	V	V		V	V	V	tpa	V		cpa	tpa													V	V
<b>Qiagen</b>																															
Rotor-Gene Q® Rotor 72 Rotor	72 X 0.1ml																												V		
Rotor-Gene Q® Rotor 36 Rotor	36 x 0.2ml					V																									

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- B: use blue grid to fit cycler
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For qPCR cyclers see page 26 to 28, for sequencers see page 28. For the most precise selection and the latest updates see our website.

# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	Single Tubes						8-Tube Strip with attached caps						24 & 48 well Plates										
			K1877201	8-12 Tube Strips			K1872810	96 well Plates and assemblies					B50340	B71601											
			LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP
<b>Roche</b>																									
Cobas z 480	96 x 0.2ml	LP			Va/WT	Va/WT	Va	Va/WT	Va	Va/WT	Va	V	V												
LightCycler® 480 System	96 x 0.2ml	LP			Va/WT	Va/WT	Va	Va/WT	Va	Va/WT	Va	V	V	V											
LightCycler® 96 System	96 x 0.2ml	LP	V	V	V	V	V	V	V	V	V	V	V	V	V										
LightCycler® 480 System 384-well	384-well	X																							
LightCycler® Nano	32 x 0.2ml	LP	V	V	V	V	tpa		V																
COBAS Taqman 48 Analyzer	24 x 0.2ml	RP																							
<b>SensoQuest</b>																									
Labcyler	Thermoblock 96	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Labcyler	Thermoblock 48	MP	V	V	V	V	tpa		V	cpa					cpa									V	V
Labcyler	Thermoblock 384	X																							
<b>Siemens</b>																									
VERSANT kPCR Molecular System AD	96 x 0.2ml	RP																							
<b>TaKaRa</b>																									
PCR Thermal Cycler Dice®	TP650	RP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
PCR Thermal Cycler Dice®	TP600	RP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
TP850 Dice® Real Time System	96 x 0.2ml	RP																							
TP870 Dice® Real Time System MRQ	96 x 0.2ml	RP																							
<b>Techne</b>																									
All 96 x 0.2ml models	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
TC-412	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
TC-4000	96 x 0.2ml	RP																							
TC-3000G	48 x 0.2ml	RP																							
TC-3000X	48 x 0.2ml	RP																							
All 384 well models	384-well	X																							
TC-312	25 x 0.2ml	MP	V						V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
Techgene	25 x 0.2ml	MP	V						V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
TC-3000	25 x 0.2ml	RP																							
<b>Thermo Hybaid</b>																									
MultiBlock System	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
Omn-E	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
Omnigene TR3 CM220	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
PCR Express	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
Px2	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
PxE	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
TouchDown	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
PCR Express	48 x 0.2ml	MP	V	V	V	V	tpa		V	cpa					cpa									V	V
All 384 well models	384-well	X																							
PCR Sprint	24 x 0.2ml	MP	V	V	V	V	tpa		V															V	V
<b>Thermo Fisher/Finnzymes</b>																									
PikoReal 24-well	24 x 0.2 ml	LP	V	V	V	V	tpa		V	cpa															V
PikoReal 96-well		NA																							
Arktik Thermal Cycler	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V	V	V	V	V	V
Arktik Thermal Cycler	48 x 0.2ml	MP	V	V	V	V	tpa		V	cpa					cpa									V	V
Arktik Thermal Cycler	384-well	X																							
<b>Transgenomics</b>																									
Wave MD System 4000	96 x 0.2ml	RP																							

- LP: Low Profile
- RP: Regular Profile
- HP: High Profile
- MP: Accepts all profiles

- V: Fits cycler
- Va: Fits with adaptor
- tpa: Tear off part of product fits
- cpa: Cut off part of product fits

- wp: Preference for white product
- fp: Preference for frosted product
- cp: Preference for clear product
- B: Use blue grid to fit cycler

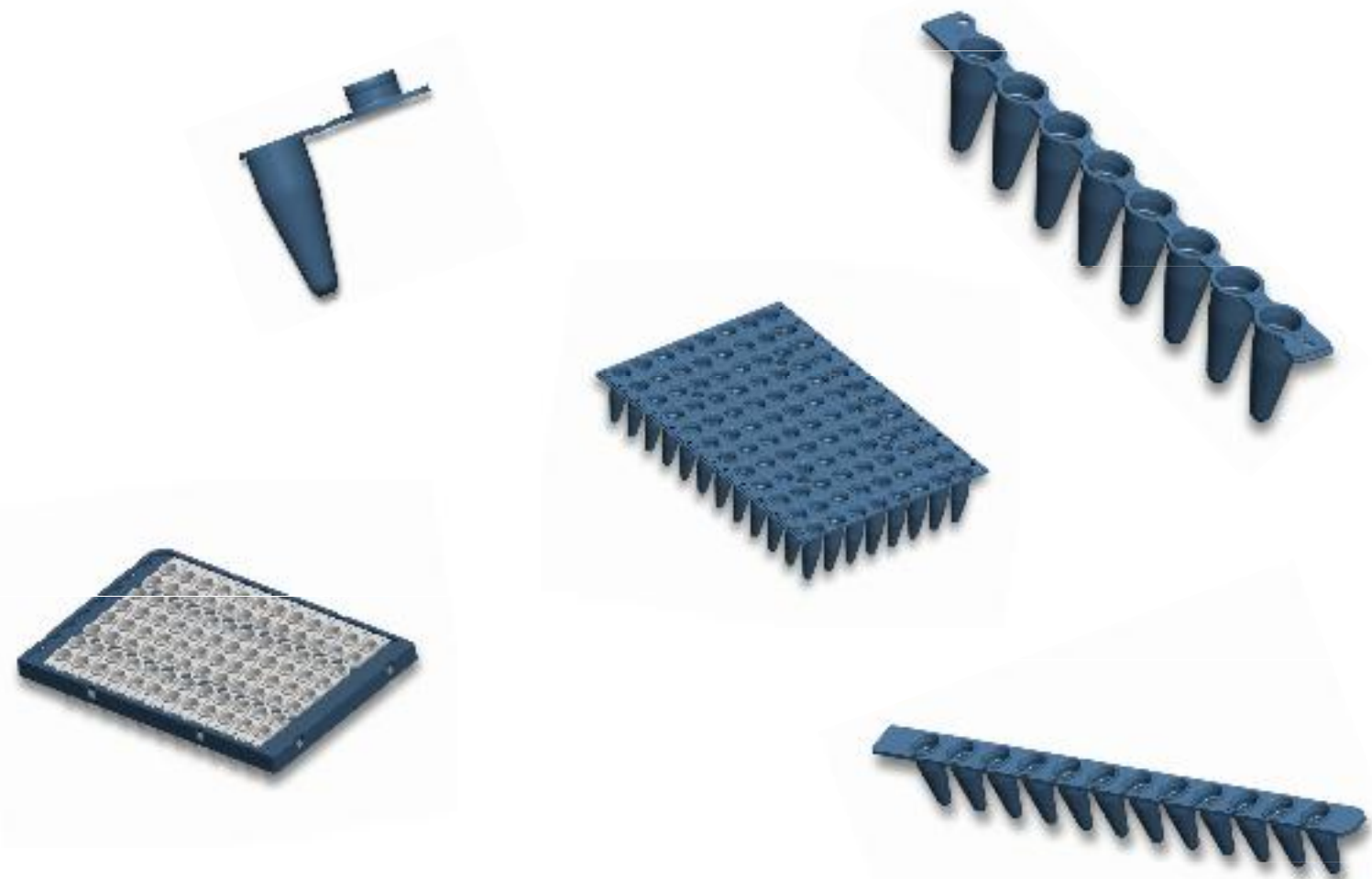
- Y: Use yellow (ABI fast) grid to fit
- WT: Use white (Roche) grid to fit



# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	Single Tubes		8-12 Tube Strips						8-Tube Strip with attached caps												24 & 48 well Plates			
			K(B)77201	K(B)59901	K(B)77001	B72711	K(B)59001	B76601	K(B)72810	B6(5)0101-1	B6(5)0601	AB70651	B17489(0)	CB17480(9)L	A4809001(9)L	B50751(9)	AB19800(9)	CB19800(9)	A8099001(9)	CB19805U(4)	A8059001(9)U(4)	B70671	B50340	B71601		
<b>VWR</b>																										
DuoCycler	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V			V	V		
DuoCycler fast	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V			V	V	V	V	V	V			V	V		
QuattroCycler	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V		
QuattroCycler fast	96 x 0.2ml	MP	V	V	V	V	V		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V		
UnoCycler	96 x 0.2ml	MP	V	V	V	V	V		V	V	V				V	V	V	V	V	V	V	V			V	V
UnoCycler fast	96 x 0.2ml	MP	V	V	V	V	V		V	V	V				V	V	V	V	V	V	V	V			V	V
All 384 well models	384-well	X																								
QuattroCycler	384-well	X																								
<b>Xian Tianlong Science &amp; Technology</b>																										
TL988 Real-time PCR 48	48 x 0.2ml	RP																								
DTC-4 / DTC-49	96-77 96 x 0.2ml	MP	V	V	V	V	V		V	V	V				V	V	V	V	V	V			V	V		



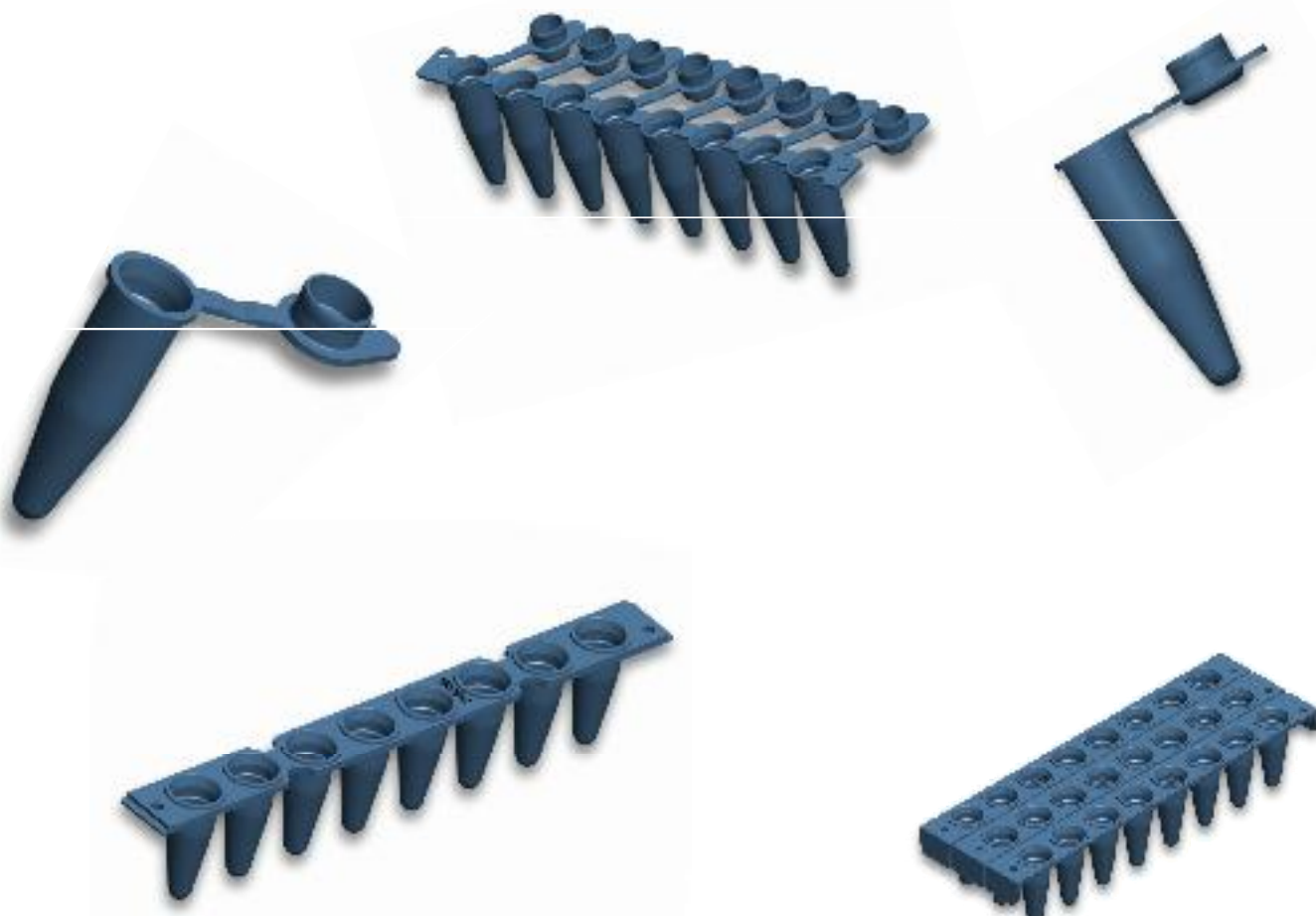
- LP: Low Profile
- RP: Regular Profile
- HP: High Profile
- MP: Accepts all profiles
- V: Fits cycler
- Va: Fits with adaptor
- tpa: Tear off part of product fits
- cpa: Cut off part of product fits
- wp: Preference for white product
- fp: Preference for frosted product
- cp: Preference for clear product
- B: Use blue grid to fit cycler
- Y: Use yellow (ABI fast) grid to fit
- WT: Use white (Roche) grid to fit



# Compatibility Chart PCR Cyclers



Manufacturer and Model	Block	Profile	8-Tube Strips with attached caps															24 & 48 well Plates														
			8-Tube Strips with attached caps			Single Tubes				8-12 Tube Strips				96 well Plates and assemblies				24 well Plates		48 well Plates												
			KB72910	C78201	B79201	KB77301	C789401	B79401	B79001	KB69901	KB77101	C79601	KB58001	KB56601	B79901	B750501-1	KB58001	B750501	AB19700	CB175009JL	A5008001(9L)	CB175030JH	A5038001(9L)	B50651	B70651	AB7500	B710515(L)	BB45001	B50240(9)	B71501(9)		
<b>VWR</b>																																
DuoCycler	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
DuoCycler fast	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
QuattroCycler	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
QuattroCycler fast	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
UnoCycler	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
UnoCycler fast	96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
All 384 well models	384-well	X																													V	
QuattroCycler	384-well	X																													V	
<b>Xian Tianlong Science &amp; Technology</b>																																
TL988 RealTime PCR 48	48 x 0.2ml	RP	V			V				V	V	V	tpa			cpa	tpa														V	V
DTC-4 / DTC-49	96-77 96 x 0.2ml	MP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V



- LP: Low Profile
- RP: Regular Profile
- HP: High Profile
- MP: accepts all profiles
- V: Fits cycler
- Va: fits with adaptor
- tpa: tear off part of product fits
- cpa: cut off part of product fits
- wp: preference for white product
- fp: preference for frosted product
- cp: preference for clear product
- B: use blue grid to fit cycler
- Y: use yellow (ABI fast) grid to fit
- WT: use white (Roche) grid to fit

For qPCR cyclers see page 26 to 28, for sequencers see page 28. For the most precise selection and the latest updates see our website.



## 1. (q)PCR PRODUCTS

### 0.1 ml & 0.2 ml (q)PCR tubes, strips and plates

The importance of disposables for a (q)PCR reaction is often underestimated. Money spent on kits, polymerases, primers, dyes, the optimization of reaction components and (q)PCR cycle calibration should be supported by superior BIOplastics (q)PCR tubes, strips and plates instead of the often used less qualified or even inferior products. Keywords here are: Reproducible and trustworthy results.

Enjoy the benefits and ease of use of superior quality (q)PCR vessels which all have the same raw material product compositions. Combine this with the extreme uniform wall thickness of the products and you actually have standardized and automatically improved the reproducibility of your results by excluding variables in uniformity and material composition.

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### 1.1.0 0.1 ml Single (q)PCR Tubes, Low Profile

#### EU 0.1 ml Thin-Wall Tube, with optical indented wide area cap, low profile

Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products. Fits also Shell Frame Grids. For qPCR applications frosted products are recommended.



12.6 mm<sup>2</sup>

Order#	Description	Package Size
K77201	EU 0.1 ml, Thin-wall tube, Ultra Clear tube with optical cap, natural	.bag, 1000
B77201	EU 0.1 ml, Thin-wall tube, Frosted tube with optical cap, natural	.bag, 1000

Colors and 2D Laser Mark Coded tubes available on request

K77202	red	K77204	green	K77206	orange	B77209	white
K77203	blue	K77205	yellow	K77207	violet	B77211	natural, sterile



### 1.1.1 0.1 ml Optical 4-Tube Strip with Single Attached Cap

#### EU 0.1 ml Optical 4-Tube Strip with attached caps

Designed to fit Qiagen® Rotor-Gene® system "72-Rotor"



Order#	Description	Package Size
B84001	EU 0.1 ml, 4-tube-strip with attached caps, natural,	.bag, 250 strips
B85001	EU 0.1 ml, 4-tube-strip with attached caps, natural, contains laser-able particles	.bag, 250 strips
B85001L	EU 0.1 ml, 4-tube-strip with attached caps, natural, each cap 2D Laser Coded	.bag, 250 strips



For 0.2 ml regular profile Thin-wall Tubes with optical indented wide area cap see page 59.

# (q)PCR Products

## 1.1.2 0.1 ml 8-Tube (q)PCR Strips, Low Profile

### EU 0.1 ml 8-Tube Strips, extra robust, low profile fits Shell Frame Grids (SFG)



Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Can be used with EU adaptors or can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI/LT 0.1 ml fast cyclers use grid AB19805G, to fit Roche LightCycler® 480 systems use grid B17489G and for making non skirted plates use grid B69304. See also: Shell Frame Grids.  
Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear-Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K59901	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, Ultra Clear, fits SFG, natural	.bag, 120
B59901	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, Frosted, fits SFG, natural	.bag, 120
B59909	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, fits SFG, white	.bag, 120
B59909L	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, fits SFG, white, Laser Mark Coded	.10 grids (120)

### EU 0.1 ml 8-Tube Strips, robust, low profile, fits Shell Frame Grids (SFG)



This strip can also be used in combination with the 8-single attachable indented cap strip (B79501).  
Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Can be used with EU adaptors or can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI/LT 0.1 ml fast cyclers use grid AB19805G, to fit Roche LightCycler® 480 systems use grid B17489G and for making non skirted plates use grid B69304. See also: Shell Frame Grids.  
Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K77001	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77001	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, Frosted, fits SFG, natural	.bag, 120
B77009	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, white	.bag, 120
B77009L	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, white, Laser Mark Coded	.10 grids (120)

K77002	.....red	K77004	.....green	K77006	.....orange	B77009	.....white
K77003	.....blue	K77005	.....yellow	K77007	.....violet	B77011	.....natural, sterile

### EU 0.1 ml 8-Tube Strips, extra robust, low profile



Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. These strips can also be as positioned in specific EU adaptors (non disposable) but are not suitable for use in Shell Frame Grids. This product is the precursor of # K59901.  
Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B72711	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, Ultra Clear, natural	.bag, 120
B72719	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, white	.bag, 120

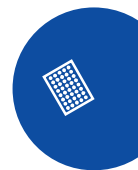
B72712	.....red	B72714	.....green	B72716	.....orange	B72719	.....white
B72713	.....blue	B72715	.....yellow	B72717	.....violet	B72721	.....natural, sterile



For 0.2 ml regular profile 8-Tube Strips see page 61. For caps and EU seals, see pages 55 through 58.

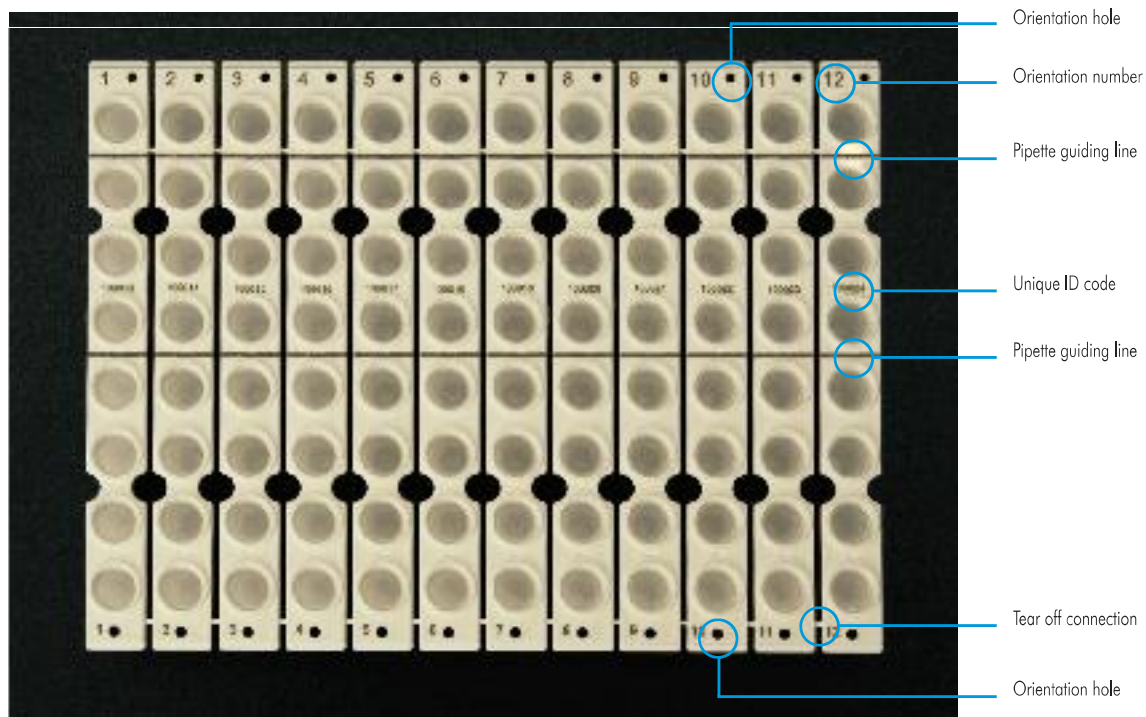
## EU 0.1 ml 8-Tube Strip, extra robust, low profile Tear Off Mat, fits Shell Frame Grids (SFG)

The 96 x 0.1 ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications, the 8-tube strips are barely attached to each other. One or more individual 8-tube strips can be easily torn off. For qPCR applications frosted or white mats are recommended. The mats can be used as plates and/or as a tear off partition of it. Furthermore the 96 x 0.1 ml Tear Off 8-Tube Strip Mat can be clicked in specific (skirted) grids also called Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments or/and robotic applications. Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K59001	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Ultra Clear, natural	.25 mats (300 strips)
B59001	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural	.25 mats (300 strips)
B59001L	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural, Laser-Mark Coded	.25 mats (300 strips)
B59009	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, white	.25 mats (300 strips)
B59009L	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, white, Laser Mark Coded	.25 mats (300 strips)

K59002 ..... red      K59003 ..... blue      K59004 ..... green      K59005 ..... yellow



For 0.2 ml regular profile 8-Tube Strips, extra robust, Tear Off Mat see page 79. For caps and EU seals, see pages 55 through 58.

# (q)PCR products



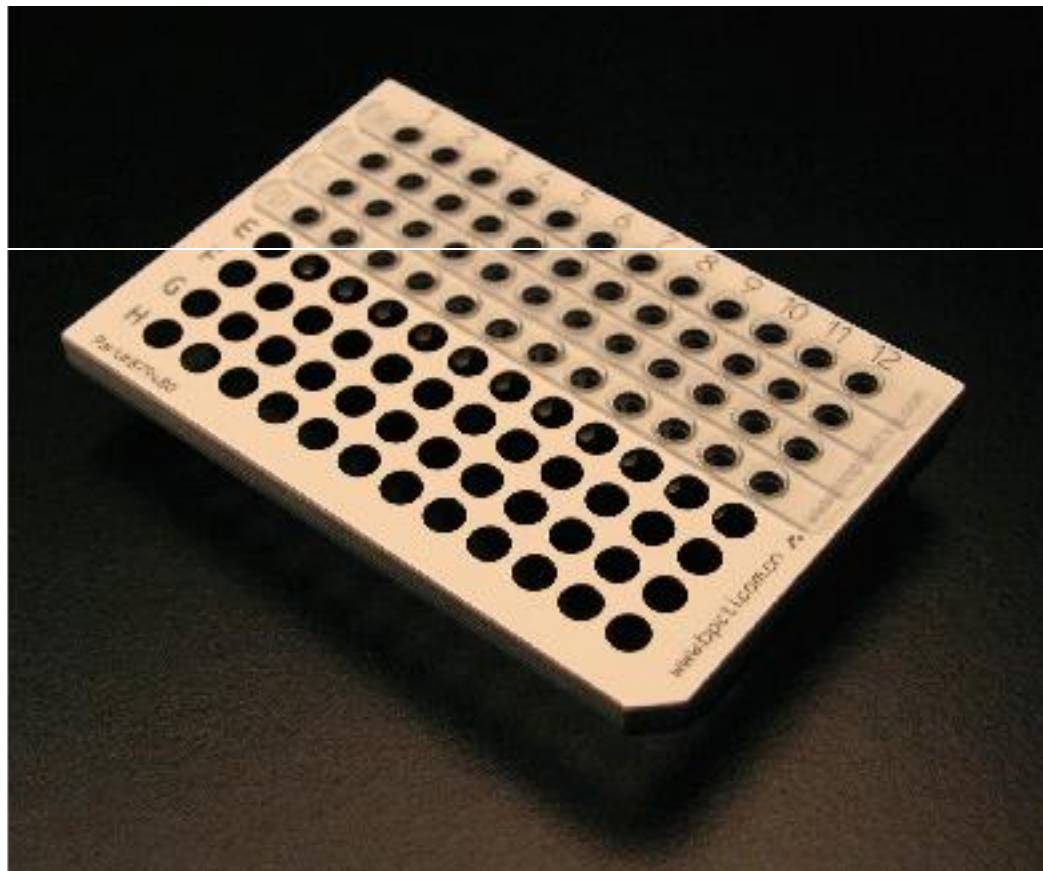
## 1.1.3 0.1 ml 12-Tube (q)PCR Strips, Low Profile

### EU 0.1ml 12-Tube Strips, extra robust, low profile

Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Designed for PCR and qPCR applications. These strips can also be positioned in specific EU adaptors (non disposable) but are not suitable for use in Shell Frame Grids. Closure can be accomplished with any EU 12-cap strip. For qPCR closure use B57821.



Order#	Description	Package Size
B76601	EU 0.1ml, Thin-wall 12-tube strip, Extra Robust, Low Profile, Ultra Clear, natural	.bag, 80
B76609L	EU 0.1ml, Thin-wall 12-tube strip, Extra Robust, Low Profile, white, Laser Mark Coded	.10 grids (120)
B76602	..... red	B76604 .....green
B76603	..... blue	B76605 .....yellow
		B76606 .....orange
		B76607 .....violet
		B76609 .....white
		B76611 .....natural, sterile



B79480 robust EU adaptor made of durable HPL with the B76601 Thin-wall 12-Tube Strips to fit Roche LightCycler® 480 systems.

For 0.2 ml regular profile 12-Tube Strips, extra robust see page 62. For caps and EU seals, see pages 55 through 58.

## 1.2.0 0.1 ml 8-Tube (q)PCR Strips, with Single Attached Caps, Low Profile

EU 0.1 ml 8-Tube Strips with single attached optical wide area caps, low profile, fits Shell Frame Grids (SFG)

Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Can be used with EU adaptors or can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI/LT 0.1 ml fast cyclers use grid AB19805G, to fit Roche LightCycler® 480 systems use grid B17489G and for making non skirted plates use grid B69304. See also: Shell Frame Grids.

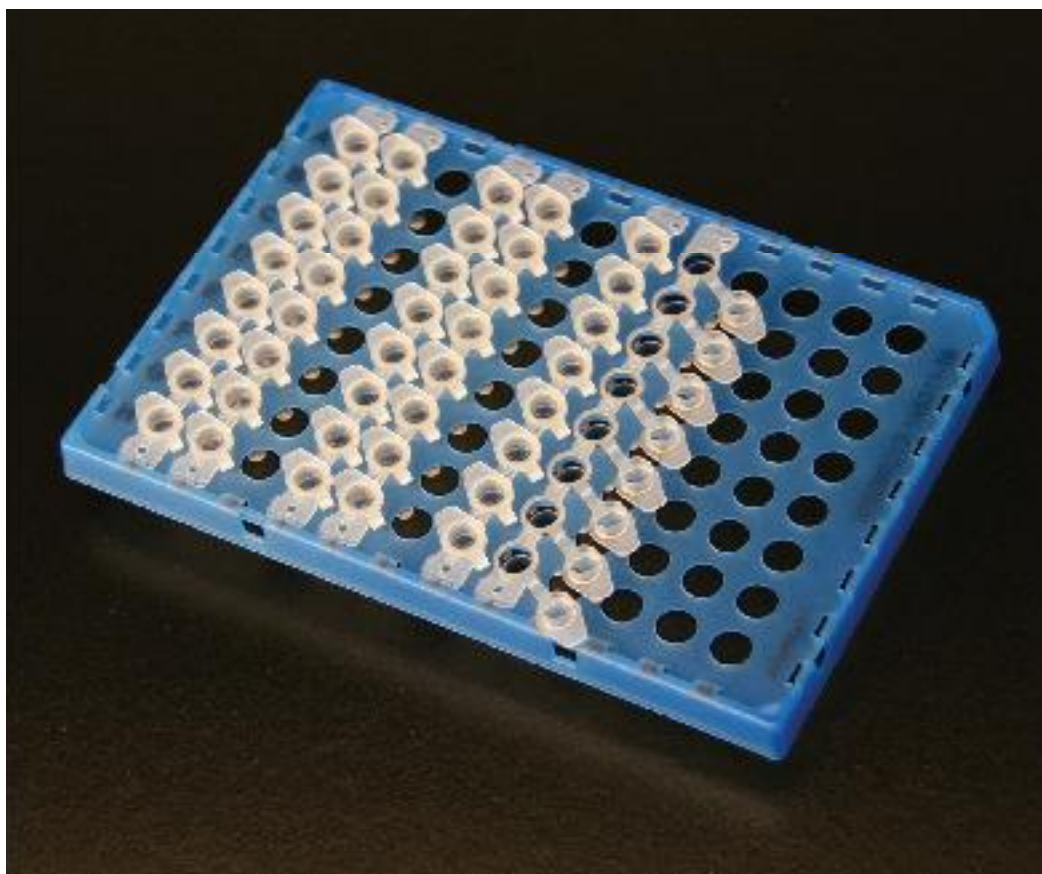


Order#	Description	Package Size
K72810	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Ultra Clear, fits SFG, natural	stacked, 120
K72810B	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Ultra Clear, fits SFG, natural	bag, 300
B72810	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Frosted, fits SFG, natural	stacked, 120
B72811	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Frosted, fits SFG, natural	bag, 120

K72812	red	K72814	green	K72816	orange	K72821	natural, sterile
K72813	blue	K72815	yellow	K72817	violet		

K72812B	red	K72814B	green	K72816B	orange	K72821B	natural, sterile
K72813B	blue	K72815B	yellow	K72817B	violet		

Not available in the USA, alternative for the USA: B79501 + B77001



AB17503G Shell Frame Grid with the K72810 thin wall 8-Tube Strip with Single Attached Cap.

For 0.2 ml regular profile 8-Tube Strip with single attached wide optical area caps see page 64. For Tube Supports and Shell Frame Grids see page 63.

## 1.2.1 0.1 ml 8-Tube (q)PCR Strips, with Single Attached Caps, 2 component version

Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Use white or frosted products for qPCR applications.

12.6 mm<sup>2</sup>



### Component 1

#### EU 8-Cap Strip with single attachable optical wide area indented caps

For closure of (q)PCR 8-tube strips type B77001, K77001, B77101, K77101.

Order#	Description	Package Size
B79501	EU 8-Single attachable optical wide area cap strip, natural	.bag, 120



### Component 2

#### EU 0.1ml 8-Tube Strip, robust, low profile

For creating 0.1 ml thin-wall 8-tube strip with attached optical cap, low profile



Order#	Description	Package Size
K77001	EU 0.1ml, Thin-wall 8-tube strip, Robust, Low Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77001	EU 0.1ml, Thin-wall 8-tube strip, Robust, Low Profile, Frosted, fits SFG, natural	.bag, 120
B77009	EU 0.1ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, white	.bag, 120
B77009L	EU 0.1ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, white, Laser Mark Coded	.10 grids (120)

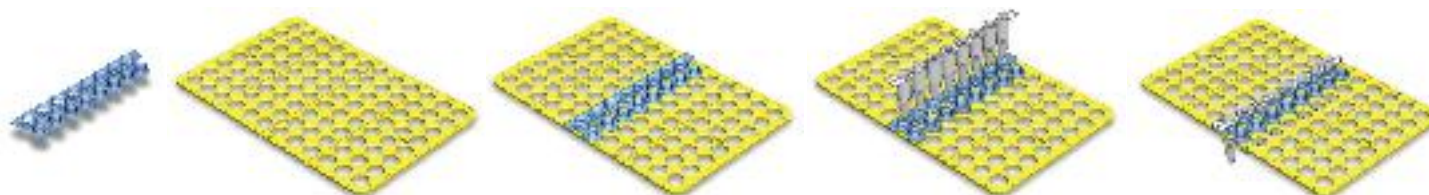
Tip: Use this strip in white in conjunction with the 8 single attachable optical wide area cap to get highest signals and lowest possible cross contamination in qPCR procedures.



### Advised work protocol for component 1 + 2

Creating low profile thin-wall 8-tube strip with single attached cap:

1. Position single attachable cap-strip in Tube Support Grid Wide (B69360, B69351).
2. Slide 8-tube-strip into the cap holes.
3. Apply reaction component in the wells, individually close the tubes and position in the cycler.



For 0.2 ml regular profile 8-Tube Strips with single attached caps, 2 component version see page 65.



## 1.3.0. 0.1 ml 24 & 48 (q)PCR Plates, Low Profile

### EU 24 x 0.1 ml (q)PCR Plate, semi skirted, low profile

These EU 24 well low profile plates are semi skirted and designed for (q)PCR applications. Fits almost all PCR and qPCR (fast) cyclers which accept low profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B50340	EU 24 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, Frosted, natural	100 plates
B50340L	EU 24 x 0.1 ml, Thin-wall plate Semi skirted, Frosted, Laser Mark Coded, natural	100 plates
B50349	EU 24 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, white	100 plates
B50349L	EU 24 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, Laser Mark Coded, white	100 plates

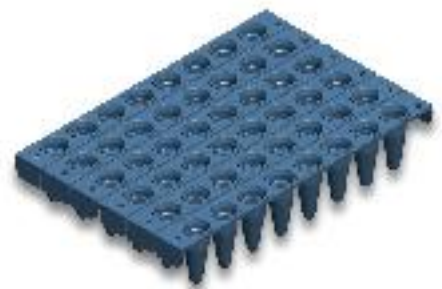


### EU 48 x 0.1 ml (q)PCR Plate, semi skirted, low profile

These EU 48 well low profile plates are semi skirted and designed for (q)PCR applications. Fits almost all PCR and qPCR (fast) cyclers which accept low profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B71601	EU 48 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, Frosted, natural	50 plates
B71601L	EU 48 x 0.1 ml, Thin-wall plate Semi skirted, Frosted, Laser Mark Coded, natural	50 plates
B71609	EU 48 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, white	50 plates
B71609L	EU 48 x 0.1 ml, Thin-wall plate Semi skirted, Low Profile, Laser Mark Coded, white	50 plates



## 1.3.1 Differences in plate skirts

With a wide variety of (q)PCR cyclers on the market today, the type of disposables a cycler accepts, and additional requirements from customers, it can be difficult to accommodate these demands. BIOplastics offers solutions. For example: if a cycler only accepts plates and you do not like to work with plates then opt for one of the BIOplastics adaptor solutions which enables the use of single tubes and strips in cyclers which normally only accept plates. (See page 53)

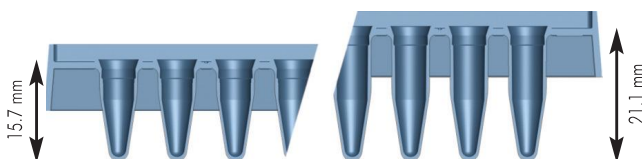
Plates are available in different heights as well as with different skirts. Find below cross sections of different plates and comments:



**Non Skirted.** These types of plates have the widest application range and can be easily cut. They fit most cyclers. Left is Low Profile, right is Regular Profile.



**Semi skirted.** These types of plates have a semi skirt. Can be used in robotic applications and the skirt gives extra stability. Some BIOplastics models can also be cut. Fits most cyclers but not as many as skirted plates. Left is Low Profile, right is Regular Profile.



**Sub skirted.** These types of plates have a sub skirt. Can be used in robotic applications and the sub-skirt gives extra stability. Fits mostly ABI cyclers and a few other cyclers. Left is Low Profile, right is Regular Profile.



**Fully skirted.** These types of plates have a full skirt. Can be used in robotic applications and the plate is stable. Typically used in liquid handling procedures. Fits a limited number of cyclers

For 0.2 ml regular profile 24 & 48 (q)PCR plates see page 67. For caps and EU seals, see pages 55 through 58.

# (q)PCR Products

## 1.3.2 96 x 0.1 ml (q)PCR Plates, Non Skirted, Low Profile

### EU 96 x 0.1 ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)



This latest innovative product, designed for PCR and qPCR applications fits almost all PCR and qPCR (fast) cyler models which accept low profile (LP) products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates can be easily cut into pieces of 16, 24, 32 or 48 wells. Plates as a whole or part(s) of it can be "clicked in" BIOplastics Shell Frame Grids. This product is also available as pre-assembled in Shell Framed Grid. (See Shell Frame Grids assemblies). The plate enables high efficiency usage as well as the use of "two products only" strategy. For some ABI cyclers the use of Shell Frame Grid AB19805G is required. The use of these products combined with Shell Frame Grid type AB19805G enables to position these products in any ABI, Life Technologies®, 0.1 ml (q)PCR cyclers (fast models), whereas if combined with Shell Frame Grid type B17489G it fits Roche LightCycler® 480 systems. Plate fits also the Roche 480 adaptor B79480. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B60101-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Ultra Clear, natural	.25 plates
B50601-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Frosted, natural	.25 plates
B60109-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, white	.25 plates
B50601L-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Frosted, Laser Mark Coded, natural	.25 plates
B60109L-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Laser Mark Coded, white	.25 plates

### EU 96 x 0.1 ml Mat of 8-Tube Strips, robust, low profile, Tear Off Mat fits SFG grids



The 96 x 0.1ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications and the 8-tube strips are barely attached to each other making them a "plate". One or more individual 8-tube strips can be easily torn off. For qPCR applications frosted or white colored mats are recommended. The Mats can be used as plates and/or as a torn off partition of it. Furthermore the 96 x 0.1ml Tear Off 8-Tube Strip Mat can be clicked in specific (skirted) grids also known as Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments or/and robotic applications. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Fits almost all PCR and qPCR (fast) cyler models which accept low profile products such as ABI Fast, Roche®, Bio-Rad®, Eppendorf® and others. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K59001	96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Ultra Clear, natural	.25 mats (300 strips)
B59001	96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural	.25 mats (300 strips)
B59001L	96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural, Laser-Mark Coded	.25 mats (300 strips)
B59009	96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, white	.25 mats (300 strips)
B59009L	96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Laser Mark Coded, white	.25 mats (300 strips)

K59002 .....red      K59003 .....blue      K59004 .....green      K59005 .....yellow

### EU 96 x 0.1 ml robust, cut-able (q)PCR Plate, low profile



These plates are designed for PCR or qPCR applications and fit almost all (q)PCR cyler models which accept low profile (LP) products. For qPCR we recommend the use of frosted products or white products. Plates can be easily cut into 16, 24, 32 or 48-well pieces. Plate also fits the Roche 480 adaptor B79480 (reusable) which enables the use of it in Roche LightCycler® 480 systems. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B60101	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, Ultra Clear, natural	.25 plates
B50601	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, Light Frosted, natural	.25 plates
AB70651	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, Frosted, natural	.25 plates
B50601L	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, Light Frosted, Laser Mark Coded, natural	.25 plates
B60109	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, white	.25 plates
B50609L	96 x 0.1ml, Thin-wall plate, Non skirted, Cut-able, Laser Mark Coded, white	.25 plates

B60101

B60102 .....red      B60104 .....green      B60106 .....orange      B60109 .....white  
 B60103 .....blue      B60105 .....yellow      B60107 .....violet      B60111 .....natural, sterile

For regular profile 96 x 0.2 ml (q)PCR plates, non skirted see page 68. For caps and EU seals, see pages 55 through 58.

## 1.3.3 96 x 0.1 ml (q)PCR Plates, Semi Skirted, Low Profile

### EU 96 x 0.1 ml robust, (q)PCR Plate, fits Roche LightCycler® 480 systems



These plates are designed for PCR and qPCR applications and specifically to fit Roche LightCycler® 480 systems. These plates fits also most (q)PCR cycler models which accept low profile (LP) products. For qPCR we recommend the use of frosted products or white products. Alternatively Roche LightCycler® 480 systems can also be equipped with Shell Frame Grids assemblies or a combination of Roche 480 adaptor (B79480) combined with either cut-able plates (B60109-1) or Tear Off Tube Strip Mats (B59009) Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
B17480	96 x 0.1 ml, Roche 480, Thin-wall plate, Semi skirted, Frosted, natural	.25 plates
B17489	96 x 0.1 ml, Roche 480, Thin-wall plate, Semi skirted, white	.25 plates
BB17489L	96 x 0.1 ml, Roche 480, Thin-wall plate, Semi skirted, Laser Mark (Bar) Coded, white	.25 plates

Alternatively Roche LightCycler® 480 systems can also be equipped with Shell Frame Grids assemblies or a combination of Roche 480 adaptor (B79480) combined with either cut-able plates (B60109-1) or Tear Off Tube Strip Mats (B59009).

### EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, fits Roche LightCycler® 480 systems



This innovative assembly is composed of either a 96 x 0.1 ml Cut-able plate (CT), or a 96 x 0.1 ml Tear Off 8-Tube Strip Mat (TO) positioned in a Shell Frame Grid. Designed to be used specifically in Roche Lightcycler® 480 systems and other (q)PCR cyclers or robotic applications. The assembly can be disassembled and not required parts can be removed (cut or torn off). The to be used part of the plate is reassembled in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. White products are recommended for highest S/N ratios in qPCR. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear-off 8-Cap Strip Mat is recommended. The total assembly, including each individual plate strip section, is Laser mark coded. See engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB17480L	96 x 0.1 ml, CT Plate SFG assembly Roche, cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
A4809001	96 x 0.1 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17489L	96 x 0.1 ml, CT Plate SFG assembly Roche, cut-able, Laser Mark Coded, Frosted, White	.25 assemblies
A4899009	96 x 0.1 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, Frosted, White	.25 assemblies

CB17480L

### EU 96 x 0.1 ml robust and cut-able (q)PCR Plate, semi skirted



Plates can be easily cut in sections of 3 rows. These plates fits also most (q)PCR cycler models which accept low profile (LP) products. For qPCR we recommend the use of frosted or white products. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. Plate is robust, flat and can be color coded using a Pre-Post Tube support grid.



Order#	Description	Package Size
B50751	96 x 0.1 ml, Thin-wall Semi skirted plate, LP, Light Frosted, cut-able, natural	.25 plates
B50759	96 x 0.1 ml, Thin-wall Semi skirted plate, LP, Light Frosted, cut-able, white	.25 plates
B50759L	96 x 0.1 ml, Thin-wall Semi skirted plate, LP, Light Frosted, Laser Mark Coded, white	.25 plates

For regular profile 96 x 0.2 ml (q)PCR plates, semi skirted see pages 69 and 70. For caps and EU seals, see pages 55 through 58.

# (q)PCR Products

## 1.3.4 96 x 0.1 ml (q)PCR Plates, Sub Skirted, Low Profile

### EU 96 x 0.1 ml robust, (q)PCR Plate, ABI Fast/Life Technologies® cyclers compatible



These plates are designed for PCR and qPCR applications and specifically to fit ABI/Life Technologies® Fast or 0.1 ml systems. These plates fits also most (q)PCR Cycler models which accept low profile (LP) products. Alternatively to this plate one can opt for Shell Frame Grids (AB19805G) and its assemblies with either cut-able plates (B50601-1) or Tear Off Mats (B59001). Closure can be accomplished with any EU cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
AB19800	96 x 0.1ml, ABI Fast LT compatible, Thin-wall plate, Sub skirted, Frosted, natural	.25 plates
AB19809	96 x 0.1ml, ABI Fast LT compatible, Thin-wall plate, Sub skirted, white	.25 plates
AB19800LB	96 x 0.1ml, ABI Fast LT compatible, Thin-wall plate, Sub skirted, Frosted, Laser Mark (Bar) Coded, natural	.25 plates
AB19809LB	96 x 0.1ml, ABI Fast LT compatible, Thin-wall plate, Sub skirted, Laser Mark (Bar) Coded, white	.25 plates

Alternatively ABI Fast/Life Technologies® (q)PCR cyclers can also be equipped with Shell Frame Grids (AB19805G) and its assemblies either assembled with cut-able plates (B50601-1) or Tear Off Mats (B59001). see also Shell Frame Grids and Shell Frame Grids assemblies

### EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, ABI Fast/Life Technologies® cyclers compatible



This innovative assembly is composed of either a 96 x 0.1 ml cut-able plate(CT), or a 96 x 0.1 ml Tear Off 8-Tube Strip Mat (TO) positioned in a Shell Frame Grid. Designed to be used in specifically, but not limited to, ABI/Life Technologies® Fast or 0.1 ml cyclers and robotic applications. The assembly can be disassembled and unrequired parts can be removed (cut or torn off). The to be used part of the plate is re-assemble in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. White products are recommended for highest S/N ratios in qPCR. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. The total assembly, including each individual plate strip section, is Laser Mark Coded See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB19800L	96 x 0.1 ml, CT Plate SFG assembly ABI/LT Fast, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
A8009001	96 x 0.1 ml, TO Plate SFG assembly ABI/LT Fast, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
CB19809L	96 x 0.1 ml, CT Plate SFG assembly ABI/LT Fast, Cut-able, Laser Mark Coded, white	.25 assemblies
A8099009	96 x 0.1 ml, TO Plate SFG assembly ABI/LT Fast, Tear Off, Laser Mark Coded, white	.25 assemblies

A8009001

## 1.3.5 96 x 0.1 ml (q)PCR Plates, Fully Skirted, Low Profile

### EU 96 x 0.1 ml robust, (q)PCR Plate, flat, fully skirted, stackable and robotic friendly

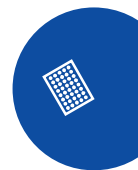


These low profile plates are rigid, flat and skirted. The plates can be used in a number of 0.1 ml and 0.2 ml blocks, PCR and Real-Time thermal cyclers. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates are robust, stackable, robotic friendly and no nesting occurs when stacking them. The plates can be color coded using a Pre-Post Tube support grid. Closure can be accomplished with any EU cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B70671	96 x 0.1 ml, Thin-wall plate, Fully skirted, Ultra Clear, natural	.25 plates
B70679	96 x 0.1 ml, Thin-wall plate, Fully skirted, Ultra Clear, white	.25 plates
B70671LB	96 x 0.1 ml, Thin-wall plate, Fully skirted, Laser Mark Bar Coded, natural	.25 plates
B70679LB	96 x 0.1 ml, Thin-wall plate, Fully skirted, Laser Mark Bar Coded, white	.25 plates

For regular profile 96 x 0.2 ml (q)PCR plates, sub skirted see page 71. For caps and EU seals, see pages 55 through 58.



## 1.4.0 Shell Frame Grids and permanent adaptors

BIOplastics manufactures and offers the widest range (q)PCR disposables for ALL BRANDS of PCR and qPCR cyclers. Some plates, strips and tubes are designed for specific cyclers whereas a number of products are smartly designed to allow full interchangeability between products and cyclers.

### Shell Frame Grids

One of our latest innovative developments is the Shell Frame Grid. Shell Frame Grids enables the use of "two products only" for all your PCR and qPCR reactions, regardless model and brand of your thermal cycler. Shell Frame Grids can be seen as the skirted version of a plate, however without any tubes.

Shell Frame Grids are available in PP disposable format next to a durable and re-useable HPL format. A selected number of cut-able plates, Tear Off 8-Tube Strip Mats, 8-tube strips, 8-tubes strips with attached caps and single tubes, all "Shell Frame Grid compatible", can be "clicked" into the Shell Frame Grid and enables creating your own format. Depending on your requirements just "click in" the required amount of tube strips, partition of plates or just a whole plate. Any assembly can easily be disassembled, and the same partition can be transferred into a different model Shell Frame Grid. There are three types of grids available. One to fit, but not limited to, Roche LightCycler® 480 systems, One for ABI, Life Technologies® Fast and Bio-Rad® cyclers and one for ABI, Life Technologies® Non fast, Eppendorf® cyclers and any other cycler brands. Shell Frame Grids differ in their optimized rims settings which, enables the fit to specific cycler models.

Your advantage: select the tube/plate format of your preference e.g. Tear Off 8-Tube Strip Mat, tear off required amounts of strips, pipette reagents, decide which thermal cycler you are going to use, e.g. LightCycler® 480 system, "Click in" the Tear Off 8-Tube-Strips in Shell Frame Grid (Roche type) and run your (q)PCR.

If you however decide to use your 7500 Fast Cycler instead, "click out" your samples from the Shell Frame Grid (Roche type) and "click them in" the Shell Frame Grid (ABI fast type) and run you samples in your 7500 Fast cycler. So basically one plate or Tear Off 8-Tube Strip Mat product can be used in all cycler models.



### One step (Dis)-Assembling/Toolkit for Shell Frame Grids (SFG)

Although fSFG (fit Shell Frame Grids) products such as tube strips, tear off tube strip mats and plates can be easily placed in Shell Frame Grids, you also may opt for using the One step (Dis)-Assembling / Toolkit for Shell Frame Grids (SFG). The toolkit includes: - Assembly Applicator (Frosted) - Disassembly Extractor (Transparent) - Support Work Rack-S - three different skirted models of Shell Frame Grids: \* Roche LightCycler® 480 systems: B17489G (White) \* ABI Fast cyclers & other cyclers (0.1 ml): AB19805G (Yellow) \* ABI regular cyclers & other cyclers (0.2 ml): AB17503G (Blue) 1 basic non-skirted grid (all cyclers): B69304 (Green). The user manual can be found on pages 140 through 142.



B12345, One step (Dis)-Assembling/Toolkit for Shell Frame Grids

### One step assembly using Toolkit



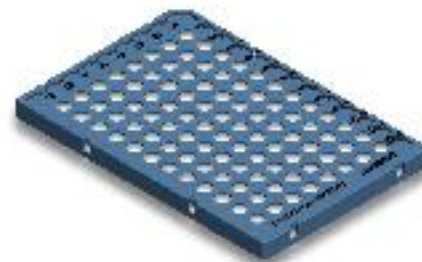
Instructions for assembling and disassembling Tube Strip Mats, parts of Tube Strip Mats and designated 8-Tube Strips in Shell Frame Grids see page 140.

# (q)PCR Products



## Shell Frame Grids (disposable)

- Semi skirted labeled and coded
- Alphanumeric and pipetting “help lines” laser marked
- Ideal for all PCR and qPCR applications
- Fits all thermal cyclers (PCR & qPCR)
- New color coded options, (colored grids assembled with other colored products)
- Accepts assembly and disassembly of designated Shell Frame Grid plates, tear off tube strip mats, tube strips and tubes



AB19805G

## Shell Frame Grids

Order#	Description	Package Size
AB19805G	SFG, Low Profile UNIVERSAL use, Yellow, Laser Mark Coded	.24 Grids
AB17503G	SFG, Regular Profile UNIVERSAL use, Blue, Laser Mark Coded	.24 Grids
B17489G	SFG, Roche LightCycler® 480 systems, LP, White, Laser Mark Coded	.24 Grids
AB19805G	SFG, ABI Fast /Life Technologies® 0.1 ml format, LP, Yellow, Laser Mark Coded	.24 Grids
AB17503G	SFG, ABI/Life Technologies® 0.2 ml format Blue, Laser Mark Coded	.24 Grids
B12345	One step (Dis)-Assembling / Toolkit for Shell Frame Grids (SFG)	.1 kit

## Durable Shell Frame Grids and EU Adaptors

Instead of the disposable Shell Frame Grids you may opt using a permanent solution by selecting specific, non disposable and durable Shell Frame Grids and EU adaptors, which accepts all type of Shell Frame Grid compatible “click in” disposables. Shell Frame Grids features a “click-in” option whereas EU Adaptors are lacking this feature.

Durable Shell Frame Grids and EU adaptors are robust, stiff, reusable and made of durable HPL.



## Shell Frame Grids and EU Adaptors (permanent)

- Semi or fully skirted labeled and Laser Mark Coded
- Alphanumeric and pipetting “help lines” laser marked
- Ideal for all PCR and qPCR applications
- Fits designated specific Thermal cyclers (PCR & qPCR)
- Accepts Shell Frame Grid compatible “click in” disposables
- Can be used for robotic applications

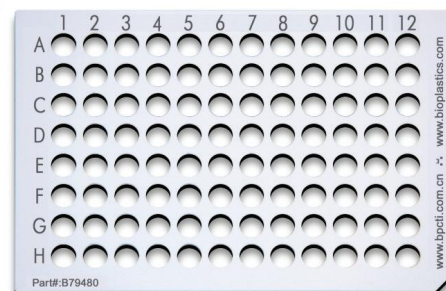
## Shell Frame Grids and EU Adaptors (durable, permanent)

Order#	Description	Package Size
AB19805X	SFG, LP, UNIVERSAL and ABI Fast /Life Technologies® 0.1 ml format use, durable, reusable, Laser Mark Coded	.1 Grid
AB17503X	SFG, RP, UNIVERSAL and ABI/Life Technologies® 0.2 ml format use, durable, reusable, Laser Mark Coded	.1 Grid
B17489X	SFG, Roche LightCycler® 480 systems, LP, durable, reusable, Laser Mark Coded	.1 Grid
B70671X	SFG, LP, UNIVERSAL, FULLY SKIRTED, durable, reusable, Laser Mark Coded, Robotic Applications	.1 Grid
AB19700X	SFG, RP, UNIVERSAL, FULLY SKIRTED, durable, reusable, Laser Mark Coded, Robotic Applications	.1 Grid
B79480	EU adaptor 1 for use in Roche LightCycler® 480 systems, reuseable	.1 adaptor

## Shell Frame Grid and Adaptor compatible products:

Assigned:

- Single tubes
- 8-tube strips
- 8-tube strips with single attached caps
- Tear Off 8-Tube Strips Mats
- Cut-able plates





### 1.4.1 qPCR and PCR Cap Strips and Mats

#### Optical wide area 8-Cap Strip robust with wide indented flat cap

Optimized for qPCR and PCR applications. Indented cap prevents “finger touch” signal interference. For closure of all BIOplastics type (q)PCR tubes, strips and plates.

Order#	Description	Package Size
B57801	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural	.bag, 120
B57801B	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural	.bag, 300
B57811	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural, sterile	.bag, 120



#### Optical wide area 8-Cap Strip with wide indented flat cap

Designed and optimized for PCR and qPCR applications. Indented cap prevents “finger touch” signal interference. This cap-strip is the optimized version of the, in 2013 discontinued, Optical Flat thin-wall 8-Cap Strip. For closure of all BIOplastics type (q)PCR tubes, strips and plates.

Order#	Description	Package Size
B79701-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural	.bag, 120
B79701B-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural	.bag, 300
B79711-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural, sterile	.bag, 120



#### Optical wide area 8-Single attachable wide indented flat Cap Strip

Can only be used in combination with (q)PCR 8-Tube Strips type B77001/K77001 (LP) and B77101/K77101 (RP).

Order#	Description	Package Size
B79501	EU 8-Single attachable Optical Wide indented cap-strip, natural	.bag, 120



#### Optical wide area 8-Cap Strip, robust with wide indented flat cap, Tear Off Mat

The Tear Off 8-Cap Strip Mat is designed and optimized for PCR and qPCR applications and the extra robust 8-cap strips are barely attached to each other. One or more individual 8-cap-strips can be easily torn off. For closure of all BIOplastics type (q)PCR tube strips and plates.

Order#	Description	Package Size
B57651	EU Optical Wide 8-cap strip mat, Robust with wide indented flat cap, natural	.50 mats (600 strips)



# (q)PCR Products



## Semi-domed Thin-wall 8 Cap-Strip

For closure of all BIOplastics type PCR tubes, strips and plates.

For qPCR optimized signals use B57801 or B79701-1, EU Wide Optical 8-Cap Strip.



Order#	Description	Package Size
C79701	EU Semi-domed Thin-wall 8-cap strip, natural	.bag, 120
C79701B	EU Semi-domed Thin-wall 8-cap strip, natural	.bag, 300
C79702	.....red	
C79703	.....blue	
C79704	.....green	
C79705	.....yellow	
C79706	.....orange	
C79707	.....violet	
C79708	.....amber	
C79711	.....natural, sterile	

## Robust indented flat 8-Cap Strip

For closure of all BIOplastics type PCR tubes, strips and plates. For qPCR optimized signals use B57801 or B79701-1, EU Wide Optical 8-Cap Strip.



Order#	Description	Package Size
B75701	EU Thin-wall 8-cap strip, Robust, natural	.bag, 120
B75701B	EU Thin-wall 8-cap strip, Robust, natural	.bag, 300
B75702	.....red	
B75703	.....blue	
B75704	.....green	
B75705	.....yellow	
B75706	.....orange	
B75707	.....violet	
B75708	.....amber	
B75711	.....natural, sterile	

## Optical wide area 12-Cap Strip, robust with wide indented flat cap

Optimized for qPCR and PCR applications.

Indented cap prevents "finger touch" signal interference. For closure of all BIOplastics type (q)PCR 12-tube strips and plates.



Order#	Description	Package Size
B57821	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 80
B57821B	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 200
B57831	EU Optical Wide 12-cap strip, with wide indented flat cap, natural, sterile	.bag, 80

## Robust indented flat 12-Cap Strip

For closure of all BIOplastics type PCR 12-tube strips and plates. For qPCR optimized signals use wide optical cap strips and mats.



Order#	Description	Package Size
B56501	EU Thin-wall 12-cap strip, Robust, natural	.bag, 80
B56501B	EU Thin-wall 12-cap strip, Robust, natural	.bag, 200
B56502	.....red	
B56503	.....blue	
B56504	.....green	
B56505	.....yellow	
B56506	.....orange	
B56507	.....violet	
B56508	.....amber	
B56511	.....natural, sterile	





## 1.4.2 qPCR and PCR Cap-plate and Seals

### Optical wide area Cap Plate 96 format with indented flat caps

Optimized for PCR and qPCR applications. Indented cap prevents “finger touch” signal interference. For closure of all BIOplastics type (q)PCR tube-strips and plates as well as for BIOplastics Titer dilution and (cryo) storage tubes. Easy to cut required format with scissors.

Order#	Description	Package Size
B57601	EU Optical Wide cap-plate 96 format, with indented flat cap, Cut-able, natural	25 plates



### Opti-Seal™ optical disposable adhesive, classic version

Opti-Seal™ provides the best sealing option for EU plates. The EU Opti-Seal™ is non pierce-able and can be easily removed after the (q)PCR reaction is performed. Pressure applied by the heated lid of the thermal cycler, is needed to keep the seal well closed during thermal cycling. Opti-Seal™ generates excellent results and is designed and tested to be used in Real-Time PCR applications.

Order#	Description	Package Size
157300	Opti-Seal™, optical, disposable, adhesive	100 sheets



### Opti-Seal™ Tear Off, optical disposable adhesive with 8-strip tear off option

Opti-Seal™ Tear Off provides an excellent sealing option for EU plates, parts of it or strips. Opti-Seal™ Tear Off is non pierce-able and has a perforation every 9 mm which enables tearing off one or more strips or several strips to seal part of a plate. Pressure applied by the heated lid of the thermal cycler is needed to keep the seal well closed during thermal cycling. Opti-Seal™ generates excellent results and is designed to be used in Real-Time PCR applications.

Order#	Description	Package Size
157400	Opti-Seal™, Tear Off optical, disposable, adhesive	100 sheets



# (q)PCR Products



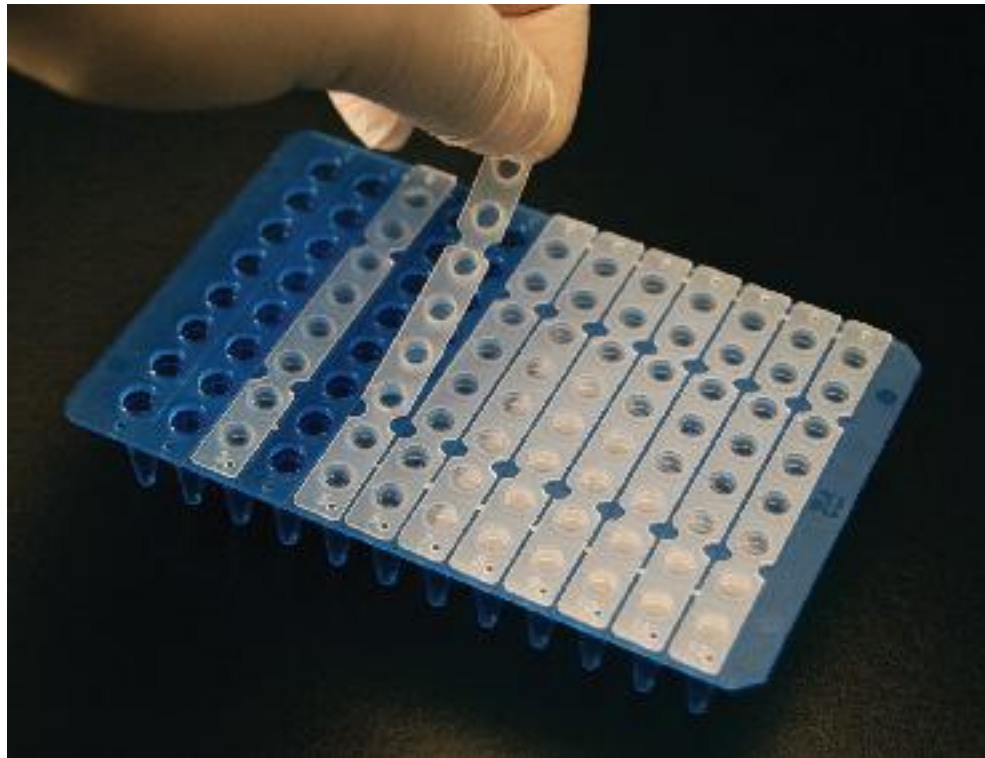
## Alu-Seal™ disposable adhesive, extra thick

Alu-Seal™ provides a good sealing option for plates. The Alu-Seal™ is pierce-able and can be easily removed. Alu-Seal™ can be used in a wide range of applications like PCR, incubation and freezer storage. Note that Alu-Seal™ is the most robust seal available on the market. Handle the Alu-Seal™ with care to prevent possible (cutting) injuries.



Order#	Description	Package Size
157200	EU Alu-Seal™, disposable, adhesive	100 sheets

Order#	Product Name	Material	Adhesive	Long term cold storage	Pierce-able	Optical for qPCR	Easy removal
B79701-1	8-cap strip with wide indented flat cap	polypropylene	No	Yes	No	Yes	Yes
B57651	8-cap strip with wide indented flat cap, Tear Off mat	polypropylene	No	Yes	No	Yes	Yes
B57601	EU Optical Wide cap-plate 96 format	polypropylene	No	Yes	No	Yes	Moderate
157300	Opti-Seal, optical, disposable, adhesive	Polyester	Yes	Yes	No	Yes	Moderate
157400	Opti-Seal, Tear Off optical, disposable, adhesive	Polyester	Yes	Yes	No	Yes	Yes
157200	EU Alu-Seal disposable, adhesive	Aluminum	Yes	Yes	Yes	No	Moderate



## 1.5.0 0.2 ml Single (q)PCR Tubes, Regular Profile

### EU 0.2 ml Thin-wall Tube with optical indented wide area cap, regular profile

Fits almost all PCR and qPCR cyclers models which accept regular profile products, such as ABI/LT, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). For qPCR applications frosted products are recommended.



Order#	Description	Package Size
K77301	EU 0.2 ml, Thin-wall tube, Ultra Clear with optical cap, Regular Profile, natural	.bag, 1000
B77301	EU 0.2 ml, Thin-wall tube, Frosted with optical cap, Regular Profile, natural	.bag, 1000
K77302	red	K77304 green
K77303	blue	K77305 yellow
		K77306 orange
		K77307 violet
		K77308 amber
		K77311 natural, sterile



### EU 0.2 ml Classic Thin-wall Tube with semi-domed cap, regular profile

Fits almost all cycler models which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
C78401	EU Classic 0.2 ml, Thin-wall tube, Ultra Clear, with domed cap, natural	.bag, 1000
C79401	EU Classic 0.2 ml, Thin-wall tube, Light Frosted, with domed cap, natural	.bag, 1000

C78402	red	C78404 green	C78406 orange	C78408 amber
C78403	blue	C78405 yellow	C78407 violet	C78411 natural, sterile



### EU 0.2 ml Thin-wall Tube with anti-contamination domed cap, regular profile

Fits almost all cycler models which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
B79401	EU 0.2 ml, Thin-wall tube, Ultra Clear, with anti-contamination domed cap, natural	.bag, 1000

B79402	red	B79404 green	B79406 orange	B79408 amber
B79403	blue	B79405 yellow	B79407 violet	B79411 natural, sterile



### EU 0.2 ml Thin-wall Tube with optical flat cap, high profile,

Fits almost all cycler models which have height adjustable lids. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
B79001	EU 0.2 ml, Thin-wall tube, Ultra Clear, with optical flat cap, High Profile, natural	.bag, 1000

B79002	red	B79004 green	B79006 orange	B79008 amber	B79011 natural, sterile
B79003	blue	B79005 yellow	B79007 violet	B79009 white	



For 0.1 ml low profile Thin-wall Tubes with optical indented wide area cap see page 43.

# (q)PCR Products



## 1.5.1 0.5 ml Single PCR Tubes

### EU 0.5 ml graduated Thin-wall Tube with optical flat cap

Fits all 0.5 ml cycler models.  
See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
C79801	EU 0.5 ml, Thin-wall graduated tube with attached cap, Ultra Clear, natural	.bag, 1000
C79802	.....red	
C79803	.....blue	
C79804	.....green	
C79805	.....yellow	
C79806	.....orange	
C79807	.....violet	
C79808	.....amber	
C79811	.....natural, sterile	



## 1.5.2 (q)PCR Multo Rack Systems

### 0.2 ml Work Rack. Multo Rack System

The Multo Rack System contains of a 0.2 ml Multo Plate Rack and a Multo Rack Box. The Multo Plate Rack is Laser Mark Coded A-H, 1-12 and can hold 0.1 ml and 0.2 ml tubes, strips and plates (low profile and regular profile). The Multo Rack Box is an assembly of the base and the lid. Base and lid are "click-in" to become the Multo Box. The Multo Rack System is used as work, storage, freezer or cryo storage system. The Multo Rack System accepts any (q)PCR vessel or plate and closes securely. Its limited height of 3 cm (1.2 Inch) enables the Multo Systems to be used for kit packaging as well as a shipping system for valuable samples. Customized laser marking of box and/or plate rack is on demand available.

0.2 ml Multo Rack Systems Rack positioned in box with Lid Dimensions Multo Plate Box System:

- Multo Plate Rack, 128.4 mm (W) x 85.9 mm (L) x 10.3 mm (H)
- Multo Plate Box footprint, 134.8 mm (W) x 92.8 mm (L)
- Multo Plate Box Maximum, 135 mm (W) x 103.6 mm (L) x 27.7 mm (H)

Base composition is: White Multo Plate Rack positioned in Multo Plate Box with blue base and natural lid.  
Contact BIOplastics for different colors Multo Plate Racks positioned in any combination of Multo Plate Boxes.

Order#	Description	Package Size
B10443	Multo work rack system, white rack in box with lid, blue base, transparent lid, Laser Marked	.8 systems
B10442	.....red	
B10444	.....green	
B10445	.....yellow	
B10446	.....orange	
B10447	.....violet	
B10449	.....white	
B10452	.....mixed colors	



### 1.5.3 0.2 ml 8-Tube (q)PCR Strip, Regular Profile

#### EU 0.2ml 8-Tube Strips, extra robust, regular profile, fits Shell Frame Grids (SFG)



Fits almost all PCR and qPCR cyler models which accept regular profile products, such as ABI/LT, Agilent®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Designed for PCR and qPCR applications. Can also be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments.

To fit all ABI 0.2 ml cyclers use grid AB17503G and for making solid non skirted plates use B69304 grid.

See also: Shell Frame Grids.

Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or the Optical Tear Off 8-Cap Strip Mat (B57651) is recommended.



Order#	Description	Package Size
K69901	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 120
B69901	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, Frosted, fits SFG, natural	.bag, 120
B69909	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, white	.bag, 120
B69909L	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, white, Laser Mark Coded	.10 grids (120)

#### EU 0.2ml 8-Tube Strips, robust, regular profile fits Shell Frame Grids (SFG)



This strip can also be used in combination with the 8-single attachable indented cap strip (B79501).

Fits almost all PCR and qPCR (fast) cyler models which accept regular profile products, such as ABI/LT Fast, Roche®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Designed for PCR and qPCR applications. Can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI 0.2 ml cyclers use grid AB17503G and for making solid non skirted plates use B69304 grid. See also: Shell Frame Grids.

Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Frosted, fits SFG, natural	.bag, 120
B77109	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, white	.bag, 120
B77109L	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, white, Laser Mark Coded	.10 grids (120)

K77102 . . . . . red	K77104 . . . . . green	K77106 . . . . . orange	B77109 . . . . . White
K77103 . . . . . blue	K77105 . . . . . yellow	K77107 . . . . . violet	B77111 . . . natural, sterile

#### EU 0.2ml 8-Tube Strip, classic, regular profile



Fits all PCR and some qPCR cyler models which accept regular profile products.

See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
C79601	EU 0.2ml, Thin-wall 8-tube strip, Classic, Regular Profile, Ultra Clear, natural	.bag, 120
C79609	EU 0.2ml, Thin-wall 8-tube strip, Classic, Regular Profile, white	.bag, 120

C79602 . . . . . red	C79604 . . . . . green	C79606 . . . . . orange	C79608 . . . . . amber
C79603 . . . . . blue	C79605 . . . . . yellow	C79607 . . . . . violet	C79611 . . . natural, sterile

For 0.1 ml low profile 8-Tube Strips see page 44. For caps and EU seals, see pages 55 through 58.

# (q)PCR Products



## EU 0.2ml 8-Tube Strips, extra robust, regular profile, Tear Off Mat, fits Shell Frame Grids



The 96 x 0.2ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications and the 8-tube strips are barely attached to each other. One or more individual 8-tube strips can be easily torn off. For qPCR applications frosted or white mats are recommended. The mats can be used as plates or as a tear off partition of it. Furthermore the 96 x 0.2ml Tear Off 8-Tube Strip Mat can be "clicked in" specific (skirted) grids also called Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments and/or robotic applications. Fits all PCR and most qPCR cyclers which accept regular profile products, such as ABI/LT, Agilent®, Bio-Rad®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Ultra Clear, natural	.25 mats (300 strips)
B58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, natural	.25 mats (300 strips)
B58001L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, natural, Laser-Mark Coded	.25 mats (300 strips)
B58009	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, white,	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, white, Laser Mark Coded	.25 mats (300 strips)

K58002 .....red      K58003 .....blue      K58004 .....green      K58005 .....yellow

## 1.5.4 0.2 ml 8-Tube PCR Strips, High Profile

### EU 0.2ml 8-Tube Strips, high profile



Fits all PCR cycler models with height adjustable lids. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B79901	EU 0.2ml, Thin-wall 8-tube strip, High Profile, Ultra Clear, natural	.bag, 120
B79902 .....red	B79905 .....yellow	B79907 .....violet
B79903 .....blue	B79906 .....orange	B79911 .....natural, sterile



This product is superseded by the K77101 and will in time be discontinued.

## 1.5.5 0.2 ml 12-Tube (q)PCR Strips, Regular Profile

### EU 0.2ml 12-Tube Strips, extra robust, regular profile



Fits almost all PCR and qPCR cycler models which accept regular profile products such as ABI/LT, Agilent®, BIO-RAD®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Designed for PCR and qPCR applications. Closure can be accomplished with any EU 12-cap strip. For qPCR closure use B57821.

Order#	Description	Package Size
K56601	EU 0.2ml, Thin-wall 12-tube strip, Extra Robust, Regular Profile, Ultra Clear, natural	.bag, 80
B56601	EU 0.2ml, Thin-wall 12-tube strip, Extra Robust, Regular Profile, Frosted, natural	.bag, 80
B56609	EU 0.2ml, Thin-wall 12-tube strip, Extra Robust, Regular Profile, white,	.bag, 80
B56609L	EU 0.2ml, Thin-wall 12-tube strip, Extra Robust, Regular Profile, white, Laser Mark Coded	.10 grids (120)

B56602 .....red      B56604 .....green      B56606 .....orange      B56609 .....White  
 B56603 .....blue      B56605 .....yellow      B56607 .....violet      B56611 .....natural, sterile



For 0.1 ml low profile 12-Tube Strips, extra robust see page 46. For caps and EU seals, see pages 55 through 58.

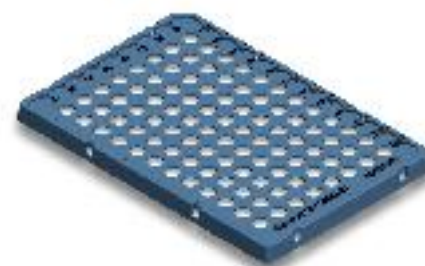


### 1.5.6 Make your own plate with Tube Support and Shell Frame Grids (SFG)

Shell frame and tube support grids hold plates, strips or individual tubes.

Shell Frame Grids are available in two universal formats whereas tube support grids are available in two formats (regular and wide). All grids have knobs either to “click in” or to fix assigned Shell Frame Grid EU tubes, strips and plates. Once the tube strips or plates are positioned, and after pipetting the required reagents, the grid is used as a carrier which can be placed in the thermal cycler.

Wide Area (use with click on strip-cap, color coding plates, C7... tubes and C7....tube strips)



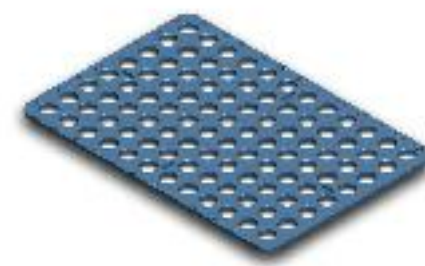
AB19805G

#### Shell Frame Grids to make semi skirted plates

Order#	Description	Package Size
AB19805G	Low Profile UNIVERSAL use, Yellow, Laser Mark Coded	.24 grids
AB17503G	Regular Profile UNIVERSAL use, Blue, Laser Mark Coded	.24 grids

#### Tube Support Grids to make non skirted plates

Order#	Description	Package Size
B69302	EU Pre-Post Tube support grid can hold SFG assigned products, regular, red	.8 grids
B69354	EU Pre-Post Tube support grid can hold SFG assigned products, wide, green	.8 grids



B69302

#### Assigned Shell Frame Grid fit-able products

##### 0.1 ml Low Profile Products

- EU 0.1ml, 8-tube strips, extra robust, low profile, fits SFG
- EU 0.1ml, 8-tube strips, robust, low profile, fits SFG
- EU 0.1ml, 8-tube strips, extra robust, low profile, Tear Off Mat, fits SFG
- EU 0.1ml, 8-tube strips with single attached optical wide area caps, low profile, fits SFG
- EU 96 x 0.1ml, robust, cut-able (q)PCR plate, fits SFG



##### 0.2 ml Regular Profile Products

- EU 0.2ml, 8-tube strips, extra robust, regular profile, fits SFG
- EU 0.2ml, 8-tube strips, robust, regular profile, fits SFG
- EU 0.2ml, 8-tube strips, extra robust, regular profile, Tear Off Mat, fits SFG
- EU 0.2ml, 8-tube strips with single attached optical wide area caps, low profile, fits SFG
- EU 96 x 0.2ml, robust, cut-able (q)PCR plate, fits SFG



For Shell Frame Grid assemblies and fit-able products see pages 74 through 79.

# (q)PCR Products



## 1.6.0 0.2 ml 8-Tube (q)PCR Strips, with Single Attached Caps, Regular Profile

### EU 0.2ml 8-Tube Strips with single attached optical wide area caps, regular profile, fits SFG

Fits almost all PCR and qPCR (fast) cyclers models which accept regular profile products, such as ABI/LT, Agilent®, BIO-RAD®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Designed for PCR and qPCR applications. Can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI/LT 0.2 ml cyclers use grid AB17503G and for making non skirted plates use grid B69304. See also: Shell Frame Grids.



Order#	Description	Package Size
K72910	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Ultra Clear, fits SFG, natural	stacked, 120
K72910B	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 300
B72910	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Frosted, fits SFG, natural	stacked, 120
B72911	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Frosted, fits SFG, natural	.bag, 120

K72912 ..... red	K72914 ..... green	K72916 ..... orange	K72921 ..... natural, sterile
K72913 ..... blue	K72915 ..... yellow	K72917 ..... violet	

Not available in the USA, alternative for the USA: B79501 + K7710

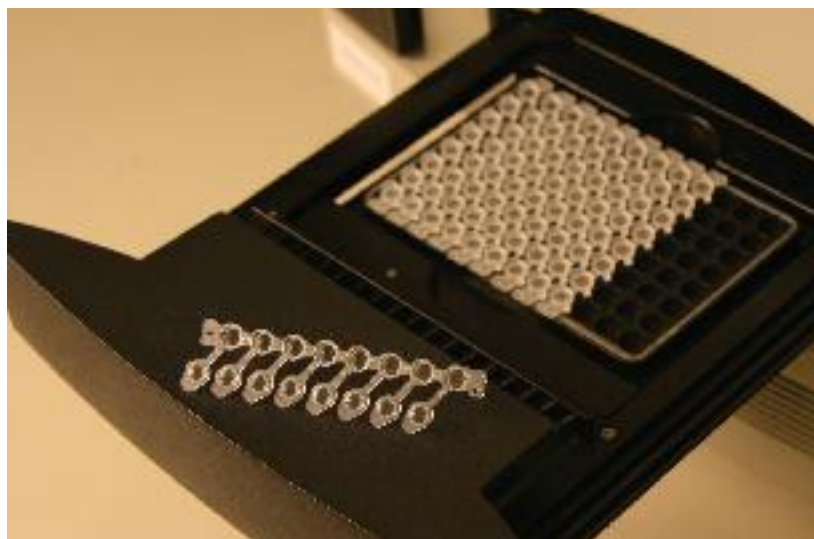
### EU 0.2ml 8-Tube Strips with single attached domed caps, regular profile

Fits almost all PCR models which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size	
C78201	EU 0.2ml, Thin-wall 8-tube strip with attached domes caps, Regular Profile, Ultra Clear, natural	.bag, 120	
C78202 ..... red	C78205 ..... yellow	C78208 ..... amber	C78211 ..... natural, sterile
C78203 ..... blue	C78206 ..... orange	C78209 ..... white	
C78204 ..... green	C78207 ..... violet	C78210 ..... black	

Not available in the USA, alternative for the USA: B79501 + K77101



For 0.1 ml low profile 8-Tube Strip with single attached wide optical area caps see page 47.





### 1.6.1 0.2 ml 8-Tube (q)PCR Strips, with Single Attached Caps, 2 component version

Fits almost all PCR and qPCR cyclers models which accept low profile products.  
See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Use white or frosted products for qPCR applications.



#### Component 1

##### EU 8-Cap-Strip with single attachable optical wide area indented caps

For closure of (q)PCR 8-Tube Strips type B77001, K77001, B77101, K77101.



Order#	Description	Package Size
B79501	EU 8-Single attachable optical wide area cap strip, natural	.bag, 120

#### Component 2

##### EU 0.2ml 8-Tube Strips, robust, regular profile

For creating 0.2ml thin-wall 8-Tube Strip with attached optical cap, regular profile.



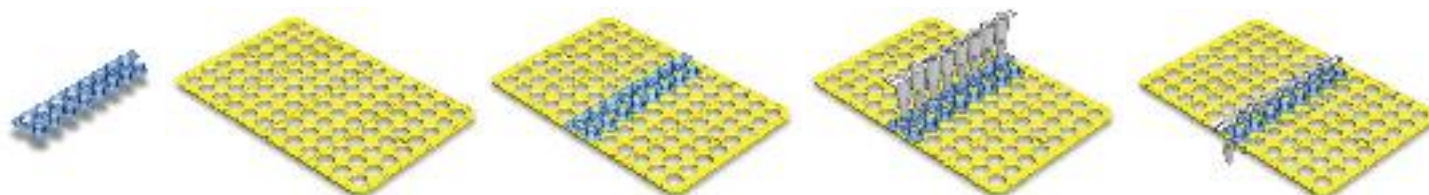
Order#	Description	Package Size
K77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Frosted, fits SFG, natural	.bag, 120
B77109	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, white	.bag, 120

Tip: Use this strip in white in conjunction with the 8 single attachable optical wide area caps to get highest signals and lowest possible cross contamination in qPCR procedures.

#### Advised work protocol for component 1 + 2

Creating low profile thin-wall 8-Tube Strip with single attached cap.

1. Position single attachable cap-strip in Tube Support Grid Wide (B69360, B69351).
2. Slide 8-tube-strip into the cap holes.
3. Apply reaction component in the wells, individually close the tubes and position in the cycler.



For 0.1 ml low profile 8-Tube Strips with single attached caps, 2 component version see page 48

# (q)PCR Products



## 1.6.2 0.2 ml 8-Tube (q)PCR Strips, with Single Attached Caps, High Profile

### EU 0.2ml 8-Tube Strips with single attached optical caps, high profile

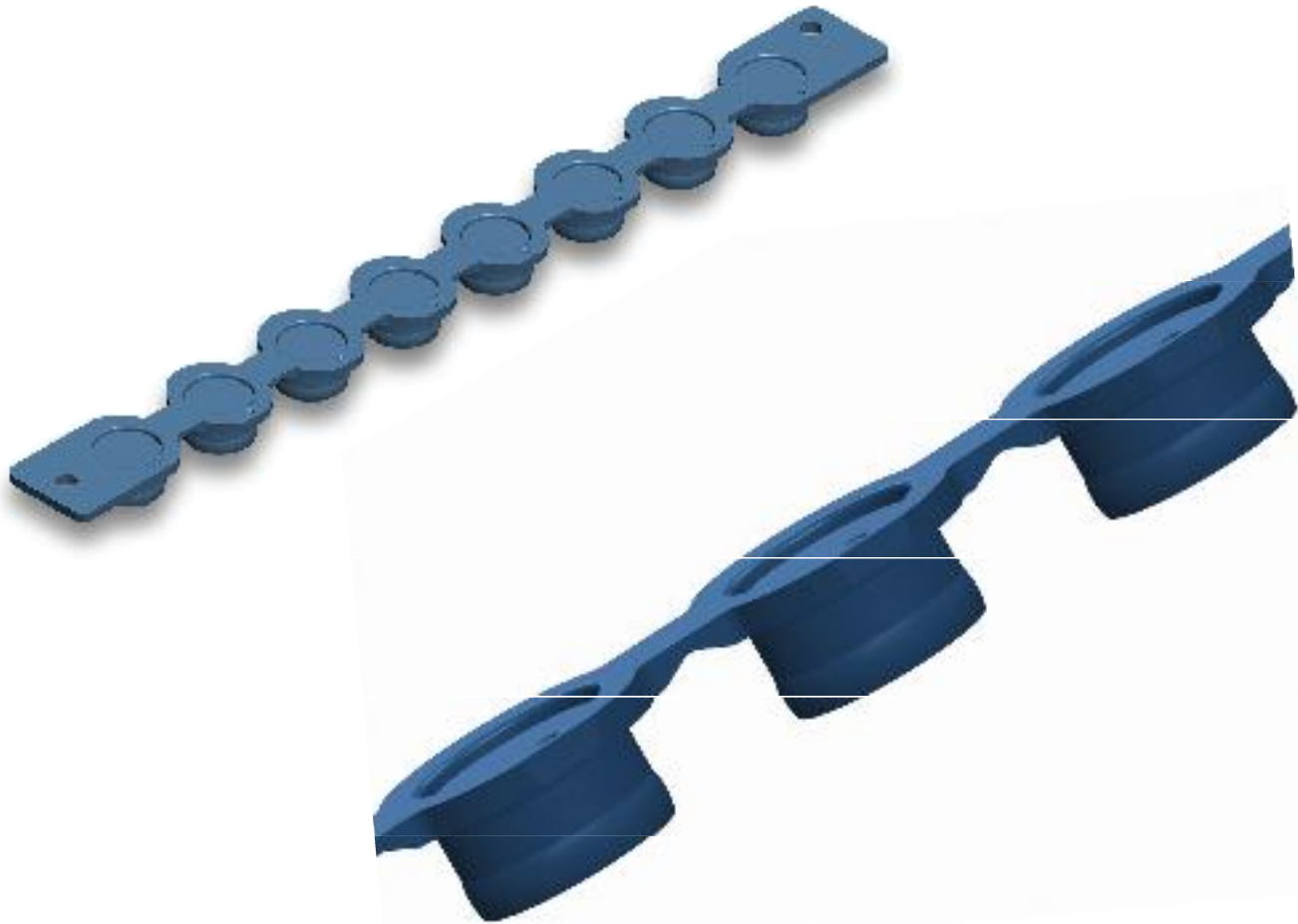
Fits all PCR cycler models which have height adjustable lids.  
See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
B79201	EU 0.2ml, Thin-wall 8-tube strip with attached cap, High Profile, Ultra Clear, natural	stacked, 120
B79201B	EU 0.2ml, Thin-wall 8-tube strip with attached cap, High Profile, Ultra Clear, natural	bag, 300
B79202	..... red	B79205 .....yellow
B79203	..... blue	B79206 .....orange
B79204	..... green	B79207 .....violet
		B79208 .....amber
		B79211 ...natural, sterile



This products is superseded by K72910  
Not available in the USA, alternative for the USA: B79501 + K77101



8-Cap Strip type B79701-1 with cleverly designed hinged caps for easy “one cap at a time” opening

For low profile 0.1ml 8-Tube (q)PCR Strips with single attached caps see page 47, for regular profile 0.2 ml 8-Tube (q)PCR Strips with single attached caps see page 64.



### 1.7.0 0.2 ml 24 & 48 (q)PCR Plates, Regular Profile

#### EU 24 x 0.2 ml (q)PCR Plate, semi skirted, regular profile



These EU 24 well regular profile plates are semi skirted and designed for (q)PCR applications. Fits almost all PCR and qPCR cyclers which accept regular profile products, such as ABI/LT, BIO-RAD®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B50240	EU 24 x 0.2 ml, Thin-wall plate Semi skirted, Regular Profile, frosted, natural	100 plates
B50240L	EU 24 x 0.2 ml, Thin-wall plate Semi skirted, frosted, Laser Mark Coded™, natural	100 plates
B50249	EU 24 x 0.2 ml, Thin-wall plate Semi skirted, Regular Profile, white	100 plates
B50249L	EU 24 x 0.2 ml, Thin-wall plate Semi skirted, frosted, Laser Mark Coded, white	100 plates

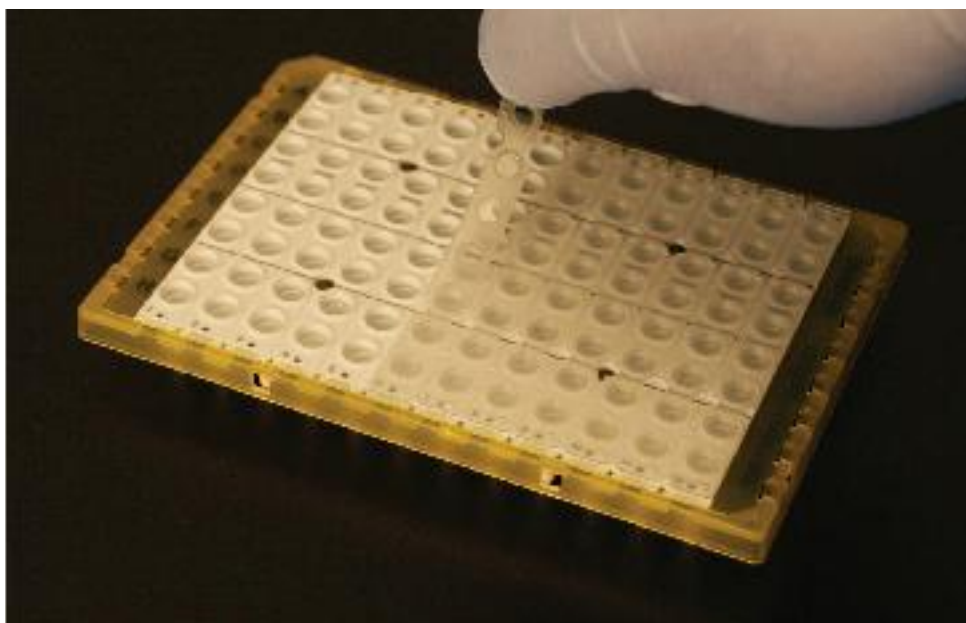
#### EU 48 x 0.2 ml (q)PCR Plate, non skirted, regular profile



These EU 48 well regular profile plates are non skirted and designed for (q)PCR applications. Fits almost all PCR and qPCR cyclers which accept regular profile products, such as ABI/LT, BIO-RAD®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B71501	EU 48 x 0.2 ml, Thin-wall plate Non skirted, Regular Profile, Ultra Clear, natural	50 plates
B71509	EU 48 x 0.2 ml, Thin-wall plate Non skirted, Regular Profile, white	50 plates



The Tear Off 8-Cap Strip Mat easily peels off from the Shell Frame Grid assembly.

For 0.1 ml low profile 24 & 48 (q)PCR plates, semi skirted see page 49. For caps and EU seals, see pages 55 through 58.

# (q)PCR Products

## 1.7.1 96 x 0.2 ml (q)PCR Plates, Non Skirted, Regular Profile

### EU 96 x 0.2ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)



This latest innovative product, designed for PCR and qPCR applications fits almost all PCR and qPCR cycler models which accept regular profile (RP) products, such as ABI/LT, Agilent®, BIO-RAD®, Eppendorf® and others. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Plates can be easily cut into 16, 24, 32 or 48-well pieces. Plates as a whole or part(s) of it can be "clicked in" BIOplastics Shell Frame Grids. This product is also available pre-assembled in Shell Frame Grids.

(see SFG assemblies). The plate enables high efficiency usage as well as the use of "two product only" strategy. For some ABI cyclers the use of Shell Frame Grid AB17503G is required. The use of these products combined with Shell Frame Grid type# AB17503G enables to position these products in any ABI, Life Technologies®, 0.2 ml (q)PCR cycler.

Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B70501-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits SFG, Ultra Clear, natural	.25 plates
B50501-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits SFG, Frosted, natural	.25 plates
B50501L-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Laser Mark Coded, Frosted, natural	.25 plates
B70509-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, white	.25 plates
B70509L-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Laser Mark Coded, white	.25 plates

### EU 96 x 0.2ml Mat of 8-Tube Strips, robust, regular profile, Tear Off Mat fits SFG



The 96 x 0.2ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications. The 8-tube strips are barely attached to each other making them a "plate". One or more individual 8-tube-strips can be easily torn off. For qPCR applications frosted or white mats are recommended. The Mats can be used as plates and/or as a torn off partition of it. Furthermore the 96 x 0.1 ml Tear Off 8-Tube Strip Mat can be clicked in specific (skirted) grids also called Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments or/and robotic applications. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Fits all PCR and qPCR cycler models which accept regular profile products, such as ABI/LT, Agilent®, BIO-RAD®, Eppendorf® and others. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
K58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Ultra Clear, natural	.25 mats (300 strips)
B58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, natural	.25 mats (300 strips)
B58001L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, Laser-Mark Coded, natural	.25 mats (300 strips)
B58009	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, white	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Laser-Mark Coded, white	.25 mats (300 strips)

K58002 ..... red      K58003 ..... blue      K58004 ..... green      K58005 ..... yellow

### EU 96 x 0.2ml robust, cut-able (q)PCR Plate, regular profile



These plates are designed for PCR and qPCR applications and fit almost all (q)PCR cycler models which accept regular profile (RP) products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

For qPCR we recommend the use of frosted or white products. Plates can be easily cut into 16, 24, 32 or 48-well pieces. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™.

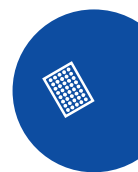
For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B70501	96 x 0.2ml, Thin-wall plate, Non skirted, cut-able, Ultra Clear, natural	.25 plates
B50501	96 x 0.2ml, Thin-wall plate, Non skirted, cut-able, Light Frosted, natural	.25 plates
B50501L	96 x 0.2ml, Thin-wall plate, Non skirted, cut-able, Frosted, Laser Mark coded, natural	.25 plates
B70509	96 x 0.2ml, Thin-wall plate, Non skirted, cut-able, white	.25 plates
B70509L	96 x 0.2ml, Thin-wall plate, Non skirted, cut-able, Light Frosted, Laser Mark coded, white	.25 plates

B70502 ..... red      B70504 ..... green      B70506 ..... orange      B70511 ..... natural, sterile  
 B70503 ..... blue      B70505 ..... yellow      B70507 ..... violet

For low profile 96 x 0.1 ml (q)PCR plates, non skirted see page 50. For caps and EU seals, see pages 55 through 58.



## 1.7.2 96 x 0.2 ml (q)PCR Plates, Semi Skirted, Regular Profile

### EU 96 x 0.2ml robust, (q)PCR Plate, BUDGET

These plates are designed for PCR and qPCR applications and fits most (q)PCR cyler models which accept regular profile (RP) products. For qPCR we recommend the use of frosted products or white products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



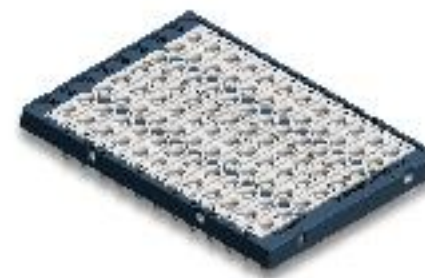
Order#	Description	Package Size
AB19700	96 x 0.2ml, Thin-wall plate, Semi skirted, Light Frosted, natural	.25 plates

### EU 96 x 0.2ml (q)PCR Shell Frame Grid assembly, fits ABI and Life Technologies® systems



This innovative assembly is composed of either a 96 x 0.2ml Cut-able plate(CT), or a 96 x 0.2ml Tear Off 8-Tube Strip Mat (TO) positioned in a Shell Frame Grid. Designed for universal use as well as to fit ABI and Life Technologies® systems. The assembly can be disassembled and unused parts can be removed (cut or torn off). The to be used cut part of the plate is reassembled in the Shell Frame Grid.

A dis-assembly toolkit (not required) is available under #B12345. White products are recommended for highest S/N ratios in qPCR. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. The total assembly, including each individual plate strip section is laser mark coded. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB17500L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
A5008001	96 x 0.2 ml, TO Plate SFG assembly ABI/LT, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17509L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, white	.25 assemblies
A5008009	96 x 0.2 ml, TO Plate SFG assembly ABI/LT, Tear Off, Laser Mark Coded, white	.25 assemblies

A5008009

### EU 96 x 0.2ml robust and cut-able (q)PCR Plate



Plates can be easily cut in sections of 3 rows. These plates fits also most (q)PCR Cyler models which accept regular profile (RP) products. For qPCR we recommend the use of frosted products or white products. Closure can be accomplished with any EU 8 or 12-cap strip and Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. Plate is robust, flat and can be color coded using a Pre-Post Tube support grid.



Order#	Description	Package Size
B50651	96 x 0.2 ml, Thin-wall, Semi skirted plate, RP, Light Frosted, Cut-able, natural	.25 plates
B50659	96 x 0.2 ml, Thin-wall, Semi skirted plate, RP, Light Frosted, Cut-able, white	.25 plates
B50659L	96 x 0.2 ml, Thin-wall, Semi skirted plate, RP, Laser Mark Coded, white	.25 plates

For low profile 96 x 0.1 ml (q)PCR plates, semi skirted see page 51. For caps and EU seals, see pages 55 through 58.

# (q)PCR Products



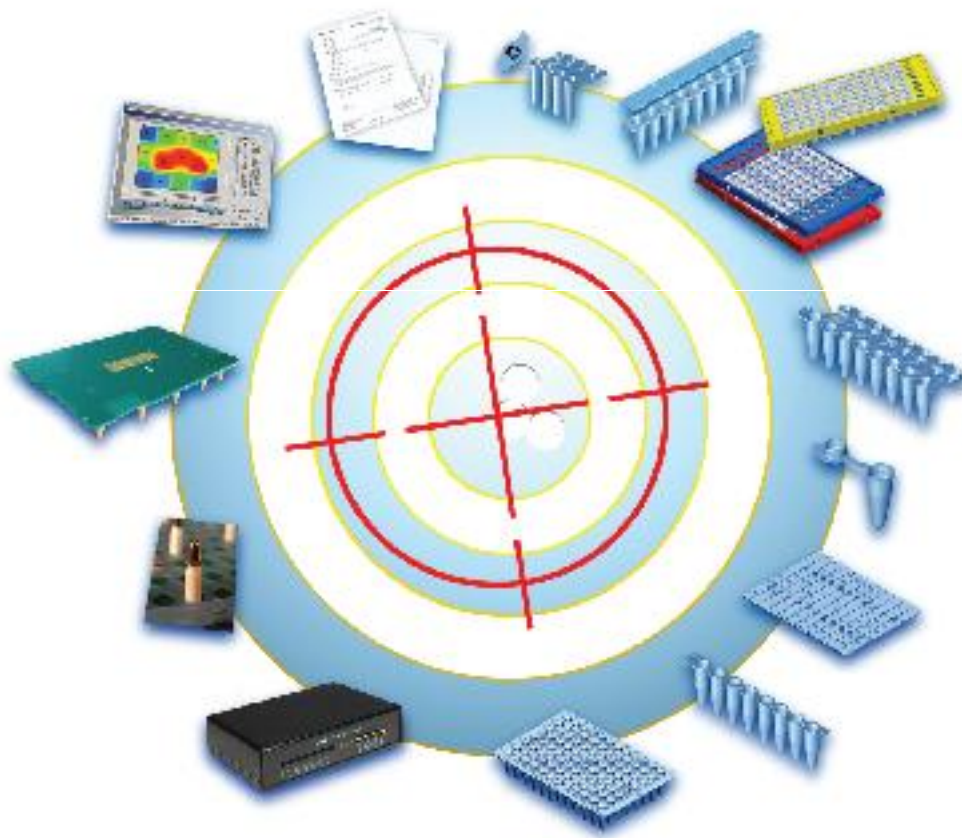
## EU 96 x 0.2ml extra robust (q)PCR plate, extra rigid

These plates have a very rigid, extra stabilized frame and the semi skirt makes them suited for robotic handling. These plates fits also most (q)PCR Cycler models which accept regular profile (RP) products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B70651	96 x 0.2 ml, Thin-wall, Semi skirted plate, RP, Ultra Clear, Extra Robust and Rigid, natural	.25 plates
B70659	96 x 0.2 ml, Thin-wall, Semi skirted plate, RP, Extra robust and Rigid, white	.25 plates

Colors available on request.



BIOplastics and CYCLERtest products and tools supports most accurate, precise and reproducible (q)PCR results.

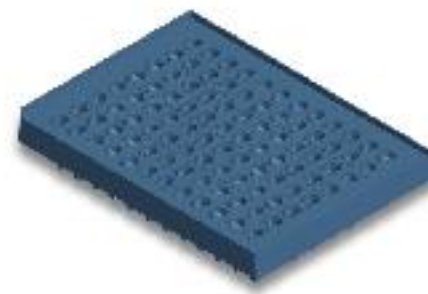
For low profile 96 x 0.1 ml (q)PCR Plate, semi skirted see page 51. For caps and EU seals, see pages 55 through 58.

### 1.7.3 96 x 0.2 ml (q)PCR Plates, Sub Skirted, Regular Profile

#### EU 96 x 0.2ml robust, (q)PCR plate, ABI/Life Technologies® cycler compatible



These plates are designed for PCR and qPCR applications and specifically to fit ABI/ Life Technologies® 0.2 ml systems. These plates fits also most (q)PCR Cycler models which accept regular profile (RP) products. Alternatively to this plate, one can opt for Shell Frame Grids (AB17503G) and its assemblies with either cut-able plates (B50501-1) or Tear Off Mats (B58001). Closure can be accomplished with any EU cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
AB17500	96 x 0.2ml, ABI/LT compatible, Thin-wall plate, Sub skirted, Frosted, natural	.25 plates
AB17509	96 x 0.2ml, ABI/LT compatible, Thin-wall plate, Sub skirted, white	.25 plates
BB17500L	96 x 0.2ml, ABI/LT compatible, Thin-wall plate, Sub skirted, Frosted, Laser Mark (Bar) Coded, natural	.25 plates
BB17509L	96 x 0.2ml, ABI/LT compatible, Thin-wall plate, Sub skirted, Frosted, Laser Mark (Bar) Coded, white	.25 plates

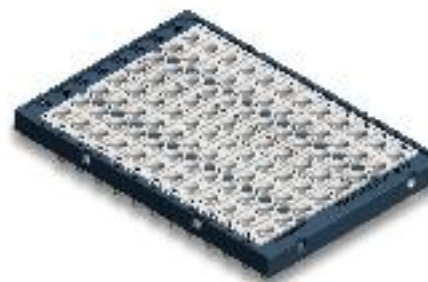
AB17502	red	AB17504	green	AB17506	orange	AB17511	natural, sterile
AB17503	blue	AB17505	yellow	AB17507	violet		

Alternatively ABI/Life Technologies® (q)PCR cyclers can also be equipped with Shell Frame Grids (AB17503G) and its assemblies either assembled with cut-able plates (B50501-1) or Tear Off Mats (B58001). See also Shell Frame Grids and Shell Frame Grids assemblies.

#### EU 96 x 0.2ml (q)PCR Shell Frame Grid assembly, fits ABI and Life Technologies® systems



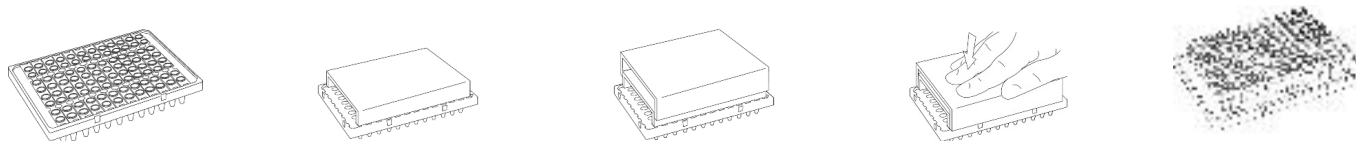
This innovative assembly is composed of either a 96 x 0.2ml Cut-able plate(CT), or a 96 x 0.2ml Tear Off 8-Tube Strip Mat (TO) positioned in a Shell Frame Grid. Designed for universal use as well as to fit ABI and Life Technologies® systems. The assembly can be disassembled and unused parts can be removed (cut or torn off). The to be used cut part of the plate is reassembled in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. White products are recommended for highest S/N ratios in qPCR. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. The total assembly, including each individual plate strip section is laser mark coded. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB17500L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
A5008001	96 x 0.2 ml, TO Plate SFG assembly ABI/LT, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17509L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, white	.25 assemblies
A5008009	96 x 0.2 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, white	.25 assemblies

A5008009

#### One step disassembly using Toolkit (Order# B12345)

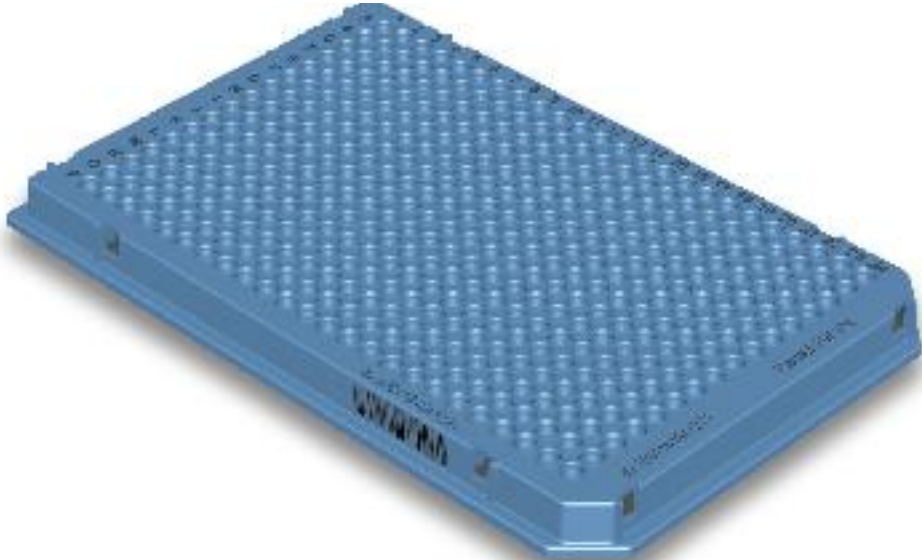


Instructions for assembling and disassembling Tube Strip Mats, parts of Tube Strip Mats and designated 8-Tube Strips in Shell Frame Grids see page 140.

For low profile 96 x 0.1 ml (q)PCR plates, sub skirted see page 52. For caps and EU seals, see pages 55 through 58.



B70519L, EU 384 well Thin-wall plate, Laser Marked Coded, white







### 1.7.4 384 well (q)PCR Plates

#### EU Thin-wall 384 well Plate, Roche LightCycler® 480 systems compatible, flat, robust, stackable and robotic friendly



This fully skirted 384 well EU plate is designed to fit Roche LightCycler® 480 systems. Optimized for robotic high-throughput applications. Can be used in many 384 well block (q)PCR cyclers models.

See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Plates are rigid, flat and stackable. Closure can be accomplished with one of the EU Seals (157300, 157200).

Plates contain BPLPM technology.



Order#	Description	Package Size
B71515L	EU 384 Well Thin-wall plate, Roche 480 Type, Laser Mark Coded, natural	.40 plates
B71519L	EU 384 Well Thin-wall plate, Roche 480 Type, Laser Mark Coded, white	.40 plates
B71519LB	EU 384 Well Thin-wall plate, Roche 480 Type, Laser Mark Bar Coded, white	.40 plates

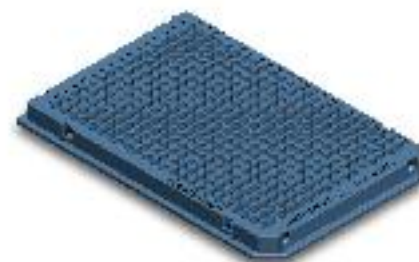
#### EU Thin-wall 384 well Plates, ABI and Life Technologies® cyclers compatible



This superior 384 well EU plate is designed to fit ABI and Life Technologies® cyclers, optimized for robotic applications. Allows high-throughput and low-volume processing. Can be used in many 384 well block (q)PCR cyclers models. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Plates are rigid, flat and stackable. Closure can be accomplished with one of the EU Seals (157300, 157200).

Plates contain BPLPM technology.



Order#	Description	Package Size
B70515L	EU 384 Well Thin-wall plate, ABI Type, Laser Mark Coded, natural	.40 plates
B70519L	EU 384 Well Thin-wall plate, ABI Type, Laser Mark Coded, white	.40 plates
B70515LB	EU 384 Well Thin-wall plate, ABI Type, Laser Mark Bar Coded, natural	.40 plates

#### EU Thin-wall 384 well plate, flat, robust, stackable and robotic friendly



This superior fully skirted 384 well EU plate is designed to fit standard 384 well cyclers, optimized for robotic applications. Allows for high-throughput, low-volume processing. Can be used in many 384 well block (q)PCR cyclers models. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates are rigid, flat and stackable.

Closure can be accomplished with one of the EU Seals (157300, 157200).



Order#	Description	Package Size
B70515	EU 384 Well Thin-wall plate, rigid, stackable, natural	.40 plates
B70519	EU 384 Well Thin-wall plate, rigid, stackable, white	.40 plates

For EU seals see pages 57 and 58.

## 1.8.0 Shell Frame Grid Assemblies and Parts

### Benefits:

- “One product only” to equip your whole 0.1 ml (q)PCR cyclers assortment
- “One product only” to equip your whole 0.2 ml (q)PCR cyclers assortment
- One chemistry strategy, one format only and full flexibility

Shell Frame Grids assemblies and Shell Frame Grid fit-able products enables the use of “two products only” for all your PCR and qPCR reactions, regardless model and brand of your thermal cycler.

Shell Frame Grid fit-able products can be used solely or in combination with Shell Frame. A selected number of cut-able plates, Tear Off 8-Tube Strip Mats, 8-tube strips, 8-tubes strips with attached caps and single tubes, all “Shell Frame Grid compatible”, can be “clicked” into the Shell Frame Grid and enables creating your own format.



### Shell Frame Grid assemblies

Composed of either a 96 x 0.1 ml Cut-able plate (CT), or a 96 x 0.1 ml Tear Off 8-Tube Strip Mat (TO) positioned in a Shell Frame Grid. The individual 8 strips, also in the cut-able plate version, are laser mark coded with a strip # 1 to 12 as well as that each strip has a unique ID#. In all cases one has full traceability and a unique ID for each strip or plate part. Furthermore the Shell Frame Grid has a unique ID# next to the alphanumeric laser marking.

### Assemblies:

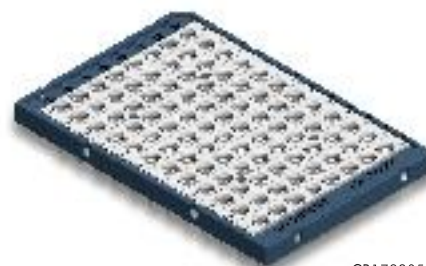
- Unique laser coded, semi skirted
- Each “plate-strip” has a unique ID#
- Alphanumeric and pipetting “help lines” laser marked
- Ideal for all PCR and qPCR applications
- Fits all thermal cyclers (PCR & qPCR)
- Robotic friendly

### Universal Assemblies 96 x 0.1 ml, Low Profile



Fits all (q)PCR cyclers which accept low profile products.  
See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
CB179805U	96 x 0.1 ml, CT Plate SFG Yellow assembly, Cut-able, Grid ID, Ultra Clear, natural	.25 assemblies
CB179805F	96 x 0.1 ml, CT Plate SFG Yellow assembly, Cut-able, Grid, Plate & strip ID, Frosted, natural	.25 assemblies
CB179805W	96 x 0.1 ml, CT Plate SFG Yellow assembly, Cut-able, Grid, Plate & strip ID, white	.25 assemblies
A8059001U	96 x 0.1 ml, TO Plate SFG Yellow assembly, Tear Off, Grid ID, Ultra Clear, natural	.25 assemblies
A8059001F	96 x 0.1 ml, TO Plate SFG Yellow assembly, Tear Off, Grid, Plate & strip ID, Frosted, natural	.25 assemblies
A8059009	96 x 0.1 ml, TO Plate SFG Yellow assembly, Tear Off, Grid Plate & strip ID, white	.25 assemblies



CB179805U

### Universal Assemblies 96 x 0.2 ml, Regular Profile



Fits all (q)PCR cyclers which accept regular profile products.  
See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
CB17503U	96 x 0.2 ml, CT Plate SFG Blue assembly, Cut-able, Grid ID, Ultra Clear, natural	.25 assemblies
CB17503F	96 x 0.2 ml, CT Plate SFG Blue assembly, Cut-able, Grid Plate & strip ID, Frosted, natural	.25 assemblies
CB17503W	96 x 0.2 ml, CT Plate SFG Blue assembly, Cut-able, Grid Plate & strip ID, white	.25 assemblies
A5038001U	96 x 0.2 ml, TO Plate SFG Blue assembly, Tear Off, Grid ID, Ultra Clear, natural	.25 assemblies
A5038001F	96 x 0.2 ml, TO Plate SFG Blue assembly, Tear Off, Grid, Plate & strip ID, Frosted, natural	.25 assemblies
A5038009	96 x 0.2 ml, TO Plate SFG Blue assembly, Tear Off, Grid Plate & strip ID, white	.25 assemblies



A5038001U

For caps and EU seals, see pages 55 through 58.

## EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, fits Roche LightCycler® 480 systems



Designed to be used specifically in Roche Lightcycler® 480 systems and other (q)PCR cyclers or robotic applications. The assembly can be disassembled and unused parts can be removed (cut or torn off). The to be used cut part of the plate is reassembled in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. White products are recommended for highest S/N ratios in qPCR. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB17480L	96 x 0.1 ml, CT Plate SFG assembly Roche, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17489L	96 x 0.1 ml, CT Plate SFG assembly Roche, Cut-able, Laser Mark Coded, White	.25 assemblies
A4809001	96 x 0.1 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
A4899009	96 x 0.1 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, white	.25 assemblies

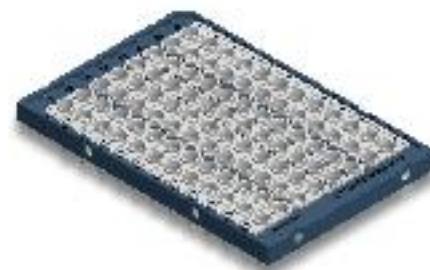
CB17480L



## EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, ABI Fast/Life Technologies® cyclers compatible



Designed to be used specifically in, but not limited to, ABI/ Life Technologies® Fast or 0.1 ml cyclers and robotic applications. The assembly can be disassembled and unused parts can be removed (cut or torn off). The to be used cut part of the plate is reassembled in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB179800L	96 x 0.1 ml, CT Plate SFG assembly ABI/LT Fast, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB179809L	96 x 0.1 ml, CT Plate SFG assembly ABI/LT Fast, Cut-able, Laser Mark Coded, white	.25 assemblies
A8009001	96 x 0.1 ml, TO Plate SFG assembly ABI/LT Fast, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
A8099009	96 x 0.1 ml, TO Plate SFG assembly ABI/LT Fast, Tear Off, Laser Mark Coded, white	.25 assemblies

A8009001

## EU 96 x 0.2ml (q)PCR Shell Frame Grid assembly, fits ABI and Life Technologies® systems



Designed for universal use as well as to fit ABI and Life Technologies® systems. The assembly can be disassembled and unused parts can be removed (cut or torn off). The to be used cut part of the plate is reassembled in the Shell Frame Grid. A dis-assembly toolkit (not required) is available under #B12345. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).



Order#	Description	Package Size
CB17500L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17509L	96 x 0.2 ml, CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, white	.25 assemblies
A5008001	96 x 0.2 ml, TO Plate SFG assembly ABI/LT, Tear Off, Laser Mark Coded, Frosted, natural	.25 assemblies
A5008009	96 x 0.2 ml, TO Plate SFG assembly Roche, Tear Off, Laser Mark Coded, white	.25 assemblies

A5008001

For caps and EU seals, see pages 55 through 58.

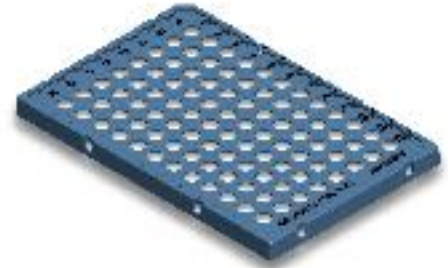


## 1.8.1 Shell Frame Grid Parts

### Shell Frame Grids

Grids without Shell Frame Grid fit-able products

Order#	Description	Package Size
AB19805G	Low Profile UNIVERSAL use, Yellow, Laser Mark Coded	.24 grids
AB17503G	Regular Profile UNIVERSAL use, Blue, Laser Mark Coded	.24 grids
B17489G	Roche LightCycler® 480 systems, Low Profile, White, Laser Mark Coded	.24 grids
AB19805G	ABI Fast/Life Technologies® 0.1 ml format, Low Profile, Yellow, Laser Mark Coded	.24 grids
AB17503G	ABI/Life Technologies® 0.2 ml format Blue, Laser Mark Coded	.24 grids
B12345	One step (Dis)-Assembling/Toolkit for Shell Frame Grids (SFG)	.1 kit



AB19805G

### Durable Shell Frame Grids

Instead of the disposable Shell Frame Grids you may opt using a permanent solution by selecting specific, non disposable and durable Shell Frame Grids, which accepts all type of Shell Frame Grid compatible “click in” disposables.

Durable Shell Frame Grids are robust, stiff, reusable and made of durable HPL.

#### Durable Shell Frame Grids (permanent)

- Semi or fully skirted, labeled and Laser Mark Coded
- Alphanumeric and pipetting “help lines” laser marked
- Ideal for all PCR and qPCR applications
- Fits designated specific Thermal cyclers (PCR & qPCR)
- Accepts Shell Frame Grid compatible “click in” disposables
- Can be used for robotic applications
- Available in fully skirted versions



#### Shell Frame Grids and EU Adaptors (durable, permanent)

Order#	Description	Package Size
AB19805X	SFG, LP, UNIVERSAL and ABI Fast /Life Technologies® 0.1 ml format use, durable, reusable, Laser Mark Coded	.1 Grid
AB17503X	SFG, RP, UNIVERSAL and ABI/Life Technologies® 0.2 ml format use, durable, reusable, Laser Mark Coded	.1 Grid
B17489X	SFG, Roche LightCycler® 480 systems, LP, durable, reusable, Laser Mark Coded	.1 Grid
B70671X	SFG, LP, UNIVERSAL, FULLY SKIRTED, durable, reusable, Laser Mark Coded, Robotic Applications	.1 Grid
AB19700X	SFG, RP, UNIVERSAL, FULLY SKIRTED, durable, reusable, Laser Mark Coded, Robotic Applications	.1 Grid

## 1.8.2 Shell Frame Grid Fit-able 8-Tube Strips

### EU 0.1 ml 8-Tube Strips, extra robust, low profile fits Shell Frame Grids



Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products.

Order#	Description	Package Size
K59901	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, Ultra Clear, fits SFG, natural	.bag, 120
B59901	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, Frosted, fits SFG, natural	.bag, 120
B59909	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, fits SFG, white	.bag, 120
B59909L	EU 0.1 ml, Thin-wall 8-tube strip, Extra Robust, Low Profile, fits SFG, Laser Mark Coded, white	10 grids (120)



### EU 0.1 ml 8-Tube Strips, robust, low profile, fits Shell Frame Grids



This strip can also be used in combination with the 8-single attachable indented cap strip (B79501).  
Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products.

Order#	Description	Package Size
K77001	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77001	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, Frosted, fits SFG, natural	.bag, 120
B77009	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, white	.bag, 120
B77009L	EU 0.1 ml, Thin-wall 8-tube strip, Robust, Low Profile, fits SFG, Laser Mark Coded, white	10 grids (120)

K77002	..... red	K77004	..... green	K77006	..... orange	B77009	..... White
K77003	..... blue	K77005	..... yellow	K77007	..... violet	B77011	..... natural, sterile



### EU 0.1 ml 8-Tube Strips, extra robust, low profile, Tear Off Mat, fits Shell Frame Grids



The 96 x 0.1 ml Tear Off 8-Tube Strip Mat fits almost all PCR and qPCR (fast) cyclers models which accept low profile products.

Order#	Description	Package Size
K59001	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Ultra Clear, natural	.25 mats (300 strips)
B59001	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural	.25 mats (300 strips)
B59001L	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, Laser Mark Coded, natural	.25 mats (300 strips)
B59009	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, white	.25 mats (300 strips)
B59009L	EU 96 x 0.1 ml, 8-tube strip Tear Off Mat, Low Profile, Laser Mark Coded, white	.25 mats (300 strips)

K59002	..... red	K59003	..... blue	K59004	..... green	K59005	..... yellow
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### EU 0.1 ml 8-Tube Strips with single attached optical wide area caps, low profile, fits Shell Frame Grids



Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products.

Order#	Description	Package Size
K72810	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Ultra Clear, fits SFG, natural	.....stacked, 120
K72810B	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Ultra Clear, fits SFG, natural	.....bag, 300
B72810	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Frosted, fits SFG, natural	.....stacked, 120
B72811	EU 0.1 ml, Thin-wall 8-tube strip with attached optical cap, Low Profile, Frosted, fits SFG, natural	.....bag, 120

Not available in the USA, alternative for the USA: B79501 + B77001



For caps and EU seals, see pages 55 through 58.

# (q)PCR Products



## EU 0.2ml 8-Tube Strips, extra robust, regular profile, fits Shell Frame Grids



Fits almost all PCR and qPCR cycler models which accept regular profile products.

Order#	Description	Package Size
K69901	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 120
B69901	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, Frosted, fits SFG, natural	.bag, 120
B69909	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, white	.bag, 120
B69909L	EU 0.2ml, Thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, Laser Mark Coded, white	.10 grids (120)



## EU 0.2ml 8-Tube Strips, robust, regular profile, fits Shell Frame Grids



This strip can also be used in combination with the 8-single attachable indented cap strip (B79501). Fits almost all PCR and qPCR (fast) cycler models which accept regular profile products.

Order#	Description	Package Size
K77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 120
B77101	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, Frosted, fits SFG, natural	.bag, 120
B77109	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, white	.bag, 120
B77109L	EU 0.2ml, Thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, Laser Mark Coded, white	.10 grids (120)

K77102	..... red	K77104	..... green	K77106	..... orange	B77109	..... white
K77103	..... blue	K77105	..... yellow	K77107	..... violet	B77111	..... natural, sterile



## EU 0.2ml 8-Tube Strips, extra robust, regular profile, Tear Off Mat, fits Shell Frame Grids



The 96 x 0.2ml Tear Off 8-Tube Strip Mat fits all PCR and most qPCR cycler models which accept regular profile products.

Order#	Description	Package Size
K58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Ultra Clear, natural	.25 mats (300 strips)
B58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, natural	.25 mats (300 strips)
B58001L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, Laser Mark Coded, natural	.25 mats (300 strips)
B58009	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, white	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Laser Mark Coded, white	.25 mats (300 strips)

K58002	..... red	K58003	..... blue	K58004	..... green	K58005	..... yellow
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## EU 0.2ml 8-Tube Strips with single attached optical wide area caps, regular profile, fits Shell Frame Grids

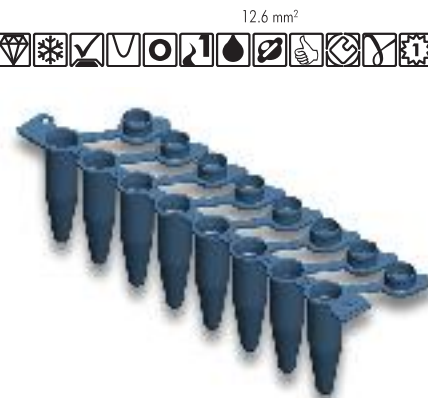


Fits almost all PCR and qPCR (fast) cycler models which accept regular profile products.

Order#	Description	Package Size
K72910	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Ultra Clear, fits SFG, natural	.stacked, 120
K72910B	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Ultra Clear, fits SFG, natural	.bag, 300
B72910	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Frosted, fits SFG, natural	.stacked, 120
B72911	EU 0.2ml, Thin-wall 8-tube strip with attached optical cap, Regular Profile, Frosted, fits SFG, natural	.bag, 120

K72912	..... red	K72914	..... green	K72916	..... orange	K72921	..... natural, sterile
K72913	..... blue	K72915	..... yellow	K72917	..... violet		

Not available in the USA, alternative for the USA: B79501 + K77101  
For caps and EU seals, see pages 55 through 58.



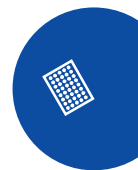
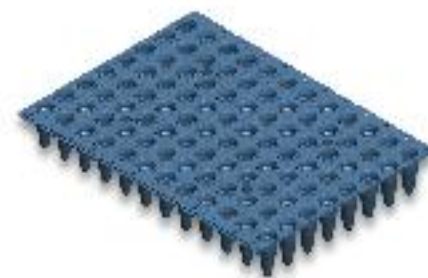
### 1.8.3 Shell Frame Grid Fit-able Plates



#### EU 96 x 0.1 ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)

This latest innovative product designed for PCR and qPCR applications, fits almost all PCR and qPCR (fast) cyclers models.

Order#	Description	Package Size
B60101-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Ultra Clear, natural	.25 plates
B50601-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Frosted, natural	.25 plates
B60109-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, white	.25 plates
B50601L-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Frosted, Laser Mark Coded, natural	.25 plates
B60109L-1	96 x 0.1ml, Thin-wall plate, Non skirted, fits SFG, Laser Mark Coded, white	.25 plates



#### EU 0.1ml 8-Tube Strips, extra robust, low profile, Tear Off Mat, fits Shell Frame Grid (SFG)

The 96 x 0.1ml Tear Off 8-Tube Strip Mat fits almost all PCR and qPCR (fast) cycler models which accept low profile products.



Order#	Description	Package Size
K59001	EU 96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Ultra Clear, natural	.25 mats (300 strips)
B59001	EU 96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, natural	.25 mats (300 strips)
B59001L	EU 96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Frosted, Laser Mark Coded, natural	.25 mats (300 strips)
B59009	EU 96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, white,	.25 mats (300 strips)
B59009L	EU 96 x 0.1ml, 8-tube strip Tear Off Mat, Low Profile, Laser-Mark Coded, white	.25 mats (300 strips)

K59002 ..... red      K59003 ..... .blue      K59004 ..... .green      K59005 ..... .yellow



#### EU 96 x 0.2ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)

Fits almost all PCR and qPCR cycler models which accept regular profile (RP) products.



Order#	Description	Package Size
B70501-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Ultra Clear, natural	.25 plates
B50501-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Frosted, natural	.25 plates
B50501L-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Frosted, Laser Mark Coded, natural	.25 plates
B70509-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, white	.25 plates
B70509L-1	96 x 0.2ml, Thin-wall plate, Non skirted, fits Shell Frame Grids, Laser Mark Coded, white	.25 plates



#### EU 0.2ml 8-Tube Strips, extra robust, regular profile, Tear Off Mat, fits Shell Frame Grids

The 96 x 0.2ml Tear Off 8-Tube Strip Mat fits all PCR and most qPCR cycler models which accept regular profile products.



Order#	Description	Package Size
K58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Ultra Clear, natural	.25 mats (300 strips)
B58001	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, natural	.25 mats (300 strips)
B58001L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Frosted, Laser Mark Coded, natural	.25 mats (300 strips)
B58009	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, white	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml, 8-tube strip Tear Off Mat, Regular Profile, Laser Mark Coded, white	.25 mats (300 strips)

K58002 ..... red      K58003 ..... .blue      K58004 ..... .green      K58005 ..... .yellow



For caps and EU seals, see pages 55 through 58.



## 1.9.0 Optical qPCR and PCR Caps-Strips and Mats

Order#	Product Name	Material	Adhesive	Long term cold storage	Pierce-able	Optical for qPCR	Easy removal
B79701-1	8-cap strip with wide indented flat cap	polypropylene	No	Yes	No	Yes	Yes
B57651	8-cap strip with wide indented flat cap, Tear Off Mat	polypropylene	No	Yes	No	Yes	Yes
B57601	EU Optical Wide cap-plate 96 format	polypropylene	No	Yes	No	Yes	Moderate
157300	Opti-Seal™, optical, disposable, adhesive	Polyester	Yes	Yes	No	Yes	Moderate
157400	Opti-Seal™, Tear Off optical, disposable, adhesive	Polyester	Yes	Yes	No	Yes	Yes
157200	EU Alu-Seal™ disposable, adhesive	Aluminum	Yes	Yes	Yes	No	Moderate

### Optical wide area 8-Cap Strip robust with wide indented flat cap

Optimized for qPCR and PCR applications. Indented caps prevents “finger touch” signal interference. For closure of all BIOplastics type (q)PCR tubes, strips and plates.

Order#	Description	Package Size
B57801	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural	.bag, 120
B57801B	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural	.bag, 300
B57811	EU Optical Wide 8-cap strip, with wide indented flat cap, Robust, natural, sterile	.bag, 120



### Optical wide area 8-Cap Strip with wide indented flat cap

Designed and optimized for PCR and qPCR applications. Indented caps prevents “finger touch” signal interference. This cap-strip is the optimized version of the, by 2013 discontinued, Optical Flat thin wall 8-cap strip. For closure of all BIOplastics type (q)PCR tubes, strips and plates.

Order#	Description	Package Size
B79701-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural	.bag, 120
B79701B-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural	.bag, 300
B79711-1	EU Optical Wide 8-cap strip, with wide indented flat cap, natural, sterile	.bag, 120



For 0.1 ml low profile 8-Tube Strips see page 44 and 45, for 0.2 ml regular profile 8-Tube Strips see page 61 and 62. For 0.1 ml low profile plates see pages 49 to 52, for 0.2 ml regular profile plates see pages 68 to 71.





## Optical wide area 8-single attachable wide indented flat Cap Strip

Can only be used in combination with (q)PCR 8-tube strips type B77001/K77001 (LP) and B77101/K77101 (RP).

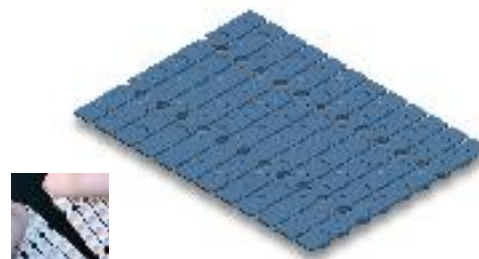
Order#	Description	Package Size
B79501	EU 8-Single attachable Optical Wide indented cap strip, natural	.bag, 120



## Optical wide area 8-Cap Strip, robust with wide indented flat cap, Tear Off Mat

The Tear Off 8-Cap Strip Mat is designed and optimized for PCR and qPCR applications. The extra robust 8-cap strips are barely attached to each other. One or more individual 8-cap strips can be easily torn off. For closure of all BIoplastics type (q)PCR tube strips and plates.

Order#	Description	Package Size
B57651	EU Optical Wide 8-cap strip mat, Robust with wide indented flat cap, natural	.25 mats (300 strips)



## Optical wide area 12-Cap Strip, robust with wide indented flat cap

Optimized for qPCR and PCR applications. Indented caps prevents "finger touch" signal interference. For closure of all BIoplastics type (q)PCR 12-tube strips and plates.

Order#	Description	Package Size
B57821	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 80
B57821B	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 200
B57831	EU Optical Wide 12-cap strip, with wide indented flat cap, natural, sterile	.bag, 80



For 0.1 ml low profile 8-Tube Strips see page 44 and 45, for 0.2 ml regular profile 8-Tube Strips see page 61 and 62. For 0.1 ml low profile plates see pages 49 to 52, for 0.2 ml regular profile plates see pages 68 to 71.



## 1.9.1 PCR Cap Strips

### Semi domed thin-wall 8-Cap Strip

For closure of all BIOplastics type PCR tubes, strips and plates. For qPCR optimized signals use B57801 or B79701-1, EU Wide Optical 8-Cap Strip.



Order#	Description	Package Size
C79701	EU Semi-Domed Thin-wall 8-cap strip, natural	.bag, 120
C79701B	EU Semi-Domed Thin-wall 8-cap strip, natural	.bag, 300
C79702	.....red	
C79703	.....blue	
C79704	.....green	
C79705	.....yellow	
C79706	.....orange	
C79707	.....violet	
C79708	.....amber	
C79711	.....natural, sterile	



### Robust indented flat 8-Cap Strip

For closure of all BIOplastics type PCR tubes, strips and plates. For qPCR optimized signals use B57801 or B79701-1, EU Wide Optical 8-Cap Strip.



Order#	Description	Package Size
B75701	EU Thin-wall 8-cap strip, robust, natural	.bag, 120
B75701B	EU Thin-wall 8-cap strip, robust, natural	.bag, 300
B75702	.....red	
B75703	.....blue	
B75704	.....green	
B75705	.....yellow	
B75706	.....orange	
B75707	.....violet	
B75708	.....amber	
B75709	.....white	
B75711	.....natural, sterile	



### Optical wide area 12-Cap Strip robust with wide indented flat cap

Optimized for qPCR and PCR applications. Indented caps prevents "finger touch" signal interference. For closure of all BIOplastics type (q)PCR 12-tube strips and plates.



Order#	Description	Package Size
B57821	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 80
B57821B	EU Optical Wide 12-cap strip, with wide indented flat cap, natural	.bag, 200
B57831	EU Optical Wide 12-cap strip, with wide indented flat cap, natural, sterile	.bag, 80



### Robust indented flat 12-Cap Strip

For closure of all BIOplastics type PCR 12 tube-strips and plates. For qPCR optimized signals use Wide Optical Cap Strips and mats.



Order#	Description	Package Size
B56501	EU Thin-wall 12-cap strip, robust, natural	.bag, 80
B56501B	EU Thin-wall 12-cap strip, robust, natural	.bag, 200
B56502	.....red	
B56503	.....blue	
B56504	.....green	
B56505	.....yellow	
B56506	.....orange	
B56507	.....violet	
B56508	.....amber	
B56511	.....natural, sterile	



For 0.1 ml low profile 8-Tube Strips see page 44 and 45, for 0.2 ml regular profile 8-Tube Strips see page 61 and 62. For 0.1 ml low profile plates see pages 49 to 52, for 0.2 ml regular profile plates see pages 68 to 71.



## 1.9.2 qPCR and PCR Cap Plates and Seals

### Optical wide area Cap Plate 96 format with indented flat cap

Optimized for PCR and qPCR applications. Indented caps prevent “finger touch” signal interference. For closure of all BIOplastics type (q)PCR tube-strips and plates as well as for BIOplastics titer dilution and (cryo) storage tubes. Easy to cut with scissors to required format.

Order#	Description	Package Size
857601	EU Optical Wide cap-plate 96 format, with indented flat cap, Cut-able, natural	25 plates



### Opti-Seal™ optical disposable adhesive, classic version

Opti-Seal™ provides the best sealing option for EU plates. The EU Opti-Seal™ is non pierce-able and can be easily removed after the (q)PCR reaction is performed. Pressure applied by the heated lid of the thermal cycler, is needed to keep the seal well closed during thermal cycling. Opti-Seal™ generates excellent results and is designed and tested to be used in Real-Time PCR applications.

Order#	Description	Package Size
157300	Opti-Seal™, optical, disposable, adhesive	100 sheets



### Opti-Seal™ Tear Off, optical disposable adhesive with 8-strip Tear Off option

Opti-Seal™ Tear Off provides an excellent sealing option for EU plates, parts of it or strips. Opti-Seal™ Tear Off is non pierce-able and has a perforation every 9 mm which enables tearing off one or more strips or several strips to seal part of a plate. Pressure applied by the heated lid of the thermal cycler, is needed to keep the seal well closed during thermal cycling. Opti-Seal™ generates excellent results and is designed to be used in Real-Time PCR applications.

Order#	Description	Package Size
157400	Opti-Seal™, Tear Off optical, disposable, adhesive	100 sheets



### Alu-Seal™ disposable adhesive, extra thick

Alu-Seal™ provides a good sealing option for plates. The Alu-Seal™ is pierce-able and can be easily removed. It can be used in a wide range of applications like PCR, incubation and freezer storage. Note that Alu-Seal™ is the most robust seal available on the market. Handle the Alu-Seal™ with care to prevent possible (cutting) injuries.

Order#	Description	Package Size
157200	EU Alu-Seal™ disposable, adhesive	100 sheets



For 0.1 ml low profile 8-Tube Strips see page 44 and 45, for 0.2 ml regular profile 8-Tube Strips see page 61 and 62. For 0.1 ml low profile plates see pages 49 to 52, for 0.2 ml regular profile plates see pages 68 to 71.



## 2. GRADIENT FILTERTIPS

BIOplastics Gradient filtertips provide a superior protection against aerosols that could contaminate your pipette, cross-contaminate your sample, and contaminate your valuable reaction set up. The protection that is given by the 18  $\mu\text{m}$  gradient Self Sealing pores is optimal and enables precise and reproducible pipetting. In general, the use of SSNC (Self Sealing Non-Collapsing) filtertips protects against cross-contamination. Read more about this topic on pages 76 “The essence of filter material”.

How to find the right tip for your application and pipette .....	page 85
The essence of filter material .....	page 91

2.1. SSNC Filtertips .....	page 92
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Use the Tip Selector Chart in this catalog, or the dynamic on-line Tip Database at our website [www.bioplastics.com](http://www.bioplastics.com) to find the right tip for your application.





## How to find the right tip for your application and pipette

We would like to assist you in making the right choice of tip or filter tip for your pipette. Use the Tip Selector Chart in this catalog, or the dynamic on-line Tip Database at our website [www.bioplastics.com](http://www.bioplastics.com) to find exactly the right tip for your application. Find tips in this catalog: use the tip selector charts. Use the tip selector charts in 2 simple steps:

From the Pipette Tip Selector Chart 1 (pages 86 to 89), choose the brand of pipette (e.g. 1 channel Gilson P200 20 - 200  $\mu$ l). You will find the type of tips you need (e.g. type B & D). Some tips are so similar in shape that they will fit the same brands/volume of pipette, but differ in length or other specifications.

From the Pipette Tip Family Chart 2 (page 90), look up this type (e.g. type A) and choose which other specifications you need (e.g. SSNC filtertip). You will find the basic order number and the catalog page of this tip (e.g. B95501 on page 92).

### Other ways to find something in this catalog....

1. Just browse through the catalog. Every tip itself has specific information about its family/type, the pipettes it will fit, packaging configurations, and other features.
2. If you already know the order number of the item you need, look up the corresponding page in the index in the back of this catalog (page 164).

### The icon legend

Attached to the back cover of this catalogue is a fold-out legend of icon symbols. Almost every item in this catalog has one or more icons that describe specific features like filter pore size, evaporation grade, orifice etc.

### Find tips on-line: [www.bioplastics.com](http://www.bioplastics.com)

The online tip database at the BIOplastics website is a very convenient tool to find the right tip for your pipette and/or application. Just select the volume range and the brand of pipette desired, and receive search results within seconds. Results are presented with all the relevant properties of that tip, a schematic drawing, and the different packaging options.



# Gradient Filtertips

## 1. Choose the pipette brand you need a tip for and find the tip family

Brand		Volume	Type	A	B	C	D	E	K	M	R	Z0
Biohit	Proline (fixed)	5 µl, 10 µl	1		○		○					○
Biohit	Proline (fixed)	20 µl, 25 µl, 50 µl, 100 µl, 200 µl	1									
Biohit	Proline (fixed)	250 µl, 500 µl, 1000 µl	1							○		
Biohit	Proline	0.1 - 2.5 µl, 0.5 µl - 10 µl	1		○		○					○
Biohit	Proline	2 - 20 µl, 5 - 50 µl	1						○			
Biohit	Proline	10 - 100 µl	1							○		
Biohit	Proline	20 - 200 µl, 50 µl - 200 µl	1									
Biohit	Proline	100 - 1000 µl, 200 - 1000 µl	1							○		
Biohit	Proline	5 - 50 µl	4						○			
Biohit	Proline	20 - 250 µl	4						○			
Biohit	Proline	0.5 - 10 µl	8				○					
Biohit	Proline	5 - 50 µl	8						○			
Biohit	Proline	50 - 250 µl, 50 - 300 µl	8						○			
Biohit	Proline	0.5 - 10 µl	12				○					
Biohit	Proline	5 - 50 µl	12						○			
Biohit	Proline	50 - 250 µl, 50 - 300 µl	12						○			
Biohit	Proline Electronic / ePET	0.2 - 10 µl	1E		○	○						
Biohit	Proline Electronic / ePET	5 - 100 µl	1E									
Biohit	Proline Electronic / ePET	10 - 250 µl	1E									
Biohit	Proline Electronic / ePET	10 - 500 µl, 50 - 1000 µl	1E							○		
Biohit	Proline Electronic / ePET	5 - 100 µl	4E						○			
Biohit	Proline Electronic / ePET	25 - 250 µl	4E									
Biohit	Proline Electronic / ePET	0.2 - 10 µl	8E				○					
Biohit	Proline Electronic / ePET	5 - 100 µl	8E						○			
Biohit	Proline Electronic / ePET	25 - 250 µl	8E									
Biohit	Proline Electronic / ePET	0.2 - 10 µl	12E				○					
Biohit	Proline Electronic / ePET	5 - 100 µl, 25 - 250 µl	12E									
Biohit	eLINE Electronic	0.2 - 10 µl	1E		○	○						
Biohit	eLINE Electronic	5 - 120 µl	1E									
Biohit	eLINE Electronic	20 - 300 µl	1E									
Biohit	eLINE Electronic	50 - 1000 µl	1E							○		
Brand		Volume	Type	A	B	C	D	E	K	M	R	Z0
Gilson	Pipetman F2~F200 (fixed)	2 µl, 5 µl, 10 µl, 20 µl, 25 µl 50 µl, 100 µl, 200 µl	1	○								
Gilson	Pipetman F250~F1000 (fixed)	250 µl, 300 µl, 400 µl, 500 µl, 1000 µl	1							○		
Gilson	Pipetman P2	0.1 - 2 µl, 0.5 - 10 µl	1		○		○					○
Gilson	Pipetman P10	1 - 10 µl	1				○					
Gilson	Pipetman P20	2 - 20 µl	1	○								
Gilson	Pipetman P100	20 - 100 µl, 50 - 200 µl	1	○					○			
Gilson	Pipetman P200	20 - 200 µl	1	○					○			
Gilson	Pipetman UltraMultichannel 12x200	20 - 200 µl	1	○								
Gilson	Pipetman P1000	200 - 1000 µl	1							○		



## 1. Choose the pipette brand you need a tip for and find the tip family

Brand		Volume	Type	A	B	C	D	E	K	M	Z0
Eppendorf	Reference (fixed)	1 µl , 2 µl, 5 µl, 10 µl	1		○	○	○				○
Eppendorf	Reference (fixed)	10 µl , 20 µl, 25 µl, 50 µl, 100 µl	1	○							
Eppendorf	Reference (fixed)	200 µl, 250 µl, 500 µl, 1000 µl	1							○	
Eppendorf	Reference	0.1 - 2.5 µl	1		○		○				○
Eppendorf	Reference	0.5 - 10 µl	1		○	○	○				○
Eppendorf	Reference	2 - 20 µl	1	○		○					
Eppendorf	Reference	10 - 100 µl	1	○				○			
Eppendorf	Reference	20 - 200 µl	1	○							
Eppendorf	Reference	100 - 1000 µl	1							○	
Eppendorf	Research (fixed)	10 µl, 20 µl, 25 µl, 50 µl, 100 µl	1	○							
Eppendorf	Research (fixed)	200 µl, 250 µl, 500 µl, 1000 µl	1							○	
Eppendorf	Research	0.1 - 2.5 µl	1				○				○
Eppendorf	Research	0.5 µl, 10 µl	1		○	○	○				○
Eppendorf	Research	2 - 20 µl, 10 - 100 µl, 20 - 200 µl	1	○							
Eppendorf	Research	100 - 1000 µl	1							○	
Eppendorf	Research	0.5 µl - 10 µl	8			○	○				○
Eppendorf	Research	50 - 100 µl, 30 - 300 µl	8	○							
Eppendorf	Research	0.5 - 10 µl	12			○	○				○
Eppendorf	Research	50 - 100 µl, 30 - 300 µl	12	○							
Eppendorf	Research Pro	0.5 - 10 µl	1E		○	○	○				○
Eppendorf	Research Pro	5 - 100 µl, 20 - 300 µl	1E	○							
Eppendorf	Research Pro	50 - 1000 µl	1E							○	
Eppendorf	Research Pro	0.5 - 10 µl	1E			○	○				○
Eppendorf	Research Pro	5 - 100 µl, 20 - 300 µl	8E	○							
Eppendorf	Research Pro	50 - 1000 µl	8E							○	
Eppendorf	Research Pro	0.5 - 10 µl	12E			○	○				○
Eppendorf	Research Pro	5 - 100 µl, 20 - 300 µl	12E	○							
Brand		Volume	Type	A	B	C	D	E	K	M	Z0
Finnpipette	Colour (fixed)	5µl, 10 µl, 20 µl	1	○							
Finnpipette	Colour (fixed)	25 µl, 50 µl, 100 µl, 200 µl	1	○				○	○		
Finnpipette	Colour (fixed)	250 µl, 500 µl, 1000 µl	1							○	
Finnpipette	Colour	0.5 - 10 µl	1	○							
Finnpipette	Colour	5 - 40 µl, 40 - 200 µl	1	○				○	○		
Finnpipette	Colour	200 - 1000 µl	1							○	
Finnpipette	Colour	5 - 50 µl, 50 - 300 µl	4	○				○	○		
Finnpipette	Colour	5 - 50 µl, 50 - 300 µl	8	○				○	○		
Finnpipette	Colour	5 - 50 µl, 50 - 300 µl	12	○				○	○		
Finnpipette	Digital (fixed)	1 µl, 2 µl, 5 µl, 10 µl	1								○
Finnpipette	Digital (fixed)	20 µl, 25 µl, 50 µl, 100 µl, 200 µl	1	○				○	○		
Finnpipette	Digital (fixed)	250 µl, 500 µl, 1000 µl	1							○	
Finnpipette	Digital	0.2 - 2 µl	1								○
Finnpipette	Digital	0.5 - 10 µl	1						○		○
Finnpipette	Digital	2 - 20 µl, 5 - 40 µl	1	○							
Finnpipette	Digital	10 - 100 µl	1	○				○			
Finnpipette	Digital	20 - 200 µl	1	○				○	○		

# Gradient Filtertips

## 1. Choose the pipette brand you need a tip for and find the tip family

Brand	Volume	Type	A	B	C	D	E	K	M	Z0
Finnpipette Digital	100 - 1000 $\mu$ l	1							○	
Finnpipette Digital	200 - 1000 $\mu$ l	1							○	
Finnpipette Digital	0.5 - 10 $\mu$ l	8								○
Finnpipette Digital	5 - 50 $\mu$ l, 50 - 300 $\mu$ l	8	○				○	○		
Finnpipette Digital	5 - 50 $\mu$ l, 50 - 300 $\mu$ l	12	○				○	○		
Finnpipette Digital	5 - 50 $\mu$ l	16	○				○			
Finnpipette BioControl	5 - 40 $\mu$ l, 40 - 200 $\mu$ l	1E	○				○	○		
Finnpipette BioControl	200 - 1000 $\mu$ l	1E							○	
Finnpipette BioControl	0.5 - 10 $\mu$ l	8E								○
Finnpipette BioControl	5 - 50 $\mu$ l	8E	○				○	○		
Finnpipette BioControl	50 - 300 $\mu$ l	8E	○				○	○		
Finnpipette BioControl	50 - 1500 $\mu$ l	8E							○	
Finnpipette BioControl	5 - 50 $\mu$ l	12E	○				○	○		
Finnpipette BioControl	50 - 300 $\mu$ l	12E	○				○	○		
Finnpipette Multistep	5 - 250 $\mu$ l	8E							○	

Brand	Volume	Type	A	B	C	D	E	K	M	Z0
Costar OnePette	1 - 20 $\mu$ l	1	○					○		
Costar OnePette	10 - 100 $\mu$ l, 20 - 200 $\mu$ l	1	○				○	○		
Costar OnePette	100 - 1000 $\mu$ l	1							○	
Costar 8-Pette	20 - 200 $\mu$ l	8	○					○		
Costar 12-Pette	20 - 200 $\mu$ l	12	○					○		
Costar Octapette (fixed)	25 - 200 $\mu$ l	8	○					○		

Brand	Volume	Type	A	B	C	D	E	K	M	Z0
Hamilton SoftGrip (fixed)	5 $\mu$ l, 10 $\mu$ l	1				○				○
Hamilton SoftGrip (fixed)	25 $\mu$ l, 50 $\mu$ l, 100 $\mu$ l, 200 $\mu$ l, 250 $\mu$ l, 300 $\mu$ l	1	○					○		
Hamilton SoftGrip	0,2 - 2 $\mu$ l, 1 - 10 $\mu$ l	1				○				○
Hamilton SoftGrip	2.5 - 25 $\mu$ l, 10 - 100 $\mu$ l, 30 - 300 $\mu$ l	1	○					○		
Hamilton SoftGrip	5 - 50 $\mu$ l, 30 - 300 $\mu$ l	8	○					○		
Hamilton SoftGrip	5 - 50 $\mu$ l, 30 - 300 $\mu$ l	12	○					○		

Brand	Volume	Type	A	B	C	D	E	K	M	Z0
Socorex Acura 811	1 $\mu$ l, 5 $\mu$ l	1			○					
Socorex Acura 811	10 $\mu$ l, 20 $\mu$ l	1	○		○					
Socorex Acura 811	25 $\mu$ l, 50 $\mu$ l, 100 $\mu$ l	1	○							
Socorex Acura 811	200 $\mu$ l, 250 $\mu$ l, 500 $\mu$ l, 1000 $\mu$ l	1							○	
Socorex Acura 821	5 - 50 $\mu$ l	1	○				○			
Socorex Acura 821	50 - 200 $\mu$ l	1	○				○			
Socorex Acura 821	200 - 1000 $\mu$ l	1							○	
Socorex Acura 851	5 - 50 $\mu$ l	8	○							
Socorex Acura 851	50 - 200 $\mu$ l	8	○				○			
Socorex Acura 851	5 - 50 $\mu$ l	12	○							
Socorex Acura 851	50 - 200 $\mu$ l	12	○				○			
Socorex Calibra 822	0.2 - 2 $\mu$ l	1E			○					
Socorex Calibra 822	1 - 10 $\mu$ l	1E	○		○					





## 1. Choose the pipette brand you need a tip for and find the tip family

Brand		Volume	Type	A	B	C	D	E	K	M	Z0
Socorex	Calibra 822	2- 20 $\mu$ l, 10 - 100 $\mu$ l	1E	○							
Socorex	Calibra 822	20- 200 $\mu$ l	1E	○				○			
Socorex	Calibra 822	100 - 1000 $\mu$ l	1E							○	
Socorex	Calibra 852	1- 10 $\mu$ l	8E			○					
Socorex	Calibra 852	10 - 100 $\mu$ l, 20 - 200 $\mu$ l	8E	○							
Socorex	Calibra 852	10 - 100 $\mu$ l, 20 - 200 $\mu$ l	12E	○				○			
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Volac		1 - 200 $\mu$ l	1	○							
Volac		100 - 1000 $\mu$ l	1							○	
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Oxford	Benchmate	0.5 - 10 $\mu$ l	1		○	○	○				○
Oxford	Benchmate	10 - 50 $\mu$ l	1					○	○		
Oxford	Benchmate	40 - 200 $\mu$ l	1					○	○		
Oxford	Benchmate	200 - 1000 $\mu$ l	1							○	
Oxford	Benchmate	1000 - 5000 $\mu$ l	1							○	
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
SMI	Airpettor	1000 $\mu$ l	1							○	
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
MLA		1 - 200 $\mu$ l	1	○				○			
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Nichiryo		0.5 - 10 $\mu$ l	1		○	○					○
Nichiryo		10 - 50 $\mu$ l	1	○							
Nichiryo		40 - 200 $\mu$ l	1	○				○	○		
Nichiryo		200 - 1000 $\mu$ l	1							○	
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Excaliber		10 - 200 $\mu$ l, 100 - 1000 $\mu$ l	1	○							
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Helena		200 - 1000 $\mu$ l							○		
<b>Brand</b>											
<b>Brand</b>		<b>Volume</b>	<b>Type</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>K</b>	<b>M</b>	<b>Z0</b>
Titertek		0.5 - 10 $\mu$ l	1	○		○			○		
Titertek		5 - 50 $\mu$ l	1	○					○		
Titertek		40 - 200 $\mu$ l, 50 - 200 $\mu$ l	1	○							
Titertek		50 - 300 $\mu$ l	1	○				○	○		
Titertek		200 - 1000 $\mu$ l	1							○	
Titertek		1 - 10 $\mu$ l	1	○		○					



# Gradient Filertips

2. Select the family of tip you need and choose from the different possibilities within the family.



Type			Volume	Ordernumber	Page
A	Regular	Gelloading	200 µl	B71931	
A	Regular	Beveled Orifice	200 µl	B70002	
A	Regular	Extra Long	200 µl	B74109	
A	Regular	Certified	200 µl	B60009	
A	Regular	Low Adhesion, Extra Long	200 µl	L74109	
A	Regular	Certified, Extra Long	200 µl	B74120	
A	Regular	Low Adhesion	200 µl	L60002	
A	SSNC	Beveled Orifice	20 µl	B95020	
A	SSNC	Beveled Orifice	50 µl	B90550	
A	SSNC	Beveled Orifice	100 µl	B95100	
A	SSNC	Beveled Orifice	150 µl	B90151	
A	SSNC	Extra Long	200 µl	B90222	
Type			Volume	Ordernumber	Page
B Nanotip	Regular		10 µl	B70400	
B Nanotip	SSNC		5 µl	B95501	
B Nanotip	Regular	Certified	10 µl	B70411	
B Nanotip	Regular	Low Adhesion	10 µl	L70400	
Type			Volume	Ordernumber	Page
C Microtip	Regular		10 µl	B71029	
C Microtip	Regular	Certified	10 µl	B70030	
C Microtip	Regular	Low Adhesion	10 µl	B70569	
C Microtip	SSNC		10 µl	B95010	
C Microtip	SSNC		20 µl	B90114	
Type			Volume	Ordernumber	Page
D Microtip	Regular		10 µl	B70558	
D Microtip	Regular	Certified	10 µl	B70028	
D Microtip	Regular	Low Adhesion	10 µl	B70560	
D Microtip	SSNC		10 µl	B95011	
Type			Volume	Ordernumber	Page
E	Regular		100 µl	B74114	
E	SSNC		100 µl	B90225	
E	Regular	Low Adhesion	100 µl	L74114	
Type			Volume	Ordernumber	Page
K	Regular	Graduated	300 µl	B71400	
K	Regular	Certified	300 µl	B64174	
K	Regular	Graduated, Low Adhesion	100 µl	L71400	
K	SSNC	Graduated	10 µl	B90122	
K	SSNC	Graduated	100 µl	B90111	
K	SSNC	Graduated	200 µl	B95201	
Type			Volume	Ordernumber	Page
M	Regular		1000 µl	B74271	
M	Regular	Certified	1000 µl	B64276	
M	Regular	Graduated, Low Adhesion	1000 µl	L74271	
M	SSNC		1000 µl	B95210	
Type			Volume	Ordernumber	Page
Z0	Regular		10 µl	B75029	
Z0	SSNC		10 µl	B95012	
Z0	Regular	Certified	10 µl	B75040	



## The essence of filter material

Filtertips are generally accepted as the solution in the prevention of cross-contamination in PCR reactions. A main source of this contamination is the formation of aerosols in the shaft of the pipette used during the PCR liquid handling. Carry-over of previously pipetted DNA, RNA and proteins can cause false positive signals.

### Filter materials

The use of a filter in a filter tip eliminates the formation of aerosols in the shaft of the pipette, because it blocks the air-to-liquid interface between the sample and the shaft. This simple idea has evolved in numerous types and brands of filtertips and filter materials.

Most filters are made of inert 3-dimensional cross-linked PE (Polyethylene).

### Self sealing protection versus accuracy

The most important parameter for a filter tip is the pore size and the ratio of filter length and pore size of the applied filter material. The pore size must be smaller than  $25\ \mu\text{m}$  to protect against aerosols at all. If the pore size is between  $20$  and  $25\ \mu\text{m}$ , a filter will give reasonable protection, however liquid will pass when overloaded. Below  $20\ \mu\text{m}$ , a filter will give superior protection. When pore sizes get below  $14\ \mu\text{m}$ , it becomes too difficult to pipet liquids in a reproducible manner, because of the airflow barrier. Therefore, it makes no sense to use filters with this small pore size. The costs and investments to manufacture a filter material with an average pore size of  $18\ \mu\text{m}$  are high. BIOplastics' Self Sealing Non Collapsing (SSNC) filter tip meets this  $18\ \mu\text{m}$  pore size specification and is built up with a density gradient from top to bottom. It is the perfect balance between superior protection and accurate pipetting.

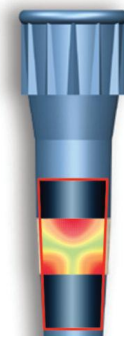
### Filtering and gradient capacity

The filtering capacity of a certain filter is defined as the ratio of filter length and pore size. The longer a filter is, the better it filters. This relation is almost linear. BIOplastics filters have the longest length available in the market when compared to other brands. By applying a gradient within the filter (see picture 3-dimensional GRADIENT filter) the aerosols air flow length is even extended and aerosol particles are additionally forced to a non linear track. When these three factors are combined, the result is a superior filter tip.

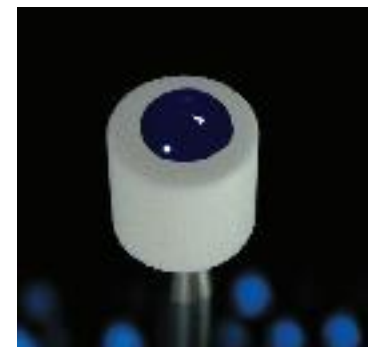
### Tips in Multi Purpose Racks (MPR)

BIOplastics BV has designed multi purpose racks in which tips are packed. Tips are made of medical grade extreme clear and soft PP with no molecule binding properties. The soft tips ensure superior pipetting, easy pipette seating and releasing, thus reducing RSI. Each rack consists of a colored bottom part, a transparent hinged lid and a multi-purpose interchangeable tip insert. The empty box can be used for storage.

The multi-purpose interchangeable tip insert can hold PCR plates and strips. Additional tube grids are available which enable you to make your own  $0.5\ \text{ml}$  /  $1.5\ \text{ml}$  microcentrifuge tube storage / freezer rack. Whenever you buy racked tips you end up with not only an excellent tip, but also a good start for an even more organized lab!



Gradient 18 micron filter with extended airflow and balanced optimal aerosol protection



# Gradient Filtertips

## 2.1 SSNC Filtertips

### 5 µl Nano tip

Fits Gilson, Biohit, Eppendorf, Nichiryo, Oxford and others.



Order#	Description	Package Size
B95501	SSNC 5 µl filtertip, sterile	.8 racks of 96 (768)

### 10 µl

Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.



Order#	Description	Package Size
B95012	SSNC 10 µl filtertip, sterile	.8 racks of 96 (768)

### 10 µl

Fits Gilson, Rainin, Eppendorf, Biohit, Nichiryo, Oxford and others.



Order#	Description	Package Size
B95011	SSNC 10 µl filtertip, sterile	.8 racks of 96 (768)

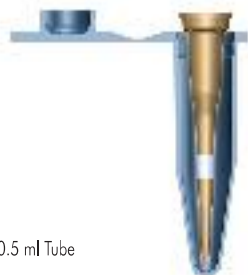
### 10 µl

Fits Eppendorf, Nichiryo, Oxford, Socorex, Titertek and others.



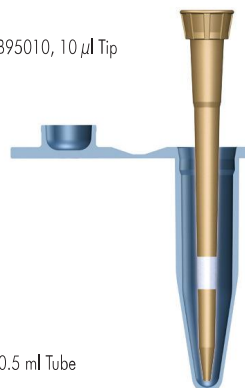
Order#	Description	Package Size
B95010	SSNC 10 µl filtertip, sterile	.8 racks of 96 (768)

B95501, 5 µl Nano Tip



0.5 ml Tube

B95010, 10 µl Tip



0.5 ml Tube

B95011, 10 µl Tip



0.5 ml Tube

B95012, 10 µl Tip



0.5 ml Tube

## 10 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford, Titertek and others.



Order#	Description	Package Size
B90122	SSNC 10 µl filtrertip, sterile .....	.8 racks of 96 (768)

## 20 µl

Fits Eppendorf, Nichiryo, Oxford, Socorex, Titertek and others.



Order#	Description	Package Size
B90114	SSNC 20 µl filtrertip, sterile .....	.8 racks of 96 (768)

## 20 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



Order#	Description	Package Size
B95020	SSNC 20 µl filtrertip, sterile .....	.8 racks of 96 (768)

## 50 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



Order#	Description	Package Size
B90550	SSNC 50 µl filtrertip, sterile .....	.8 racks of 96 (768)

## 100 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



Order#	Description	Package Size
B95100	SSNC 100 µl filtrertip, sterile .....	.8 racks of 96 (768)

## 100 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford, Titertek and others.



Order#	Description	Package Size
B90111	SSNC 100 µl filtrertip, sterile .....	.8 racks of 96 (768)



# Gradient Filertips

## 100 µl

Fits Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex and others.



type E



Order#	Description	Package Size
B90225	SSNC 100 µl filtertip, sterile	.8 racks of 96 (768)

## 150 µl

Fits Gilson, Finnpiquette, Titertek and others.



type A



Order#	Description	Package Size
B90151	SSNC 150 µl filtertip, sterile	.8 racks of 96 (768)

## 200 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford and others.



type K



Order#	Description	Package Size
B95201	SSNC 200 µl filtertip, sterile	.8 racks of 96 (768)

## 200 µl Extra long

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford and others.



type A



Order#	Description	Package Size
B90222	SSNC 200 µl filtertip, Extra Long, sterile	.8 racks of 96 (768)

## 1000 µl

Fits Gilson, Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex, SMI, Titertek, Volac and others.



type M



Order#	Description	Package Size
B95210	SSNC 1000 µl filtertip, sterile	.8 racks of 72 (576)



## 3. PIPETTE TIPS

The accuracy of pipetting procedures greatly depends on the quality of the tip used. There is no sense in buying an expensive accurate pipette and then use tips of inferior quality. Tips should be made of the highest quality virgin PP (Polypropylene), so they are flexible and soft to secure a good, leak-free fit around the shaft of the pipette.

All our tips are designed to have a very fine orifice for complete, reproducible pipetting. Some tips, marked with the beveled orifice icon, have a special 45° beveled orifice to guide the rejection of the fluids even better. Tips with special features can be found in the relevant chapters.

3.0	General Information Pipette tips	page 96
	• Pipette tips for (q)PCR, low adhesion, non-binding, high recovery	page 96
	• Low adhesion and non-binding	page 96
	• Tips in multi purpose racks (MPR)	page 96
	• Anti static pipette tips, why how and when they become favorable	page 96
3.1	Regular Tips	page 97
3.2	Certified Tips	page 99
3.3	Low Adhesion Tips	page 101



## 3.0 General Information Pipette Tips

### Pipette tips for (q)PCR, low adhesion, non-binding, high recovery

The accuracy of pipetting particularly depends on the quality of the tips used. (q)PCR methods are more frequently being used in diagnostic applications, therefore BIOplastics BV has developed a superior pipette tip for use in any (q)PCR or related high performance technique. BIOplastics BV has used existing knowledge of superior design and manufacturing capabilities to generate new highly accurate pipette tips.

### Low adhesion and non-binding

BIOplastics BV uses a similar high performance blend of polypropylene to that used in EU (q)PCR tubes and plates. By using this flexible material, a perfect seal to the pipette is guaranteed. The inert material does not hold a surface charge and assures no binding of any charged molecules like DNA, RNA, proteins etc.. Furthermore, high recovery is achieved due to the mould polish and material characteristics. This means that "all" liquid is pipetted and very limited, if any, liquid films will remain in the tip enabling the highest possible sample recovery.

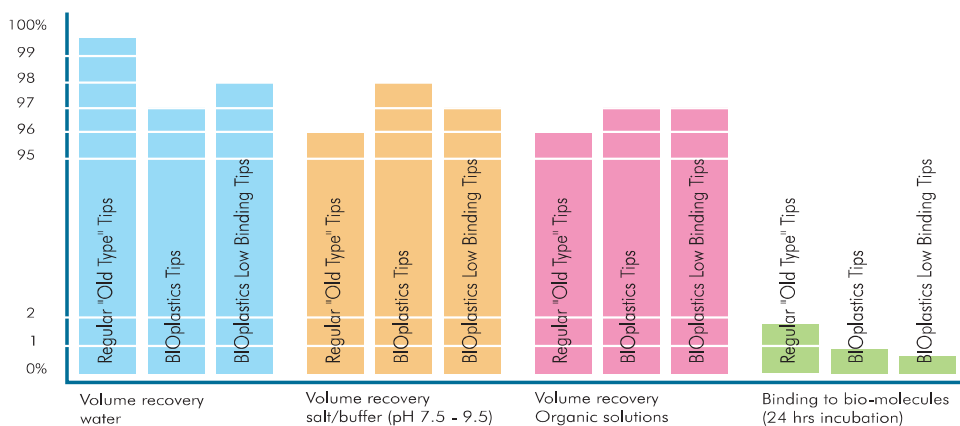
### Tips in multi purpose racks (MPR)

BIOplastics BV has designed new multi purpose racks in which the tips are packed. Each rack consist of a colored bottom part, a transparent hinged lid and multi-purpose support unit which holds the interchangeable tip insert. The empty box can be used for storage. The multi-purpose support unit can hold (q)PCR plates and strips. Additional tube grids are available which enable you to make your own 0.5 ml / 1.5 ml microcentrifuge tube storage / freezer rack. Whenever you buy racked tips, you end up with not only an excellent tip, but at the same time a good start for an even more organized lab! Yet another smart design from BIOplastics BV to serve customers the best way we can.

### Anti static pipette tips. Why, how, and when they become favorable.

BIOplastics pipette tips are designed for use in molecular biological applications, and more specifically for pipetting DNA, RNA, proteins and solutions commonly used in and around the (q)PCR process. BIOplastics has optimized pipette and filter tips by means of design and raw material selection to meet highest requirements. By selecting medical grade materials with anti-static properties, BIOplastics has reduced the biological molecule binding to the lowest possible amount. BIOplastics pipette tips become favorable when pipetting buffer, salt solutions and biological molecules (proteins, DNA, RNA). Differences in hydrophobic and hydrophilic properties of solutions, raw material surface and biomolecules cause this "phenomenon". If pipetting water contact us for "old type regular tips".

	Regular "Old Type" Tips	BIOplastics Tips	BIOplastics Low Binding Tips
Volume recovery water	99.8%	97%	98%
Volume recovery salt/buffer (pH 7.5 - 9.5)	96%	98%	97%
Volume recovery organic solutions	96%	97%	97%
Binding to bio-molecules (24 hrs incubation)	0.5 - 1 %	< 0.2%	< 0.15%





## 3.1 Regular Tips

### 10 $\mu$ l

Fits Gilson, Rainin, Eppendorf, Biohit, Nichiryo, Oxford and others.

Order#	Description	Package Size
B70558	Natural	.bag, 1000
B70559	Natural	.8 racks of 96 (768)
B71012	Natural, sterile	.8 racks of 96 (768)



type D



### 10 $\mu$ l Nano tip

Fits Gilson, Biohit, Eppendorf, Nichiryo, Oxford and others.

Order#	Description	Package Size
B70400	Natural	.bag, 1000
B70401	Natural	.8 racks of 96 (768)
B70402	Natural, sterile	.8 racks of 96 (768)



type B



### 10 $\mu$ l

Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.

Order#	Description	Package Size
B75029	Natural	.bag, 1000
B75030	Natural	.8 racks of 96 (768)
B75031	Natural, sterile	.8 racks of 96 (768)



type Z0



### 10 $\mu$ l

Fits Eppendorf, Nichiryo, Oxford, Socorex, Titertek and others

Order#	Description	Package Size
B71029	Natural	.bag, 1000
B71030	Natural	.8 racks of 96 (768)
B71031	Natural, sterile	.8 racks of 96 (768)



type C



### 100 $\mu$ l

Fits Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex and others.

Order#	Description	Package Size
B74114	Natural	.bag, 1000
B74123	Natural	.8 racks of 96 (768)
B74117	Natural, sterile	.8 racks of 96 (768)



type E



# Pipette Tips

## 200 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Biohit, Finnpiquette, Nichiryo, Socorex, Excaliber, Volac and others.



Order#	Description	Package Size
B71931	Natural	.bag, 1000
B71932	Natural	.8 racks of 96 (768)
B71933	Natural, sterile	.8 racks of 96 (768)

## 200 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



Order#	Description	Package Size
B70002	Natural	.bag, 1000
B70008	Natural	.8 racks of 96 (768)
B70009	Natural, sterile	.8 racks of 96 (768)

## 200 µl Extra long tip

Prevents "pipette shaft touching" contamination, especially when pipetting tall tubes such as blood collection tubes. Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.



Order#	Description	Package Size
B74109	Natural	.bag, 1000
B74110	Natural	.8 racks of 96 (768)
B74111	Natural, sterile	.8 racks of 96 (768)

## 300 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford, Titertek and others.



Order#	Description	Package Size
B71400	Natural	.bag, 1000
B74173	Natural	.8 racks of 96 (768)
B74174	Natural, sterile	.8 racks of 96 (768)

## 1000 µl Extra long tip 1300 µl

Fits Gilson, Eppendorf, Finnpiquette, SMI, Socorex, Titertek, Volac, Costar and others.



Order#	Description	Package Size
B74271	Natural	.bag, 1000
B74274	Natural	.8 racks of 72 (576)
B74276	Natural, sterile	.8 racks of 72 (576)



## 3.2 Certified Tips

These tips are certified to be free of any detectable levels of pyrogen, RNase or DNase activity, DNA and ATP. They are available either with or without certificate.

### 10 $\mu$ l

Fits Biohit, Rainin, Eppendorf, Biohit, Nichiryo, Oxford and others.



Order#	Description	Package Size
B70028	Natural	.8 racks of 96 (768)
B70029	Natural, with certificate	.8 racks of 96 (768)

### 10 $\mu$ l Nano tip

Fits Gilson, Biohit, Eppendorf, Nichiryo, Oxford and others.



Order#	Description	Package Size
B70411	Natural	.8 racks of 96 (768)
B70411C	Natural, with certificate	.8 racks of 96 (768)

### 10 $\mu$ l

Fits Gilson, Biohit, Eppendorf, FinnpiPETTE, Nichiryo, Oxford and others.



Order#	Description	Package Size
B70540	Natural	.8 racks of 96 (768)
B70540C	Natural, with certificate	.8 racks of 96 (768)

### 10 $\mu$ l

Fits Eppendorf, Nichiryo, Oxford, Socorex, Titerex and others.



Order#	Description	Package Size
B70030	Natural	.8 racks of 100 (800)
B70031	Natural, with certificate	.8 racks of 100 (800)



# Pipette Tips

## 200 µl Extra long tip

Prevents "pipette shaft touching" contamination, especially when pipetting tall tubes such as blood collection tubes. Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.



Order#	Description	Package Size
B74120	Natural	.8 racks of 96 (768)
B74120C	Natural, with certificate	.8 racks of 96 (768)

## 200 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



Order#	Description	Package Size
B60009	Natural	.8 racks of 96 (768)
B60009C	Natural, with certificate	.8 racks of 96 (768)

## 300 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford, Titertek and others.



Order#	Description	Package Size
B64174	Natural	.8 racks of 96 (768)
B64174C	Natural, with certificate	.8 racks of 96 (768)

## 1000 µl Extra long tip 1300 µl

Fits Gilson, Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex, SMI, Titertek, Volac and others.



Order#	Description	Package Size
B64276	Natural	.8 racks of 72 (576)
B64276C	Natural, with certificate	.8 racks of 72 (576)



## 3.3 Low Adhesion Tips

Low Adhesion Pipette Tips are injection moulded with specially blended resins to minimize liquid retention and ensure optimal sample yield. This advanced technique eliminates the use of lubricants that may be harmful to priceless samples. Tips are autoclavable and ideal for sensitive clinical assays, quantitative analysis, quality control and any other applications where optimal yield and minimal sample loss is required. moulding, quality control, and packaging systems ensure that these products are free of enzyme and nucleic acid contamination.

### 10 µl

Fits Gilson, Rainin, Eppendorf, Biohit, Nichiryo, Oxford and others.

Order#	Description	Package Size
B70560	Natural	. . . . . bag, 500
B70561	Natural	. . . . . 8 racks of 96 (768)
B70562	Natural, sterile	. . . . . 8 racks of 96 (768)



type D



### 10 µl

Fits Eppendorf, Nichiryo, Oxford, Socorex, Titerex and others.

Order#	Description	Package Size
B70569	Natural	. . . . . bag, 500
B70570	Natural	. . . . . 8 racks of 96 (768)
B70571	Natural, sterile	. . . . . 8 racks of 96 (768)



type C



### 10 µl Nano tip

Fits Gilson, Biohit, Eppendorf, Nichiryo, Oxford and others.

Order#	Description	Package Size
L70400	Natural	. . . . . bag, 500
L70401	Natural	. . . . . 8 racks of 96 (768)
L70402	Natural, sterile	. . . . . 8 racks of 96 (768)



type B



### 10 µl

Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.

Order#	Description	Package Size
L75029	Natural	. . . . . bag, 500
L75030	Natural	. . . . . 8 racks of 96 (768)
L75031	Natural, sterile	. . . . . 8 racks of 96 (768)



type Z0



# Pipette Tips

## 100 µl

Fits Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex and others.



type E



Order#	Description	Package Size
L74114	Natural	.bag, 500
L74123	Natural	.8 racks of 96 (768)
L74117	Natural, sterile	.8 racks of 96 (768)

## 200 µl

Fits Gilson, Costar, Eppendorf, Excaliber, Finnpiquette, Nichiryo, Socorex, Volac and others.



type A



Order#	Description	Package Size
L60002	Natural	.bag, 500
L60008	Natural	.8 racks of 96 (768)
L60009	Natural, sterile	.8 racks of 96 (768)

## 200 µl Extra long tip

Prevents "pipette shaft touching" contamination, especially when pipetting tall tubes such as blood collection tubes. Fits Gilson, Biohit, Eppendorf, Finnpiquette, Nichiryo, Oxford and others.



type A



Order#	Description	Package Size
L74109	Natural	.bag, 1000
L74110	Natural	.8 racks of 96 (768)
L74111	Natural, sterile	.8 racks of 96 (768)

## 300 µl Graduated tip

Fits Gilson, Biohit, Costar, Finnpiquette, Nichiryo, Oxford, Titertek and others.



type K



Order#	Description	Package Size
L71400	Natural	.bag, 500
L74173	Natural	.8 racks of 96 (768)
L74174	Natural, sterile	.8 racks of 96 (768)

## 1000 µl Extra long tip 1300 µl

Fits Gilson, Eppendorf, Costar, Finnpiquette, Nichiryo, Oxford, Socorex, SMI, Titertek, Volac and others.



type M



Order#	Description	Package Size
L74271	Natural	.bag, 500
L74274	Natural	.8 racks of 72 (576)
L74276	Natural, sterile	.8 racks of 72 (576)

## 4. TUBES

Tubes are key components in experiments. Tubes are used to prepare and perform reactions, and to store the final reaction product. Tubes should be of a trustworthy quality, durable, consistent, and stable. BIOplastics tubes are manufactured under strict quality controlled conditions. The design ensures smooth inner surfaces, easy closure and reproducible results. Most tubes are made of PP unless otherwise indicated. Depending on type and model, BIOplastics tubes can be frozen down to  $-200^{\circ}\text{C}$  and heated up to  $100^{\circ}\text{C}$ . BIOplastics microcentrifuge tubes can be centrifuged up to 20,000 g

Tubes with special features can be found in the relevant chapters.

<b>Tube Material and Product Binding Properties</b>	<b>page 104</b>
<b>Screw Cap Tubes and Screw Cap Properties</b>	<b>page 104</b>
4.1 Microcentrifuge Tubes	page 105
4.2 Certified Tubes	page 107
4.3 Low adhesion Tubes	page 108
4.4 Technical Background Screw Cap Tubes ( $-200^{\circ}\text{C}$ to $110^{\circ}\text{C}$ )	page 109
4.5 Screw Cap Tubes ( $-200^{\circ}\text{C}$ to $110^{\circ}\text{C}$ )	page 111
4.6 Screw Caps	page 112
4.7 Extra Low Binding Screw Cap Tubes	page 113
4.8 Bead-Beating Screw Cap Tubes, Extra Low Binding, Extreme robust	page 114
4.9 Cryo Micro Storage and Titer Dilution Storage Tubes and Systems	page 115



## Tube Material and Product Binding Properties

Type of vessel	Application	Competitor vessel	BIoplastics tubes (M type)	BIoplastics (O type)
(q)PCR tubes, strips, plates	Binding to DNA %	Up to 2%	NA	< 0.3%
	Binding to proteins %	Up to 4%	NA	< 0.8%
	Temperature work range °C	mainly -20 to 100 °C	NA	-30 to 100 °C
Microcentrifuge tubes 0.5, 1.5 & 2 ml	Binding to DNA %	Up to 5%	< 0.6%	< 0.3%
	Binding to proteins %	Up to 6%	< 0.6%	< 0.6%
	Pop-Open at 99 °C	yes > 80%	No	No
	Temperature work range °C	mainly -20 to 99 °C	-80 to 100 °C	-80 to 100 °C
Screw cap tubes 0.5, 1.5 & 2 ml	Binding to DNA %	Up to 5%	< 0.6%	< 0.3%
	Binding to proteins %	Up to 6%	< 0.6%	< 0.6%
	Accept organic solutions	No > 95%	Yes	Yes
	Temperature work range °C	mainly -25 to 100 °C	-200 to 100 °C	-80 to 100 °C
Titer dilution and storage tubes	Binding to DNA %	Up to 4%	< 0.6%	NA
	Binding to proteins %	Up to 4%	< 0.6%	NA
	Temperature work range °C	mainly -25 to 100 °C	-180 to 100 °C	NA

## Screw Cap Tubes and Screw Cap Properties

Type of Screw Cap Tube and Cap	Storage	Storage	Incubation	Incubation	Storage	Storage
	< -80 °C ≥ 3 years	< -80 °C < 3 years	≥ 95 °C ≥ 2 hours	≥ 95 °C < 2 hours	> -80 °C ≥ 3 years	> -80 °C < 3 years
Regular Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Regular Screw Cap Tubes with Easy Closure Screw Cap	no	yes	no	yes	no	yes
Low Binding Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Low Binding Screw Cap Tubes with Easy Closure Screw Cap	no	no	yes	yes	no	yes
Bead-Beat Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Bead-Beat Screw Cap Tubes with Easy Closure Screw Cap	yes	yes	no	yes	yes	yes



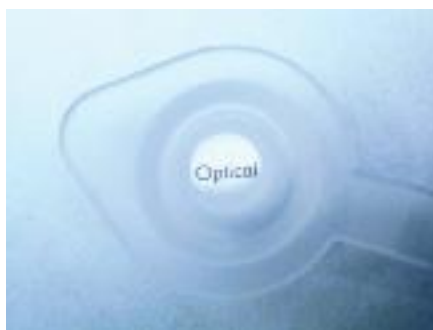


## 4.1 Microcentrifuge Tubes

### Volume 0.5 ml, Plain

Plain microcentrifuge tube, optical flat cap, frosted writing area on cap, M-type material\*. Thick wall (0.7 mm), low fluorescent background, slightly adjusted angle. Domed inside lid.

Order#	Description	Package Size
R74063	Natural	.bag, 1000
R74196	red	
R74197	blue	
R74198	green	
R74199	yellow	
R74200	orange	
R74201	violet	
R74809	white	
R71810	black	
R74064	natural, sterile	

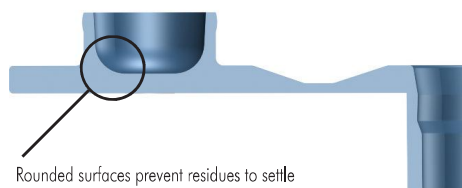


### Volume, 0.5 ml, Graduated

Graduated microcentrifuge tube, secure fitted optical flat cap, frosted writing area, M-type material\*. The tubes have graduations at 0.1, 0.2, 0.3, 0.4, 0.5 and 0.6 ml. Domed inside lid.

Order#	Description	Package Size
B71954	Natural	.bag, 1000
B71053	red	
B71050	blue	
B71051	green	
B71055	yellow	
B71052	orange	
B71054	violet	
B71056	amber	
B71049	natural, sterile	

\* M-type material is a blend of polypropylene, optimized for robust general laboratory applications.



\* M-type material is a blend of polypropylene, optimized for robust general laboratory applications.

# Tubes

## Volume 1.5 ml, Graduated

Graduated microcentrifuge tube, secure fitted optical flat cap, frosted writing area, M-type material\*. The tubes have graduations at 0.1, 0.5, 1.0 and 1.5 ml. Domed inside lid.

Order#	Description	Package Size
B74085	Natural	.bag, 500
B74286	red	
B74287	blue	
B74288	green	
B74289	yellow	
B74290	orange	
B74291	violet	
B74292	amber	
B74009	white	
B74010	black	
B74011	natural, sterile	



## Volume 2.0 ml, Graduated

Graduated microcentrifuge tube, secure fitted optical flat top cap, frosted areas. The tubes have graduations at 0.1, 0.5, 1.0, 1.5, and 2.0 ml. Frosted writing area on top and side of the tube, M-type material\*. Domed inside lid.

Order#	Description	Package Size
B71420	Natural	.bag, 500
B71421	red	
B71422	blue	
B71423	green	
B71424	yellow	
B71425	orange	
B71426	violet	
B71427	amber	



\* M-type material is a blend of polypropylene, optimized for robust general laboratory applications.

## 4.2 Certified Tubes

These tubes are certified to be free of any RNA, DNA, RNase or DNase activity and to be pyrogen free. They are available either with or without a certificate.

### Volume 0.5 ml, Graduated

Graduated, secure fitted flat top cap, frosted area, certified, M-type material\*. The tubes have graduations at 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 ml. Frosted writing area on top and side of the tube.

Order#	Description	Package Size
C77500	Natural .....	.bag, 1000
C77501	With certificate, natural .....	.bag, 1000



### Volume 1.5 ml, Graduated

Graduated, secure fitted flat top cap, frosted area, certified, M-type material\*. The tubes have graduations at 0.1, 0.5, 1.0 and 1.5 ml. Frosted writing area on top and side of the tube.

Order#	Description	Package Size
B77502	Natural .....	.bag, 500
B77503	With certificate, natural .....	.bag, 500



### Volume 2.0 ml, Graduated

Graduated microcentrifuge tube, secure fitted flat top cap, frosted area, certified, M-type material\*. The tubes have graduations at 0.1, 0.5, 1.0, 1.5 and 2.0 ml. Frosted writing area on top and side of the tube.

Order#	Description	Package Size
B77504	Natural .....	.bag, 500
B77505	With certificate, natural .....	.bag, 500



\* M-type material is a blend of polypropylene, optimized for robust general laboratory applications.

## 4.3 Low Adhesion Tubes

Low Adhesion Tubes are injection moulded with specially blended resins to minimize liquid retention and ensure optimal sample yield. This advanced technique eliminates the use of lubricants that may be harmful to priceless samples. Tubes are autoclavable and ideal for sensitive clinical assays, quantitative analysis, stock dilution series, quality control and any other applications where optimal yield and minimal sample loss is required. Advanced moulding, quality control, and packaging systems ensure that these products are free of enzyme and nucleic acid contamination.

### Volume 0.5 ml, Graduated

Graduated microcentrifuge tube, optical flat cap, frosted writing area, low adhesion. The tubes have graduations at 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 ml. The resins used during the moulding prevent any protein binding, even small amounts, to the polypropylene surface. All sensitive protein working procedures can be done in these tubes. Domed inside the lid.

Order#	Description	Package Size
B74029	Low adhesion, graduated, natural	.bag, 500
B64029	Low adhesion, non graduated, natural	.bag, 500



### Volume 1.5 ml, Graduated

Graduated microcentrifuge tube, optical flat cap, frosted writing area, low adhesion. The tubes have graduations at 0.1, 0.5, 1.0 and 1.5 ml. The resins used during the moulding prevent any protein binding, even small amounts, to the polypropylene surface. All sensitive protein working procedures can be done in these tubes. Domed inside the lid.

Order#	Description	Package Size
B74030	Low adhesion, graduated, natural	.bag, 250
B64030	Low adhesion, non graduated, natural	.bag, 250



### Volume 2.0 ml, Graduated

Graduated microcentrifuge tube, secure fitted optical flat top cap, frosted writing area, low adhesion. The tubes have graduations at 0.1, 0.5, 1.0, 1.5 and 2.0 ml. The tubes of excellent quality have flat top caps with frosted writing area on top and side of the tube. The caps of these tubes have a good tight fit. The resins used during the moulding prevent any protein binding, even small amounts, to the polypropylene surface. All sensitive protein working procedures can be done in these tubes. Domed inside the lid.

Order#	Description	Package Size
B74035	Low adhesion, graduated, natural	.bag, 500



## 4.4 Technical Background Screw Cap Tubes (-200°C to 110°C)

BIOplastics Screw Cap Tubes are an excellent means of storage. They are made of polypropylene, with frosted writing areas and with a plain, homogeneous surface inside. Screw Cap Tubes are categorized into three different volumes: 0.5 ml, 1.5 ml and 2.0 ml. Screw Cap Tubes are available as conical or free standing and sterile as well as non-sterile. The screw cap tubes have a working range of -200°C to 110°C and can be centrifuged up to 20,000 g.

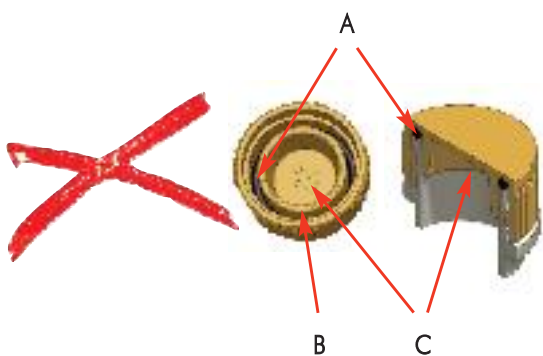
### Screw Cap closure technology

BIOplastics recently introduced a new innovative product, Screw Cap Tubes with Smart Secure Closure Technology, which results in superior Screw Cap Tubes. The screw caps are designed in a way that the use of "old fashioned" rubber rings has become obsolete since its performance is superior, when compared to regular screw cap tubes. The absence of a rubber ring assures that the closure is not affected when in contact with organic solvents nor that leakage occurs due to hardening and unbalanced shrinkage caused by low and high temperatures and pressure. The new Smart secure closure design allows frequent opening and closing, even in extreme conditions, without compromising the closure and avoiding leakage.

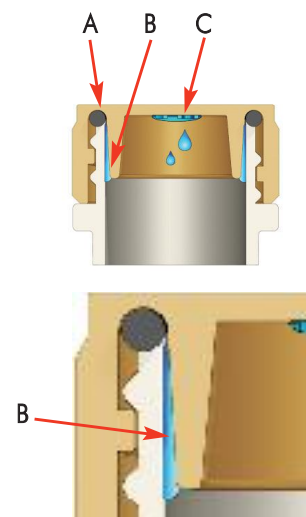
### Colored Screw Cap Tubes and colored screw caps

The marketplace uses natural colored screw cap tubes with colored caps. In some cases screw cap tubes are used with the caps attached to the tubes to prevent contamination of similar tubes by means of mixing up caps. However pipetting with an attached lid is not optimal since the spacing of tubes, the overall footprint, and the chance of touching the inner part of the cap are all major drawbacks. To overcome these drawback and prevent cross contamination, we have not only colored our screw caps but also offer screw cap tubes in 10 different colors. BIOplastics is the first company in the world offering COLORED SCREW CAP TUBES AND COLORED SCREW CAPS which enable not only a wide variety of color coded combinations (colored tube and colored cap) but also significantly reduces the chance of cross contamination caused by mixing up incorrect colored cap to tube closure.

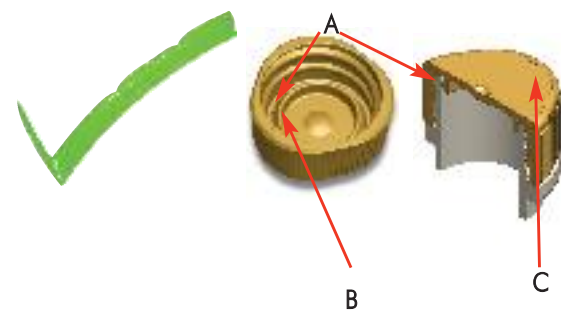
### Old traditional Screw Cap Tubes and Caps with O-Rings



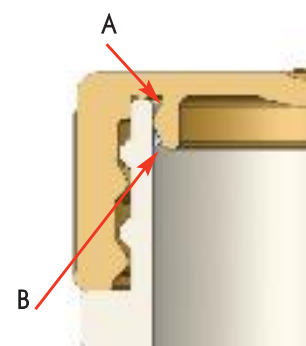
- A: Rubber ring, may contaminate your sample, dissolves in organic solutions, become brittle in time and may break at lower temperatures
- B: Inner cylinder sitting in the tube and causing loss of sample, inconsistency of result and increases contact sample to tube surface
- C: Cavity number inside the cap: source of binding and contamination



### SCREW CAP TUBES AND CAPS WITH SMART SECURE CLOSURE TECHNOLOGY



- A: Smart closure, avoids sample contaminate, withstands organic solutions, remains soft at extreme low and high temperatures
- B: Absence of cylinder sitting in the tube assures maximum sample recovery, consistency of result and decreases contact sample to tube surface
- C: Cavity number outside of the cap avoids binding and contamination



## Tube and cap facts. Why and how it works better for you.

- Triangular cap:
  - decreases chance of rolling away
  - easy handling & holding in hand
- Smart closure:
  - avoids sample contamination
  - remains soft at extreme low and high temperatures
  - enables the use of organic solvents
  - assures no leakage
- Absence of cylinder sitting in the tube:
  - assures maximum sample recovery, consistency of results and decreases contact sample to tube surface
- No logo inside of cap:
  - avoids sticking of molecules in corners and reducing total contact surface

## Secure closure and easy closure cap range for Screw Cap Tubes

Screw caps for screw cap tubes are offered in two selectable versions: The regular Secure Closure and the new Easy Closure Screw Cap.

For robust applications such as long term storage:  $\geq 3$  years below  $-80\text{ }^{\circ}\text{C}$  or incubation at  $\geq 95\text{ }^{\circ}\text{C}$  for  $\geq 2$  hours, one should opt for the regular Secure Closure Caps. For less robust applications:  $\leq 3$  years higher than  $-80\text{ }^{\circ}\text{C}$  or less stringent incubation  $\leq 100\text{ }^{\circ}\text{C}$   $\leq 1.5$  hours, one can opt for the Easy Closure Cap. Both types of caps incorporate BIOplastics' non leaking Smart Closure Cap Technology. The Easy Closure Cap is produced from a completely different material. All types of screw caps and screw tubes are offered in 10 different colors, DNase, RNase, Pyrogen, Metal and ATP free.

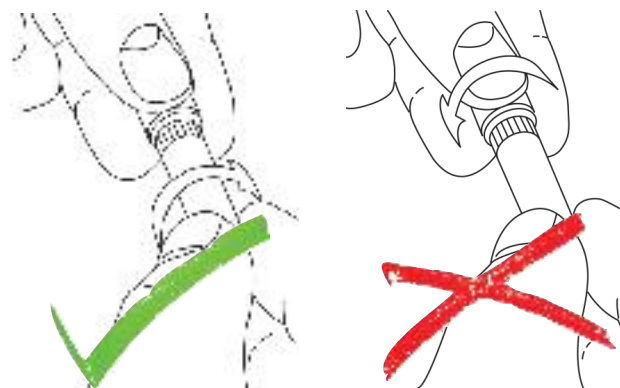
## Screw cap Tubes and Screw Cap Properties

Type of Screw Cap Tube and Cap	Storage	Storage	Incubation	Incubation	Storage	Storage
	$< -80\text{ }^{\circ}\text{C}$ $\geq 3$ years	$< -80\text{ }^{\circ}\text{C}$ $< 3$ years	$\geq 95\text{ }^{\circ}\text{C}$ $\geq 2$ hours	$\geq 95\text{ }^{\circ}\text{C}$ $< 2$ hours	$> -80\text{ }^{\circ}\text{C}$ $\geq 3$ years	$> -80\text{ }^{\circ}\text{C}$ $< 3$ years
Regular Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Regular Screw Cap Tubes with Easy Closure Screw Cap	no	yes	no	yes	no	yes
Low Binding Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Low Binding Screw Cap Tubes with Easy Closure Screw Cap	no	no	yes	yes	no	yes
Bead-Beat Screw Cap Tubes with Secure Closure Cap	yes	yes	yes	yes	yes	yes
Bead-Beat Screw Cap Tubes with Easy Closure Screw Cap	yes	yes	no	yes	yes	yes

## How to open and close the tubes easily

This is how you do it.....

SCREW THE TUBE TO THE CAP instead of the cap to the tube!



## 4.5 Screw Cap Tubes (-200°C to 110°C)

Regular low binding screw cap tubes.

### 0.5 ml Screw Cap Tubes

Conical (without screw caps)

Order#	Description	Package Size					
B71057	0.5 ml conical screw cap tube, natural	.....bag, 500					
B91002	.....red	B91005	.....yellow	B91008	.....amber	B91011	.....natural, sterile
B91003	.....blue	B91006	.....orange	B91009	.....white		
B91004	.....green	B91007	.....violet	B91010	.....black		



Free standing (without screw caps)

Order#	Description	Package Size					
B71060	0.5 ml free standing screw cap tube, natural	.....bag, 500					
B91032	.....red	B91035	.....yellow	B91038	.....amber	B91041	.....natural, sterile
B91033	.....blue	B91036	.....orange	B91039	.....white		
B91034	.....green	B91037	.....violet	B91040	.....black		



### 1.5 ml Screw Cap Tubes

Conical (without screw caps)

Order#	Description	Package Size					
B71058	1.5 ml conical screw cap tube, natural	.....bag, 500					
B91102	.....red	B91105	.....yellow	B91108	.....amber	B91111	.....natural, sterile
B91103	.....blue	B91106	.....orange	B91109	.....white		
B91104	.....green	B91107	.....violet	B91110	.....black		



Free Standing (without screw caps)

Order#	Description	Package Size					
B71061	1.5 ml free standing screw cap tube, natural	.....bag, 500					
B91132	.....red	B91135	.....yellow	B91138	.....amber	B91141	.....natural, sterile
B91133	.....blue	B91136	.....orange	B91139	.....white		
B91134	.....green	B91137	.....violet	B91140	.....black		

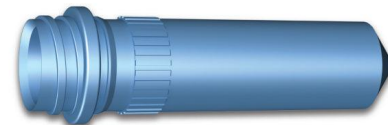


# Tubes

## 2.0 ml Screw Cap Tubes

Conical (without screw caps)

Order#	Description	Package Size
B91201	2.0 ml conical screw cap tube, natural	.bag, 500
B91202	.....red	
B91203	.....blue	
B91204	.....green	
B91205	.....yellow	
B91206	.....orange	
B91207	.....violet	
B91208	.....amber	
B91209	.....white	
B91210	.....black	
B91211	.....natural, sterile	



Free standing (without screw caps)

Order#	Description	Package Size
B71072	2.0 ml free standing screw cap tube, natural	.bag, 500
B91232	.....red	
B91233	.....blue	
B91234	.....green	
B91235	.....yellow	
B91236	.....orange	
B91237	.....violet	
B91238	.....amber	
B91239	.....white	
B91240	.....black	
B91241	.....natural, sterile	



## 4.6 Screw Caps

### Screw Caps with secure closure

By using screw caps with Secure Closure Technology excellent closure of the tubes is guaranteed. Screw caps are available in nine different colors. For use with all 0.5 ml, 1.5 ml and 2.0 ml screw cap tubes.

Order#	Description	Package Size
B91300	Screw cap, natural	.bag, 500
B91302	.....red	
B91303	.....blue	
B91304	.....green	
B91305	.....yellow	
B91306	.....orange	
B91307	.....violet	
B91308	.....amber	
B91309	.....white	
B91310	.....black	
B91311	.....natural, sterile	



### Easy closure Screw Caps

Easy Closure PE cap with Secure Closure Technology. Allows one hand opening and closure. Available in nine different colors. For use with all 0.5 ml, 1.5 ml and 2.0 ml screw cap tubes.

Order#	Description	Package Size
B91400	Easy Closure screw cap, natural	.bag, 500
B91402	.....red	
B91403	.....blue	
B91404	.....green	
B91405	.....yellow	
B91406	.....orange	
B91407	.....violet	
B91408	.....amber	
B91409	.....white	
B91410	.....black	
B91411	.....natural, sterile	



For Specific properties, see chart on page 110



## 4.7 Extra Low Binding Screw Cap Tubes

BIoplastics' extra low binding screw cap tubes are an excellent means of storage and are available in 3 three different volumes: 0.5 ml, 1.5 ml and 2.0 ml. The specific extra low binding properties of the raw material blend limits the working range. (see chart on page 110) Low binding screw cap tubes can handle a temperature range of -80°C to 110°C and can be centrifuged up to 20,000 g.

### Conical (without Screw Caps)

Order#	Description	Package Size
B71057U	0.5 ml conical screw cap tube, Extra low binding, natural	.bag, 500
B71058U	1.5 ml conical screw cap tube, Extra low binding, natural	.bag, 500
B91201U	2.0 ml conical screw cap tube, Extra low binding, natural	.bag, 500

### Free standing (without Screw Caps)

Order#	Description	Package Size
B71060U	0.5 ml free standing screw cap tube, Extra low binding, natural	.bag, 500
B71061U	1.5 ml free standing screw cap tube, Extra low binding, natural	.bag, 500
B71072U	2.0 ml free standing screw cap tube, Extra low binding, natural	.bag, 500



See properties chart (page 110) or the interactive options at [www.bioplastics.com](http://www.bioplastics.com).

## 4.8 Bead-Beating Screw Cap Tubes, Extra Low Binding, Extreme Robust

BIOplastics' extra low binding bead-beating screw cap tubes are designed to be used in Bead-Beating techniques and Bead-Beating mill homogenizers. These low binding and extreme robust tubes are also an excellent means of storage and are available in 3 three different volumes: 0.5 ml, 1.5 ml and 2.0 ml. The specific properties of the raw material enables an almost unlimited working range whereas these tubes can handle a temperature range of -200°C to 100°C and can be centrifuged up to 20,000 g.

### Conical without screw caps



Order#	Description	Package Size
B71057X	0.5 ml conical screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500
B71058X	1.5 ml conical screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500
B91201X	2.0 ml conical screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500



Extra robust flexible  
non cracking



### Free standing (without screw caps)



Order#	Description	Package Size
B71060X	0.5 ml free standing screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500
B71061X	1.5 ml free standing screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500
B71072X	2.0 ml free standing screw cap tube, Extra low binding, Extreme Robust, Bead-beat pro, natural	.bag, 500



## 4.9 Cryo Micro Storage and Titer Dilution Storage Tubes and Systems

Cryo Micro Storage and Titer dilution storage tubes and systems are designed for multi purpose usage. The tubes are extra robust.

### Micro Storage Tubes

Micro storage tubes are provided as a 4 tube-strip with single attached caps and each tube can hold a volume of 60  $\mu$ l. Due to its tiny design the storage capacity is severely increased and a footprint of 110 x 74 mm can hold 384 samples where as the height is limited to 21 mm. The single attached cap enables individual opening of the tubes. The tubes are also available with a 2D unique ID laser-mark on each individual tube-lid. All tubes have a working range of -200 °C to 100 °C.

Uniquely coded Micro storage tube-strips and tube plates Using BIOplastics BPLPM technology, products can be individually and uniquely coded. The Micro storage tubes and titer dilution and storage tubes can be laser coded by YAC laser, which also allows BIOplastics to offer uniquely coded products. In particular case each tube has a unique, in product labeled, non removable ID#. Specific codes or customized marked products are available on demand.

### Titer dilution storage tubes

These tubes holds 0.5 ml, have an extraordinary working range of -200 °C to 110 °C and can be centrifuged up to 20,000 g. The tubes are available in a single version, an 8 strip version, as well as a 96 well version. All tubes can be stored in the BIOplastics regular Work Rack S-96 and Work Rack S-96 System. All tubes can be closed with any of the BIOplastics cap strips, preferably however using the extra robust EU Indented Flat 8 Cap-Strip (B75701) or 12 Cap-Strip (B56501).

### Micro Storage tubes with single attached caps

Order#	Description	Package Size
B85101	Cryo Micro Storage 0.1ml 4-tube-strip with attached caps, natural	.bag, 250 strips
B85101L	Cryo Micro Storage 0.1ml 4-tube-strip with attached caps, natural, each cap 2D Laser Mark Coded	.bag, 250 strips



### Titer dilution and storage tubes, Single Tubes

Order#	Description	Package Size
B74056	0.5 ml Dilution and storage tubes, natural	.bag, 1000



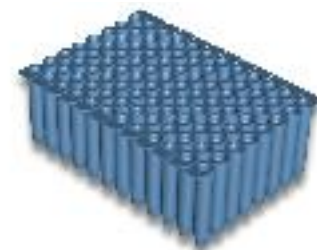
### 8-Strip-tubes

Order#	Description	Package Size
B74156	0.5 ml Dilution and storage tubes, natural	.bag, 300 strips (2400)
B74156L	0.5 ml Dilution and storage tubes, natural, Laser Mark Coded	.bag, 120 strips (960)



### 96 Interconnected Tube-Plates

Order#	Description	Package Size
B74256	0.5 ml Dilution and storage 96 interconnected tubes-plate, natural	.12 plates
B74257	0.5 ml Dilution and storage 96 interconnected tubes-plate, natural, racked in box	.8 boxes
B74256L	0.5 ml Dilution and storage 96 interconnected tubes-plate, natural, Laser Mark Coded	.12 plates
B74257L	0.5 ml Dilution and storage 96 interconnected tubes-plate, racked in box, Laser Mark Coded	.8 boxes



All tubes can be closed with any of the BIOplastics cap strips, preferably however using the extra robust EU Indented Flat 8 Cap-Strip (B75701) or 12 Cap-Strip (B56501).

## 5. RACKS AND STORAGE

The correct storage of samples on the laboratory bench, in the refrigerator, or in the freezer increases the reliability of experiments and their results. BIOplastics offers a broad range of racks for (q)PCR, storage boxes and work racks. They do not only improve your sample archivation level, but also brighten up your laboratory with vibrant colors.

5.1	(q)PCR Multo Works Racks and Systems .....	page 117
5.2	Handling Storage Boxes and Inserts, Small Footprint .....	page 119
5.3	Handling Storage Boxes and Inserts, Regular Footprint .....	page 121
5.4	(Cryo) Storage Boxes (-200° C to 110° C) .....	page 123



## 5.1 (q)PCR Multo Work Racks and Systems

### 0.2 ml Multo work rack

This bench work rack is made of very robust poly-propylene and can hold qPCR tubes, strips and plates. It holds the micro titer plate format (8 x 12, A to H 1-12) and has 2 additional columns. The Multo rack therefore holds 14 x 8-tube strips, 112 single tubes or one plate. The extra 16 wells as can be used as "master vial" position when pipetting plates. The Multo rack can be used as a Work, Storage, Freezer or Cryo Storage Rack. Systems are available in 8 colors and are alpha numeric (A-H, 1-12) laser marked and also unique ID-ed. marked and coded.

### 0.2 ml Multo work rack system

The Multo rack systems contains of a 0.2 ml Multo work rack and a Multo rack box. The Multo rack box is an assembly of a base and a lid. Base and lid have a "Click-In" feature, closes securely and the stackable Multo rack system is used as a work, storage, freezer or cryo storage system. The height of 3 cm (1.2 Inch) enables the Multo system to be used for kit packaging as well as a shipping system for valuable samples.

### 0.2 ml Multo work rack system, stackable

Dimensions Multo work rack system:

Multo work rack dimensions: 128.4 mm (W) x 85.9 mm (L) x 10.3 mm (H)  
 Multo work rack box footprint: 134.8 mm (W) x 92.8 mm (L)  
 Multo work rack box dimensions: 135 mm (W) x 103.6 mm (L) x 27.7 mm (H)

Order#	Description	Package Size
B10443	Multo work rack system, white rack in box with lid, blue base, transparent lid, Laser Marked	.8 systems
B10442	.....red	
B10444	.....green	
B10446	.....orange	
B10445	.....yellow	
B10447	.....violet	
B10440	.....natural	



### 0.2 ml Multo work rack

Dimensions: 128.4 mm (W) x 85.9 mm (L) x 10.3 mm (H)

Order#	Description	Package Size
B10429	Multo work rack only, Laser Marked Coded, white	.8 Racks
B10422	.....red	
B10424	.....green	
B10426	.....orange	
B10420	.....natural	
B10423	.....blue	
B10425	.....yellow	
B10427	.....violet	
B10428	.....amber	



# Racks and Storage

## 0.2 ml Multo work rack-X customized

Dimensions: 128.4 mm (W) x 85.9 mm (L) x 10.3 mm (H) or different on demand

In case you need a specific rack or have specific demands BIOplastics is able to customize Multo work racks to your requirement. Contact our headquarters for options.



Order#	Description	Package Size
B10429-X	Multo work rack only, customized on demand	.8 Racks

## 0.2 ml Multo work rack box, Stackable

Dimensions:

Multo work rack box footprint: 134.8 mm (W) x 92.8 mm (L)

Multo work rack box dimensions: 135 mm (W) x 103.6 mm (L) x 27.7 mm (H)



Order#	Description	Package Size
B10403	Multo work rack box, box with lid, blue base, transparent lid, Laser Marked	.8 boxes

B10402	.....red	B10404	.....green	B10406	.....orange	B10408	.....amber
B10405	.....yellow	B10407	.....violet	B10400	.....natural		

## 0.2 ml Multo work rack box-base-X-laser customized

In case you need a specific Multo work rack box customized to your requirements e.g. with laser-coding, ID, RFID or any type or irreversible markings contact us for options and possibilities.

Dimensions: 135 mm (W) x 103.6 mm (L) x 27.7 mm (H)



Order#	Description	Package Size
B10403-X	Multo work rack box, any color base, any color transparent lid, custom laser-mark ID-ed	.8 boxes



## 5.2 Handling Storage Boxes and Inserts, Small Footprint

BIOplastics racks and boxes offer ultimate flexibility on the laboratory bench. Racks and boxes are available in a number of formats and sizes and can be used as a single unit or placed in an appropriate box with lid. All boxes and racks are stackable, autoclave-able and constructed of durable polypropylene.

Dimensions:	S Rack:	12.3 cm (L) x 8.4 cm (W) x 4.5 cm (H)
	S Box :	13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H)
	F Rack :	13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)
	F Box :	14.3 cm (L) x 14.3 cm (W) x 5.9 cm (H)

Racks are alphanumerically marked and racks and boxes can also be used in cold conditions. (-80°C)

### S-Box-96 system (96 x 0.2 ml and/or 96 x 0.5 ml titer tubes)

Contains of an S-96 rack which can hold 96 x 0.2 ml (q)PCR tubes, strips, plates as well as 96 titer tubes. The S-96 rack is positioned in an S-Box. Base and lid have a "Click-In" feature, closes securely and the stackable S-96 rack and S-Box system is used as a work, storage or freezer system.

Dimensions S-Box 96 system: 13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H) (hinge dimensions excluded)

Order#	Description	Package Size
B79301	S-Box-96 system (0.2 ml), white rack S-96 in box with lid, blue base, transp. lid	.8 systems

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



### S-Box-60 system (60 x 0.5 ml micro centrifuge tubes)

Contains of an S-60 rack which can hold 60 x 0.5 ml micro centrifuge tubes. The S-60 rack is positioned in an S-Box. Base and lid have a "Click-In" feature, closes securely and the stackable S-60 rack and S-Box system is used as a work, storage or freezer system.

Dimensions S-Box 60 system: 13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H) (hinge dimensions excluded)

Order#	Description	Package Size
B10033	S-Box-60 system (0.5 ml), white rack S-60 in box with lid, blue base, transp. lid	.8 systems

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



### S-Box-40 system (40 x 1.5/2.0 ml micro centrifuge tubes)

Contains of an S-40 rack which can hold 40 x 1.5/2.0 ml micro centrifuge tubes. The S-40 rack is positioned in an S-Box. Base and lid have a "Click-In" feature, closes securely and the stackable S-40 rack and S-Box system is used as a work, storage or freezer system.

Dimensions S-Box 40 system: 13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H) (hinge dimensions excluded)

Order#	Description	Package Size
B10053	S-Box-40 system (1.5/2.0 ml), white rack S-40 in box with lid, blue base, transp. lid	.8 systems

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



### S-96 Rack (96 x 0.2 ml and/or 95 x 0.5 ml titer tubes)

S-96 rack can hold 96 x 0.2 ml (q)PCR tubes, strips, plates as well as 96 titer tubes. Used as a work, storage or freezer system.

Dimensions S-96 Rack: 12.3 cm (L) x 8.4 cm (W) x 4.5 cm (H)

Order#	Description	Package Size
B69409	S-96 Rack (0.2 ml), white rack S-96	.8 racks

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



# Racks and Storage

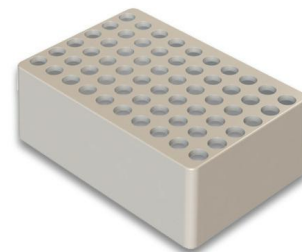
## S-60 Rack (60 x 0.5 ml micro centrifuge tubes)

S-60 rack can hold 60 x 0.5 ml micro centrifuge tubes  
Used as a work, storage or freezer system.

Dimensions S-60 Rack: 12.3 cm (L) x 8.4 cm (W) x 4.5 cm (H)

Order#	Description	Package Size
B10099	S-60 Rack (0.5 ml), white rack S-60	.8 racks

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



## S-40 Rack (40 x 1.5/2.0 ml micro centrifuge tubes)

S-40 rack can hold 40 x 1.5/2.0 ml micro centrifuge tubes.  
Used as a work, storage or freezer system.

Dimensions S-40 Rack: 12.3 cm (L) x 8.4 cm (W) x 4.5 cm (H)

Order#	Description	Package Size
B10079	S-40 Rack (1.5/2.0 ml), white rack S-40	.8 racks

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



## S-Rack-X customized

In case you need a specific rack or have specific demands BIOplastics is able to customize S-Racks to your requirement. Contact our headquarters for options.

Dimensions S-Rack-X: 12.3 cm (L) x 8.4 cm (W) x 4.5 cm (H) or different on demand

Order#	Description	Package Size
B10079-X	S-Rack X customized on demand	.8 racks

For different colors see our website: [www.bioplastics.com](http://www.bioplastics.com).



## S-Box-base

Base and lid have a "Click-In" feature, closes securely and stackable.  
Used as a work, storage or freezer box.

Dimensions S-Box base: 13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H) (hinge dimensions excluded)

Order#	Description	Package Size
B10113	S-Box-base, box with lid, blue base, transp. lid	.8 boxes



## S-Box-base-X-laser customized

In case you need a specific S-box customized to your requirements e.g. with laser-coding, ID, RFID or any type or irreversible markings contact us for options and possibilities.

Dimensions S-Box-X-laser customized: 13.1 cm (L) x 9.2 cm (W) x 6.2 cm (H) (hinge dimensions excluded) or different on demand

Order#	Description	Package Size
B10113-X	S-Box-base-X box with lid, any color base, any color transparent lid, custom laser-mark ID-ed	.8 boxes





## 5.3 Handling Storage Boxes and Inserts, Regular Footprint

BIOplastics storage boxes allow visual examination of the box contents without removing the lid. The boxes are manufactured with durable polypropylene, which does not have the problem of becoming water saturated like cardboard boxes. The autoclavable, unbreakable design provides convenient storage for micro centrifuge tubes and cryo vials. Can also be used as refrigerator or freezer storage rack. (-200°C) Racks and boxes are stackable and offer ultimate flexibility on the laboratory bench.

Dimensions: F Rack: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)  
 F Box : 14.3 cm (L) x 14.3 cm (W) x 5.9 cm (H)

Racks are alphanumerically marked and racks and boxes can also be used in cold conditions. (-80°C)

### F-Rack-96 (96 x 0.2 ml + 16 x 1.5/2.0 + 8 x 0.5 ml micro centrifuge tubes)

F-96 rack which can hold 96 x 0.2 (q)PCR tubes, strips, plates + 16 x 1.5/2ml + 8 x 0.5 ml micro centrifuge tubes. Used as a work, storage or freezer rack. Alphanumerically marked.

Dimensions F-Rack 96: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)

Order#	Description	Package Size
B10279	F-Rack 96 (0.2 ml), white	.8 racks



### F-Rack-100 (100 x 0.5 ml micro centrifuge tubes)

F-100 rack which can hold 100 x 0.5 ml micro centrifuge tubes. Used as a work, storage or freezer rack. Alphanumerically marked.

Dimensions F-Rack 100: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)

Order#	Description	Package Size
B10239	F-Rack 100 (0.5 ml), white	.8 racks



### F-Rack-81 (81 x 1.5/2.0 ml micro centrifuge tubes)

F-81 rack which can hold 81 x 1.5/2.0 ml micro centrifuge tubes. Used as a work, storage or freezer rack. Alphanumerically marked.

Dimensions F-Rack 81: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)

Order#	Description	Package Size
B10259	F-Rack 81 (1.5/2.0 ml), white	.8 racks



# Racks and Storage

## F-Rack-72 (27 x 1.5/2.0 + 45 x 0.5 ml micro centrifuge tubes)

F-72 rack which can hold 27 x 1.5/2.0 + 45 x 0.5 ml micro centrifuge tubes. Used as a work, storage or freezer rack. Alphanumerically marked.

Dimensions F-Rack 81: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H)

Order#	Description	Package Size
B10213	F-Rack 72 (0.5 + 1.5/2.0 ml), white	.8 racks



## F-Rack-X customized

In case you need a specific rack or have specific demands BIOplastics is able to customize F-Racks to your requirements. Contact our headquarters for options.

Dimensions F-Rack-X: 13.2 cm (L) x 13.2 cm (W) x 4.4 cm (H) or different on demand

Order#	Description	Package Size
B10213-X	F-Rack X customized on demand	.8 racks

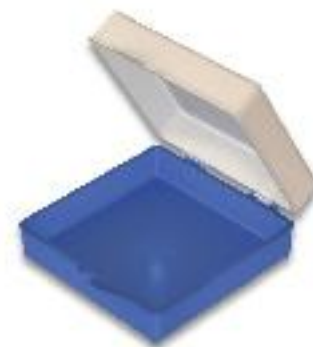


## F-Box-base

Base and lid have a "Click-In" feature, closes securely and is stackable. F-Box-base is used as a work, storage, transport or freezer box.

Dimensions F-Box-base: 14.3 cm (L) x 14.3 cm (W) x 5.9 cm (H) (hinge dimensions excluded)

Order#	Description	Package Size
B10343	F-Box-base box with lid, blue base, transp. lid	.8 boxes



## F-Box-base-X-laser customized

In case you need a specific F-box customized to your requirements e.g. with laser-coding, ID, RFID or any type or irreversible markings contact us for options and possibilities.

Dimensions F-Box-X-laser customized: 14.3 cm (L) x 14.3 cm (W) x 5.9 cm (H) (hinge dimensions excluded) or different on demand

Order#	Description	Package Size
B10343-X	F-Box-base-X box with lid, any color base, any color transparent lid, custom Laser-Mark ID-ed	.8 boxes



## 5.4 (Cryo) Storage Boxes (-200°C to 110°C)

BIOplastics cryo storage boxes allow visual examination of the box contents through the lid. The boxes are manufactured with durable polypropylene, which does not have the problem of becoming water saturated like cardboard boxes. The autoclavable, unbreakable design provides convenient storage for micro centrifuge tubes and cryo vials. The boxes can be stacked and have telescopic lids. They are available in different colors. Working range from ambient temperatures up to 110°C and down to -200°C. Accommodates all commonly used centrifuge and cryo tubes and fits most (Cryo) Storage rack systems. Outer dimensions: 13.0 cm (L) x 13.0 cm (W) x 4.5 cm (H)

### Cryo storage box 81 position, stackable

Outer dimensions: 13.0 cm (L) x 13.0 cm (W) x 4.5 cm (H)

Working range from ambient temperatures up to 110 °C and down to -200°C.

Order#	Description	Package Size
B10021	Cryo Storage Box 81 position, blue base, natural transparent telescopic lid	Box of 5
B10017	red	
B10018	yellow	
B10020	green	
B10016	natural	



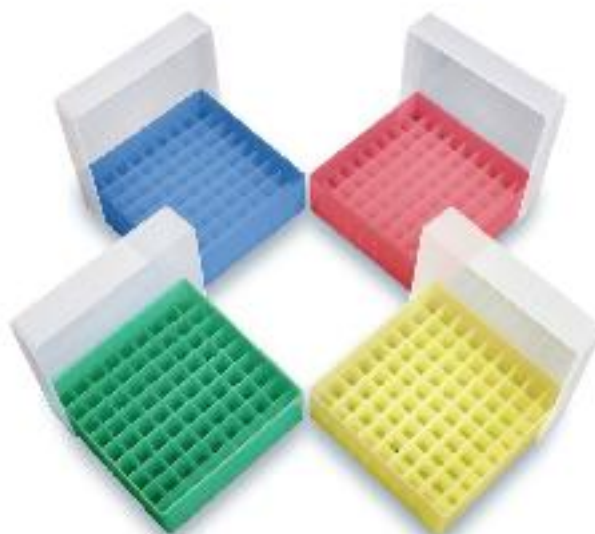
### Cryo storage box 81-X position, stackable, laser customized

In case you need a specific Cryo storage box customized to your requirements e.g. with laser-coding, ID, RFID or any type or irreversible markings contact us for options and possibilities.

Outer dimensions: 13.0 cm (L) x 13.0 cm (W) x 4.5 cm (H)

Working range from ambient temperature up to 110 °C and down to -200°C.

Order#	Description	Package Size
B10021-X	Cryo Storage Box 81 box, any color, transparent telescopic lid, custom laser-mark ID-ed	Box of 5



## 6. LASER CODED PRODUCTS

6.0	Laser Mark and Bar Coded Products	page 125
6.1.1	0.1 ml Single Tubes and 4-Tube Strip with Single Attached Cap, 2D Coded	page 126
6.1.2	0.1 ml 8 and 12-Tube Strips, Low Profile, Laser Mark Coded	page 126
6.2.1	0.1 ml 24, 48 and 96 Well Plates, Low Profile, Laser Mark Coded	page 128
6.3.1	0.2 ml 8 and 12-Tube Strips, Regular Profile, Laser Mark Coded	page 131
6.3.2	0.2 ml 24 and 96 Well Plates, regular Profile, Laser Mark Coded	page 133
6.4.1	384 (q)PCR Plates, Laser Mark Coded	page 135
6.5.1	Screw Cap (Cryo) Tubes, Laser Mark (Bar) Coded	page 136
6.6	Titer Dilution and Storage Tubes, Laser Mark (Bar) Coded	page 136

To see if products are compatible with your cycler, use the “Compatibility Chart (q)PCR Cyclers & Sequencers” on page 26 through 41. For cycler adaptors and Shell Frame Grids, see page 53 and 54.



## 6.0 Laser Mark and Bar Coded Products

### In product coding and labeling with BIOplastics BPLPM technology

One of BIOplastics innovations is in product coding and labeling with BIOplastics BPLPM, which incorporates micro particles into a selected range of products. The BPLPM technology (BIOplastics particle mix) products are offered in addition to the regular range of products. The inert particles, by nature, increase signal to noise ratios in Real-Time PCR applications. BPLPM provides indelible IN PRODUCT labeling and identification. While others use ink, stamps, or dyes containing organic solutions or stickers, BIOplastics' BPLPM technology results in a non-removable, unique marking and coding of the product. No writing with markers, no mistakes, no removal of marks, no double identification numbers; just use the unique ID# at the beginning of your process. Link the unique ID# to your Lab LIMS system and samples.

### Laser bar coded products, no stickers at all and customized labelling

Bar coded" products are bar coded by means of in product laser marking. In opposite of the use of a "sticker" the laser mark bar code can not be removed at all not can it be destroyed. It is therefore the ultimate tool for traceability which is particularly useful for accredited labs in pre-diagnostic and diagnostic settings. This type of laser-coding improves procedures and reduces the risk of label failures. Depending on volumes, custom layouts and customized codes including 2D coding are available. Forensic labs, kit manufacturers and others can benefit this superior technology which enables to effectively trace products and applications.

### Chip Incorporated (q)PCR strips and plates

Laser mark coded products are already unique and irreversible ID-ed. For those customers who would like to go beyond these already unique ID markings BIOplastics enables the possibility for incorporating an RFID chip in its products. By doing so the products are programmable, scan and readable. This might be particularly interesting in combination with unique ID's for diagnostic kits, diagnostic testing combining instruments, applications and other parameters as well as for e.g. storage purposes. Contact BIOplastics for demands, information and possibilities.



## 6.1.1 0.1 ml Single Tubes and 4-Tube Strip with Single Attached Cap, 2D Coded

EU 0.1 ml thin-wall tube, with optical indented wide area cap, low profile

2D laser mark coded tubes available on request.

EU 0.1ml Optical 4-Tube Strips with attached caps



Order#	Description	Package Size
B85001L	EU 0.1ml 4-tube-strip fits Rotor-Gene® system, natural, each cap 2D laser coded, . . . . .	.bag, 250 strips
B85101L	Cryo Micro Storage 0.1ml 4-tube-strip with attached caps, natural, each cap 2D Laser Mark Coded . . . . .	.bag, 250 strips
B85101L-X	0.1ml 4-tube-strip with attached caps, customized coded . . . . .	.bag, 250 strips



## 6.1.2 0.1 ml 8 and 12-Tube Strips, Low Profile, Laser Mark Coded

EU 0.1ml 8-Tube Strip, extra robust, low profile, fits Shell Frame Grids (SFG)



See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B59901L	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, Frosted, fits SFG, natural, Laser Mark Coded . . . . .	10 grids hold 120 strips
B59909L	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, fits SFG, white, Laser Mark Coded . . . . .	10 grids hold 120 strips
B59901L-X	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, customized coded . . . . .	10 grids hold 120 strips



EU 0.1ml 8-Tube Strips, robust, low profile, fits Shell Frame Grids (SFG)



This strip can also be used in combination with the 8-single attachable indented cap strip. (B79501)

See compatibility list at [www.bioplastics.com](http://www.bioplastics.com)

Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B77001L	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, Frosted, fits SFG, natural, Laser Mark Coded . . . . .	10 grids hold 120 strips
B77009L	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, fits SFG, white, Laser Mark Coded . . . . .	10 grids hold 120 strips
B77001L-X	EU 0.1ml, Thin-wall 8-tube strip, Low Profile, customized coded . . . . .	10 grids hold 120 strips



For cap strips and mats see pages 55 through 56.

## EU 0.1ml 8-Tube Strips, extra robust, low profile, Tear Off Mat, fits Shell Frame Grids (SFG)



The 96 x 0.1ml Tear-Off 8-Tube Strip Mat is designed for PCR and qPCR applications. The 8-tube strips are barely attached to each other. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com)  
 Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B59001L	EU 96 x 0.1ml 8-tube strips Tear Off Mat, Low Profile, Frosted, natural, Laser Mark Coded	.25 mats (300 strips)
B59009L	EU 96 x 0.1ml 8-tube strip Tear Off Mat, Low Profile, white, Laser Mark Coded	.25 mats (300 strips)
B59001L-X	EU 96 x 0.1ml 8-tube strips Tear Off Mat, Low Profile, natural, customized coded	.25 mats (300 strips)

## EU 0.1ml 8-Tube Strips with single attached optical wide area caps, low profile, fits SFG



12.6 mm<sup>2</sup>

Fits almost every PCR and qPCR (fast) cyclers model which accept low profile products.  
 See compatibility list at [www.bioplastics.com](http://www.bioplastics.com)



Order#	Description	Package Size
B72811L	EU 0.1ml thin-wall 8-tube strip with attached optical cap, fits SFG, natural, Laser Mark Coded	.bag, 120

Not available in the USA, alternative for the USA: B79501 + B77001

## EU 0.1ml 12-Tube Strips, extra robust, low profile



Fits almost all PCR and qPCR (fast) cyclers models which accept low profile products.  
 See compatibility list at [www.bioplastics.com](http://www.bioplastics.com)  
 Closure can be accomplished with any EU 12-cap strip. For qPCR closure use B57821.

Order#	Description	Package Size
B76609L	EU 0.1ml thin-wall 12-tube strip, Extra Robust, Low Profile, white, Laser Mark Coded	.10 grids (120)
B76609L-X	EU 0.1ml thin-wall 12-tube strip, Extra Robust, Low Profile, white, customized coded	.10 grids (120)



For caps and EU Seals see pages 55 through 58.

## 6.2.1 0.1 ml 24, 48 and 96 Well Plates, Low Profile, Laser Mark Coded

### EU 24 x 0.1 ml (q)PCR Plate, semi skirted, low profile



Fits almost every PCR and qPCR (fast) cyclers model which accept low profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B50340L	EU 24 x 0.1 ml thin wall plate Semi skirted, frosted, Laser Mark Coded, natural	100 plates
B50349L	EU 24 x 0.1 ml thin wall plate Semi skirted, Low Profile, Laser Mark Coded, white	100 plates
B50340L-X	EU 24 x 0.1 ml thin wall plate Semi skirted, Low Profile, customized coded	100 plates

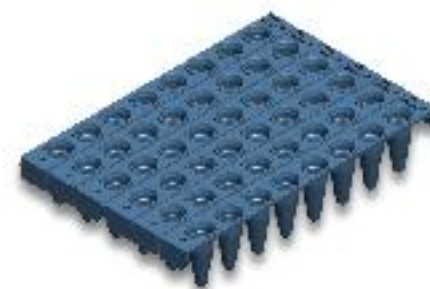


### EU 48 x 0.1 ml (q)PCR Plate, semi skirted, low profile



Fits almost every PCR and qPCR (fast) cyclers model which accept low profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B71601L	EU 48 x 0.1 ml thin-wall plate Semi skirted, frosted, Laser Mark Coded, natural	.50 plates
B71609L	EU 48 x 0.1 ml thin wall plate Semi skirted, Low Profile, Laser Mark Coded, white	.50 plates
B71601L-X	EU 48 x 0.1 ml thin-wall plate Semi skirted, Low Profile, customized coded	.50 plates



### EU 96 x 0.1 ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)



This latest innovative product, designed for PCR and qPCR applications fits almost every PCR and qPCR (fast) cyclers model which accept low profile (LP) products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates can be easily cut into 16, 24, 32 or 48-well pieces. Plates as a whole or part(s) of it can be "clicked in" BIOplastics Shell Frame Grids. This product is also available pre-assembled in SFG. (see SFG assemblies). The plate enables high efficiency usage as well as the use of "two product only" strategy. For some ABI cyclers the use of Shell Frame Grid AB19805G is required. The use of these products combined with Shell Frame Grid type #AB19805G enables to use these products in any ABI, Life Technologies®, 0.1 ml (q)PCR cyclers (fast models). Whereas if combined with Shell Frame Grid type #B17489G it fits Roche LightCycler® 480 systems. Plate also fits the Roche 480 adaptor B79480. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B50601L-1	96 x 0.1ml, thin wall plate, Non skirted, fits SFG, Frosted, Laser Mark Coded, natural	.25 plates
B60109L-1	96 x 0.1ml, thin wall plate, Non skirted, fits SFG, Laser Mark Coded, white	.25 plates
B50601L-1X	96 x 0.1ml, thin wall plate, Non skirted, fits SFG, customized coded	.25 plates



For caps and EU Seals see pages 55 through 58.



## EU 96 x 0.1 ml 8-Tube Strips, extra robust, low profile, Tear Off Mat fits Shell Frame Grids



The 96 x 0.1 ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications and the 8-tube strips are barely attached to each other. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B59001L	EU 96 x 0.1 ml 8-tube strips Tear Off Mat, Low Profile, Frosted, natural, Laser Mark Coded	.25 mats (300 strips)
B59009L	EU 96 x 0.1 ml 8-tube strip Tear Off Mat, Low Profile, white, Laser Mark Coded	.25 mats (300 strips)
B59001L-X	EU 96 x 0.1 ml 8-tube strips Tear Off Mat, Low Profile, customized coded	.25 mats (300 strips)



## EU 96 x 0.1 ml robust, cut-able (q)PCR Plate, low profile



These plates are designed for PCR and qPCR applications and almost every (q)PCR cyclor model which accept Low Profile (LP) products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B50601L	96 x 0.1 ml, thin wall plate, Non Skirted, cut-able, Light Frosted, Laser Mark coded, natural	.25 plates
B50609L	96 x 0.1 ml, thin wall plate, Non Skirted, cut-able, Laser Mark Coded, white	.25 plates



## EU 96 x 0.1 ml robust, (q)PCR Plate, fits Roche LightCycler® 480 systems



These plates are designed for PCR and qPCR applications and specifically to fit Roche LightCycler® 480 systems. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
BB17489L	96 x 0.1 ml, Roche 480, Thin-wall plate, Semi Skirted, Laser Mark (Bar) Coded, white	.25 plates
BB17489L-X	96 x 0.1 ml, Roche 480, Thin-wall plate, Semi Skirted, customized coded	.25 plates



## EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, fits Roche LightCycler® 480 systems



This innovative assembly is composed of a 96 x 0.1 ml Cut-able plate (CT) positioned in a Shell Frame Grid. Designed to be used in specifically Roche Lightcycler® 480 systems and other (q)PCR cyclors or robotic applications. The assembly can be disassembled and unused parts can be removed (cut). The to be used part of the plate is reassembled in the SFG. The total assembly, including each individual plate strip section is laser mark coded. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
CB17480L	96 x 0.1 ml CT Plate SFG assembly Roche, cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17489L	96 x 0.1 ml CT Plate SFG assembly Roche, cut-able, Laser Mark Coded, Frosted, White	.25 assemblies
CB17480L-X	96 x 0.1 ml CT Plate SFG assembly Roche, cut-able, customized coded	.25 assemblies



For caps and EU Seals see pages 55 through 58.

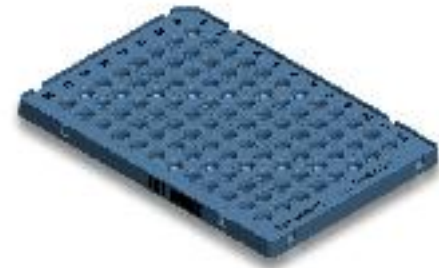
# Laser Coded Products

## EU 96 x 0.1 ml robust, (q)PCR Plate, ABI Fast /Life Technologies® cyclers compatible



These plates are designed for PCR and qPCR applications and specifically to fit ABI/ Life Technologies® Fast or 0.1 ml systems. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
AB19800LB	96 x 0.1 ml, ABI Fast LT compatible, plate, Sub Skirted, Frosted, Laser Mark (Bar) coded, natural	.25 plates
AB19809LB	96 x 0.1 ml, ABI Fast LT compatible, thin wall plate, Sub Skirted, Laser Mark (Bar) coded, white	.25 plates
AB19800LX	96 x 0.1 ml, ABI Fast LT compatible, plate, Sub Skirted, customized coded	.25 plates



## EU 96 x 0.1 ml (q)PCR Shell Frame Grid assembly, ABI Fast /Life Technologies® cyclers compatible



This innovative assembly is composed of a 96 x 0.1 ml Cut-able plate (CT) positioned in a Shell Frame Grid. Designed to be used in specifically, but not limited to, ABI/ Life Technologies® Fast or 0.1 ml cyclers and robotic applications. The assembly can be disassembled and unused parts can be removed (cut). The to be used part of the plate is reassembled in the Shell Frame Grid. The total assembly, including each individual plate strip section is laser mark coded. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
CB179800L	96 x 0.1 ml CT Plate SFG assembly ABI/LT Fast, cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB179809L	96 x 0.1 ml CT Plate SFG assembly ABI/LT Fast, cut-able, Laser Mark Coded, white	.25 assemblies
CB179800LX	96 x 0.1 ml CT Plate SFG assembly ABI/LT Fast, cut-able, customized coded	.25 assemblies



## EU 96 x 0.1 ml robust, (q)PCR Plate, flat, fully skirted, stackable and robotic friendly



These plates can be used in a number of 0.1 ml and 0.2 ml blocks, PCR and Real-Time thermal cyclers. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.

Order#	Description	Package Size
B70671LB	96 x 0.1 ml Thin-wall plate, Fully skirted, Laser Mark Bar Coded, natural	.25 plates
B70679LB	96 x 0.1 ml Thin-wall plate, Fully skirted, Laser Mark Bar Coded, white	.25 plates
B70671LX	96 x 0.1 ml Thin-wall plate, Fully skirted, customized coded	.25 plates



For caps and EU Seals see pages 55 through 58.

## 6.3.1 0.2 ml 8 and 12-Tube Strips, Regular Profile, Laser Mark coded

### EU 0.2ml 8-Tube Strips, extra robust, regular profile, fits Shell Frame Grids (SFG)



Fits almost every PCR and qPCR cyclers model which accept regular profile.  
See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Designed for PCR and qPCR applications.  
Can also be as positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments.  
Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or the Optical Tear Off 8-Cap Strip Mat (B57651) is recommended.



Order#	Description	Package Size
B69909L	EU 0.2ml thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, white, Laser mark Coded	.10 grids (120)
B69901L	EU 0.2ml thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, natural, Laser mark Coded	.10 grids (120)
B69901L-X	EU 0.2ml thin-wall 8-tube strip, Extra Robust, Regular Profile, fits SFG, customized coded	.10 grids (120)

### EU 0.2ml 8-Tube Strips, robust, regular profile, fits Shell Frame Grids (SFG)



This strip can also be used in combination with the 8-single attachable indented cap strip (B79501).  
Fits almost every PCR and qPCR (fast) cyclers model which accept regular profile products such as ABI/LT Fast, Roche®, BIO-RAD®, Eppendorf® and others. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Designed for PCR and qPCR applications. Can be positioned in specific (skirted) grids also called Shell Frame Grids and once "positioned in" becoming a plate assembly for specific (q)PCR instruments. There are four different grids available: To fit all ABI 0.2 ml cyclers use grid AB17503G and for making solid non skirted plates use B69304 grid. See also: Shell Frame Grids.  
Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B77109L	EU 0.2ml thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, white, Laser mark Coded	.10 grids (120)
B77101L	EU 0.2ml thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, natural, Laser mark Coded	.10 grids (120)
B77101L-X	EU 0.2ml thin-wall 8-tube strip, Robust, Regular Profile, fits SFG, customized coded	.10 grids (120)

### EU 0.2ml 8-Tube Strips, extra robust, regular profile, Tear Off Mat, fits Shell Frame Grids



The 96 x 0.2ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications and the 8-tube strips are barely attached to each other. One or more individual 8-tube strips can be easily torn off. The mats can be used as plates and/or as a torn off partition of it. Furthermore the 96 x 0.2ml Tear-Off 8-Tube Strip Mat can be clicked in specific (skirted) grids also called Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments or/and robotics applications. Fits all PCR and most qPCR cyclers models which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).  
Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear-off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B58001L	EU 96 x 0.2 ml 8-tube strips Tear Off Mat, Regular Profile, Frosted, natural, Laser Mark Coded	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml 8-tube strip Tear Off Mat, Regular Profile, white, Laser Mark Coded	.25 mats (300 strips)
B58001L-X	EU 96 x 0.2 ml 8-tube strips Tear Off Mat, Regular Profile, customized coded	.25 mats (300 strips)

For caps and EU Seals see pages 55 through 58.

# Laser Coded Products

## EU 0.2ml 8-Tube Strips with single attached optical wide area caps, regular profile, fits Shell Frame Grids (SFG)

Fits almost every PCR and qPCR (fast) cyclers model which accept regular profile products.

Order#	Description	Package Size
B72910L	EU 0.2ml thin-wall 8-tube strip with attached optical cap, Frosted, natural, Laser Mark Coded	.bag, 120

Not available in the USA, alternative for the USA: B79501 + K77101



12.6 mm<sup>2</sup>



## EU 0.2ml 12-Tube Strips, extra robust, regular profile

Fits almost every PCR and qPCR cyclers model which accept regular profile products.

See compatibility list at [www.bioplastics.com](http://www.bioplastics.com).

Closure can be accomplished with any EU 12-cap strip. For qPCR closure use B57821.

Order#	Description	Package Size
B56609L	EU 0.2ml thin-wall 12-tube strip, Extra Robust, Regular Profile, white, Laser Mark Coded	.10 grids (120)
B56609L-X	EU 0.2ml thin-wall 12-tube strip, Extra Robust, Regular Profile, customized coded	.10 grids (120)



For 12-Cap Strips see page 56.

## 6.3.2 0.2 ml 24 and 96 Well Plates, Regular Profile, Laser Mark Coded

### EU 24 x 0.2 ml (q)PCR Plate, semi skirted, regular profile

These EU 24 well regular profile plates are semi skirted and designed for (q)PCR applications. Fits almost every PCR and qPCR cyclers model which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B50240L	EU 24 x 0.2 ml thin-wall plate Semi skirted, frosted, Laser Mark Coded, natural	100 plates
B50249L	EU 24 x 0.2 ml thin-wall plate Semi skirted, frosted, Laser Mark Coded, white	100 plates



### EU 96 x 0.2ml robust, cut-able (q)PCR Plate, fits Shell Frame Grids (SFG)

This latest innovative product, designed for PCR and qPCR applications fits almost every PCR and qPCR cyclers model which accept regular profile (RP) products as ABI/LT, Agilent®, BIO-RAD®, Eppendorf® and others. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Plates can be easily cut into 16, 24, 32 or 48-well pieces. Plates as a whole or part(s) of it can be "clicked in" BIOplastics Shell Frame Grids. This product is also available pre-assembled in SFG. (see SFG assemblies). The plate enables high efficiency usage as well as the use of "two product only" strategy. For some ABI cyclers the use of Shell Frame Grid AB17503G is required. The use of these products combined with Shell Frame Grid type # AB17503G enables to position these products in any ABI, Life Technologies®, 0.2 ml (q)PCR cyclers. Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B50501L-1	96 x 0.2ml, thin wall plate, Non Skirted, fits Shell Frame Grids, Laser Mark Coded, Frosted, natural	.25 plates
B70509L-1	96 x 0.2ml, thin wall plate, Non Skirted, fits Shell Frame Grids, Laser Mark Coded, white	.25 plates



### EU 0.2ml 8-Tube Strips, extra robust, regular profile, Tear Off Mat, fits Shell Frame Grids (SFG)

The 96 x 0.2ml Tear Off 8-Tube Strip Mat is designed for PCR and qPCR applications and the 8-tube strips are barely attached to each other. One or more individual 8-tube-strips can be easily torn off. The mats can be used as plates and/or as a torn off partition of it. Furthermore the 96 x 0.2ml Tear Off 8-Tube Strip Mat can be clicked in specific (skirted) grids also called Shell Frame Grids and once "clicked in" becoming a plate assembly for specific (q)PCR instruments or/and robotics applications. Fits all PCR and most qPCR cyclers models which accept regular profile products. See compatibility list at [www.bioplastics.com](http://www.bioplastics.com). Closure can be accomplished with any EU 8-cap strip or Opti-Seal™. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended.



Order#	Description	Package Size
B58001L	EU 96 x 0.2 ml 8-tube strips Tear Off Mat, Regular Profile, Frosted, natural, Laser Mark Coded	.25 mats (300 strips)
B58009L	EU 96 x 0.2ml 8-tube strip Tear Off Mat, Regular Profile, white, Laser Mark Coded	.25 mats (300 strips)
B58001L-X	EU 96 x 0.2 ml 8-tube strips Tear Off Mat, Regular Profile, customized coded	.25 mats (300 strips)



For caps and EU Seals see pages 55 through 58.

# Laser Coded Products

## EU 96 x 0.2ml robust, cut-able (q)PCR Plate, regular profile



These plates are designed for PCR and qPCR applications and fit almost every (q)PCR Cycler model which accept Regular Profile (RP) products. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
B50509L	96 x 0.2ml, Thin-wall plate, Non skirted, Cut-able, Frosted, Laser Mark Coded, natural	.25 plates
B70509L	96 x 0.2ml, Thin-wall plate, Non skirted, Cut-able, Light Frosted, Laser Mark Coded, white	.25 plates



## EU 96 x 0.2ml (q)PCR Shell Frame Grid assembly, fits ABI and Life Technologies® systems



This innovative assembly is composed of either a 96 x 0.2ml cut-able plate (CT), positioned in a Shell Frame Grid. Designed for universal use as well as to fit ABI and Life Technologies® systems. The assembly can be disassembled and unused parts can be removed (cut). The to be used cut part of the plate is reassembled in the Shell Frame Grid. Closure can be accomplished with any EU 8-cap strip. For qPCR closure the use of B57801, B79701-1 or Optical Tear Off 8-Cap Strip Mat is recommended. The total assembly, including each individual plate strip section is laser mark coded. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com).

Order#	Description	Package Size
CB17500L	96 x 0.2 ml CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, Frosted, natural	.25 assemblies
CB17509L	96 x 0.2 ml CT Plate SFG assembly ABI/LT, Cut-able, Laser Mark Coded, white	.25 assemblies
CB17500L-X	96 x 0.2 ml CT Plate SFG assembly ABI/LT, Cut-able, customized coded	.25 assemblies



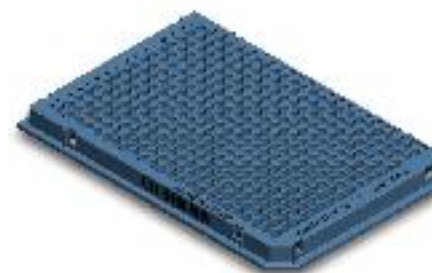
For caps and EU Seals see pages 55 through 58.

## 6.4.1 384 (q)PCR Plates, Laser Marked and Bar Coded

### EU Thin-wall 384 well Plate, Roche LightCycler® 480 systems compatible, Flat, robust, stackable and robotic friendly

This fully skirted 384 well EU plate is designed to fit Roche LightCycler® 480 systems. Optimized for robotic high-throughput applications. Can be used in many 384 well block (q)PCR cyclers models. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates are rigid, flat and stackable. Closure can be accomplished with one of the EU Seals (157300, 157200).

Order#	Description	Package Size
B71515L	EU 384 Well thin-wall plate, Roche 480 Type, Laser Mark Coded, natural	.40 plates
B71519L	EU 384 Well thin-wall plate, Roche 480 Type, Laser Mark Coded, white	.40 plates
B71519LB	EU 384 Well thin-wall plate, Roche 480 Type, Laser Mark Bar Coded, white	.40 plates
B71515L-X	EU 384 Well thin-wall plate, Roche 480 Type, customized coded	.40 plates



### EU Thin-wall 384 well Plates, ABI and Life Technologies® cyclers compatible

This superior 384 well EU plate is designed to fit ABI and Life Technologies® cyclers, optimized for robotic applications. Allows high-throughput and low-volume processing. Can be used in many 384 well block (q)PCR cycler models. See compatibility search engine at [www.bioplastics.com](http://www.bioplastics.com). Plates are rigid, flat and stackable. Closure can be accomplished with one of the EU Seals (157300, 157200). Plates contain BPLPM technology.

Order#	Description	Package Size
B70515L	EU 384 Well thin-wall plate, ABI Type, Laser Mark Coded, natural	.40 plates
B70519L	EU 384 Well thin-wall plate, ABI Type, Laser Mark Coded, white	.40 plates
B70515LB	EU 384 Well thin-wall plate, ABI Type, Laser Mark Bar Coded, natural	.40 plates
B70515L-X	EU 384 Well thin-wall plate, ABI Type, customized coded	.40 plates



For EU Seals see pages 57 through 58.

## 6.5.1 Screw Cap (Cryo) Tubes, Laser Mark (Bar) Coded

BIOplastics' screw cap tubes are designed withstand extreme conditions.

These low binding and robust tubes are also an excellent means of storage and are available in three different volumes: 0.5 ml, 1.5 ml and 2.0 ml.

The specific properties of the raw material enable these tubes to be handled in a temperature range of -200°C to 100°C. See also table as section "Screw Cap Tubes"

### Conical (without screw caps)

Order#	Description	Package Size
B71057L	Natural, 0.5 ml conical screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71058L	Natural, 1.5 ml conical screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B91201L	Natural, 2.0 ml conical screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71057UL	Natural, 0.5 ml conical screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71058UL	Natural, 1.5 ml conical screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B91201UL	Natural, 2.0 ml conical screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each



### Free standing (without screw caps)

Order#	Description	Package Size
B71060L	Natural, 0.5 ml free standing screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71061L	Natural, 1.5 ml free standing screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71072L	Natural, 2.0 ml free standing screw cap tube, low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71060UL	Natural, 0.5 ml free standing screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71061UL	Natural, 1.5 ml free standing screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each
B71072UL	Natural, 2.0 ml free standing screw cap tube, extra low binding, robust, Laser Mark Bar Coded	.5 bags of 50 tubes each



## 6.6 Titer Dilution and Storage Tubes, Laser Mark (Bar) Coded

### Titer dilution and storage 8-Strip-tubes

Order#	Description	Package Size
B74156L	0.5 ml Dilution and storage tubes, natural, laser mark coded	.bag, 120 strips (960)



### 96 Interconnected Tube-Plates

Order#	Description	Package Size
B74256L	0.5 ml Dilution and storage 96 interconnected tubes-plate, natural, laser mark coded	.12 plates
B74257L	0.5 ml Dilution and storage 96 interconnected tubes-plate, racked in box, laser mark coded	.8 boxes



All tubes can be closed with any of the BIOplastics cap strips, preferably however using the extra robust EU Indented Flat 8 Cap-Strip (B75701) or 12 Cap-Strip (B56501).

For screw caps see page 112. For caps and EU Seals see pages 55 through 57.



## APPENDIX

<b>Frequently Asked Questions</b> .....	<b>page 138</b>
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• Manual Assembly 8-Tube Strip (Mats) to Shell Frame Grids (SFG) .....	page 141
• Flexibility and interchangeability of Shell Frame Grids Assemblies .....	page 142
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# Frequently Asked Questions

## 1 What is the difference between EU-O-type, A-type and M-type material?

EU-O-type, A-type and M-type material are all blends of polypropylenes. The types of polypropylenes and the ratios between them differ. EU-O type is the most optimal blend with the lowest binding capacity for bio molecules and ions, the highest flexibility and the best optical characteristics. BIOplastics recommend this type for molecular biology applications. It is the default type used in most BIOplastics products. A-type resembles the classical polypropylene mix used by many conventional manufacturers. M-type resembles EU-O-type in binding capacity.

## 2 Do Extreme Uniform plastics contain softeners?

BIOplastics products are manufactured using a proprietary blend of polypropylenes. It is this blend, which gives the plastics its optically clear and flexible characteristics. Softeners are not used.

## 3 Are release agents used in the manufacturing process of Extreme Uniform plastics?

No release agents are used in the manufacturing process. The reactions performed in Extreme Uniform tubes, 8-strips, 96-well or 384 plates are therefore not be disturbed by release agents.

## 4 Which types of polypropylenes are used in Extreme Uniform plastics?

A proprietary confidential blend of polypropylenes is used to manufacture Extreme Uniform plastics.

## 5 Which EU tubes, 8-strips, 96-well and 384 plates fit my thermocycler?

Please refer to the PCR thermocycler and Real-Time PCR thermocycler compatibility tables. Notice that most updated information is available on the website. Preferably use the dynamic, interactive and multi comparison option using the search engine at the website.

## 6 Which EU 96-well plates fit my sequencer?

Please refer to the sequencer compatibility table in the current BIOplastics catalog. Preferably use most up to date dynamic, interactive and multi comparison option using the search engine at the website.

## 7 Which tip fits my pipette?

Please refer to compatibility table or interactive options on the website [www.bioplastics.com](http://www.bioplastics.com).

## 8 Why are frosted 96-well plates used in fluorescent applications?

Frosted 96-well plates scatter background light, therefore less background light is detected therefore a lower background and a higher signal-to-noise ratio is detected. Furthermore, the signal is boosted, which leads to an additional increase in signal-to-noise ratio.

## 9 Which EU 96-well plates can be cut into smaller pieces?

Any EU non-skirted plates and some semi skirted plates can be cut in to smaller plates or strips.

## 10 Which EU seals fit which EU 96-well and 384 plates?

Both EU Opti-seal (157300) and EU Alu-seal (157200) can be applied to any EU 96-well and 384 plate

## 11 Which 8-cap strips can be used to close EU 96-well plates?

All EU 8-cap strips and 12 strips can be combined with all EU 96-well plates.

## 12 Which EU 8-cap strip fits which EU 8-tube strip?

All EU 8-cap strips fit all EU 8-tube strips.

## 13 Which EU 96-well plates have notches for robotic handling?

The EU semi-skirted 96-well plates and the sub-skirted plates have notches for robotic handling.

## 14 Do the EU 96-well and 384 plates meet the SBS standards?

All EU 96-well plates meet the SBS standards for well layout, well-to-well distance and well markings. Footprint and height standards are met for only certain types of plates. Please contact us via [info@bioplastic.com](mailto:info@bioplastic.com) for further details concerning these standards.

## 15 Are the EU Alu-seals pierce-able?

Although the EU Alu-seals (157200) are thicker than most other seals, they are pierce-able.

## 16 What does the "Guaranteed free of DNase, RNase, metal, pyrogens" label mean on EU (q)PCR plastics?

All products with the label "Guaranteed free of DNase, RNase, metal, pyrogens" are manufactured under GMP, no-hands-on conditions, and are tested and QC-ed in our QC-laboratory. These products can be used in molecular biology applications, without the need to sterilize or autoclave.

## 17 Are all EU products sterilized?

Molecular biology applications require a DNase, RNase, metal and pyrogen free product, not a sterile product. All EU plastics are by default guaranteed and tested for the absence of DNase, RNase, metal, and pyrogens. A sterile version of the EU product is also available when the application requires sterilization, for example cell culture or microbiology applications.

## 18 Do EU (q)PCR plastics have to be autoclaved before use in (q)PCR?

All (q)PCR products are guaranteed and tested for the absence of detectable DNase, RNase, metal, pyrogens and can be used without autoclaving.

## 19 How are EU products sterilized?

EU products are sterilized by  $^{60}\text{Co}$  irradiation

## 20 Can EU products be autoclaved?

EU products can be autoclaved for 15 minutes at 121°C at 2 bar. Notice that most products are DNA(se), RNA(se) and pyrogen free, and can be used as they come. If a sterile product is still required we recommend sterilizing the EU plastics by  $^{60}\text{Co}$  irradiation. Both means of sterilization can make the polypropylene more brittle.

## 21 What is the shelf life of EU plastics?

In general plastic disposables do not have a shelf life. It is recommended to store the EU plastics out of direct sunlight, at room temperature in the original packaging. We recommend the product to be use within 7 years after manufacturing.

## 23 Can samples be frozen in EU plastics?

Samples can be frozen in EU plastics down to -200°C. (see tables in this catalog). If freezing allow 10% "air space" and fill up to 90% of the total volume of the tube to allow expansion of sample when freezing (water based solutions)

## 22 Where can the lot and or number of an EU product be found?

All cases are labeled with a unique case ID with barcode and its content, bag or box, is labeled with a unique package ID with barcode. In case of any complaints or questions, please mention your package ID for reference which enables us to fully trace all processes of the product.

## 23 Are EU plastics traceable?

The production of EU plastics, starting from incoming raw material up to the final packaging is traceable. The barcode case ID# and/or package ID# enables us to trace how and when the plastic was manufactured, packed, QC-ed, stocked and sold. So traceability includes raw material batches, injection molding machine#, mold number#, molding conditions, production date, QC dates, packaging date, packaging personnel etc.

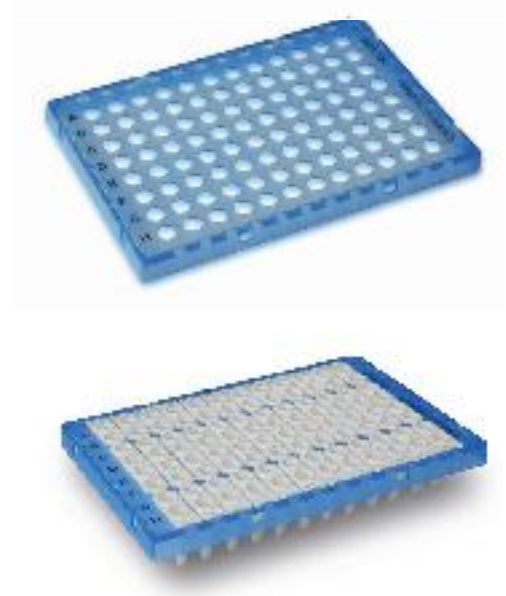
# Instructions for Shell Frame Grid Assemblies

## Instruction for assembling and disassembling Tube Strip Mats, parts of Tube Strip Mats and designated 8-Tube Strips in Shell Frame Grids

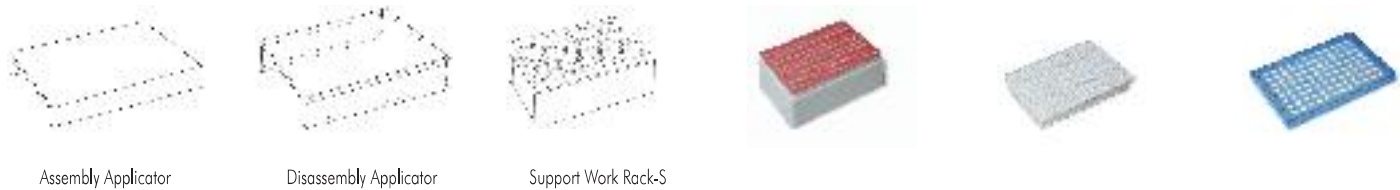
### Four types of grids available:

Roche LightCycler® 480 systems:	Shell Frame Grid	B17489G (white)
Applied Biosystems FAST cyclers (0.1 ml):	Shell Frame Grid	AB19805G (yellow)
Applied Biosystems Regular cyclers (0.2 ml):	Shell Frame Grid	AB17503G (blue)
EU Tube Support Grid:	Non Skirted Grid	B69304 (green)

Notice that specific cyler grids are required for specific cyler brands and models. However specific cyler grids assemblies also fit most other brands of cyclers. (See website [www.bioplastics.com](http://www.bioplastics.com).)  
 E.g. B17489G fits Roche LightCycler® 480 systems and almost any other cyler brand except ABI cyclers.  
 AB19805G fits all ABI FAST cyclers and almost any other cyler brand except LightCycler® 480 systems  
 AB17503G fits all ABI regular(non fast) cyclers and almost any other cyler brand except LightCycler® 480 system  
 B69304 fits all cyclers except LightCycler® 480 systems



### Assembly and disassembly using the One step (Dis)-Assembly / Toolkit (#B12345) Tool kit content:

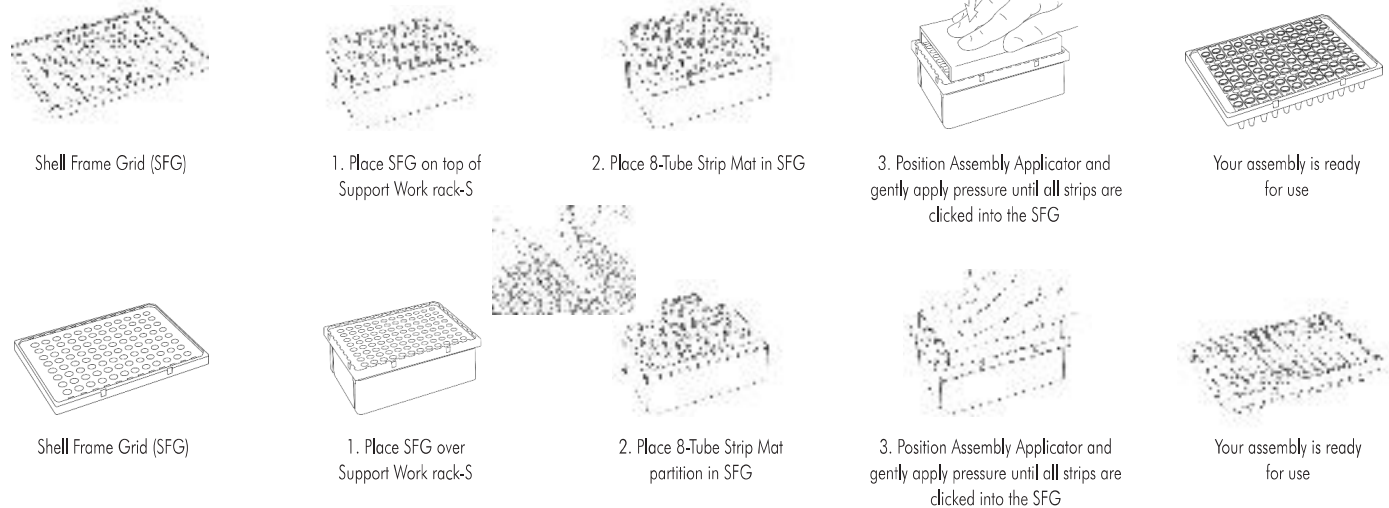


Assembly Applicator

Disassembly Applicator

Support Work Rack-S

### One step assembly using Toolkit (Order# 12345)



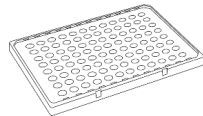
Shell Frame Grid (SFG)

1. Place SFG on top of Support Work rack-S

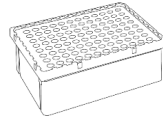
2. Place 8-Tube Strip Mat in SFG

3. Position Assembly Applicator and gently apply pressure until all strips are clicked into the SFG

Your assembly is ready for use



Shell Frame Grid (SFG)



1. Place SFG over Support Work rack-S



2. Place 8-Tube Strip Mat partition in SFG

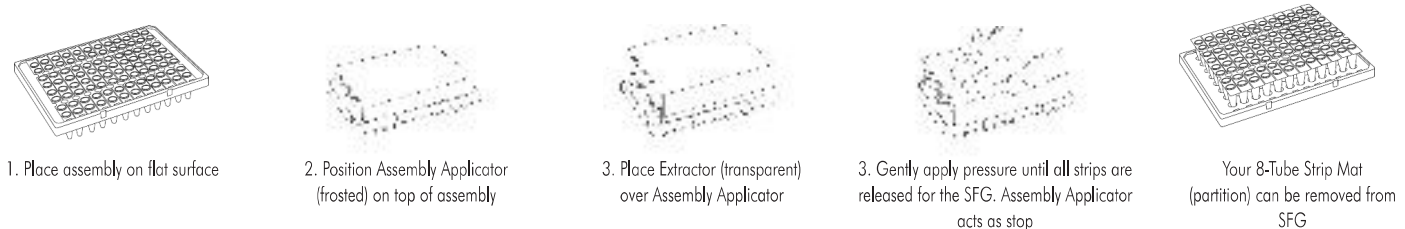


3. Position Assembly Applicator and gently apply pressure until all strips are clicked into the SFG



Your assembly is ready for use

### One step disassembly using Toolkit (Order# B12345)



1. Place assembly on flat surface

2. Position Assembly Applicator (frosted) on top of assembly

3. Place Extractor (transparent) over Assembly Applicator

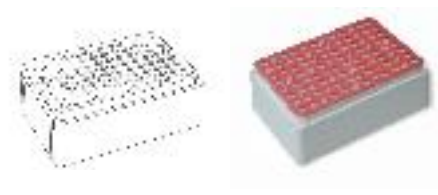
3. Gently apply pressure until all strips are released for the SFG. Assembly Applicator acts as stop

Your 8-Tube Strip Mat (partition) can be removed from SFG

# Instructions for Shell Frame Grid Assemblies

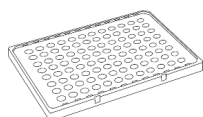
## Manual Assembly 8-Tube Strip (Mats) to Shell Frame Grids (SFG)

For Manual Assembly the use of a Support Work Rack-S (B69409) with EU Tube Support Grid (B69302) is recommended however not required. The parts are also included in the Sample Shell Frame Grid. (#SFG123) and the One Step Tool Kit #B12345.



Support Work Rack-S

### Manual assembly using Support Work Rack-S



Shell Frame Grid (SFG)



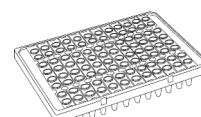
1. Place SFG on top of Support Work Rack-S



2. Place 8-Tube Strip Mat in SFG

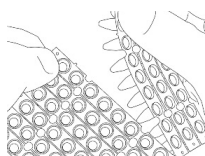


3. Gently press down both ends of individual strips, clicking them into SFG

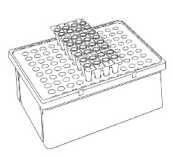


Your assembly is ready for use

OR:



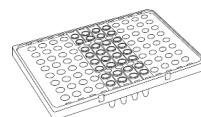
1. Tear off section of 8-Tube Strip Mat



2. Place section of 8-Tube Strip Mat in SFG

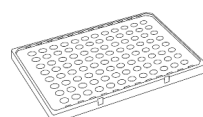


3. Gently press down both ends of individual strips, clicking them into SFG

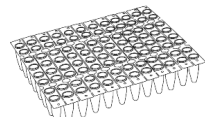


Your assembly is ready for use

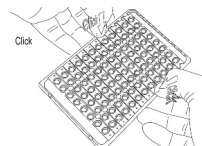
### Manual assembly without Support Work Rack-S



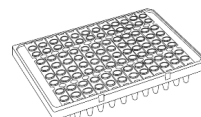
1. Place Shell Frame Grid on flat surface



2. Place 8-Tube Strip Mat in SFG

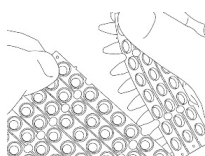


3. Hold SFG while gently pressing down both ends of individual strips, clicking them into SFG

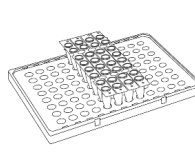


Your assembly is ready for use

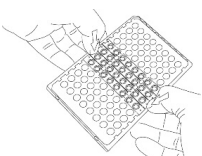
OR:



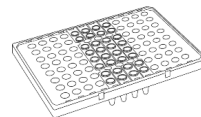
1. Tear off section of 8-Tube Strip Mat



2. Place section of 8-Tube Strip Mat in SFG

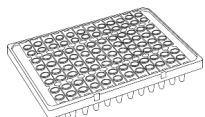


3. Hold SFG while gently pressing down both ends of individual strips, clicking them into SFG



Your assembly is ready for use

### Manual disassembly without Support Work Rack-S



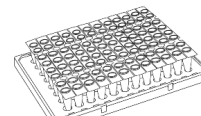
1. Place assembly on flat surface



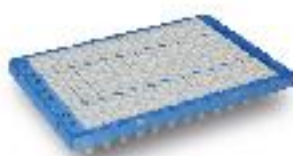
2. Place thumbs and index fingers on the holes of the SFG skirt



3. Press down evenly, in one firm, quick movement

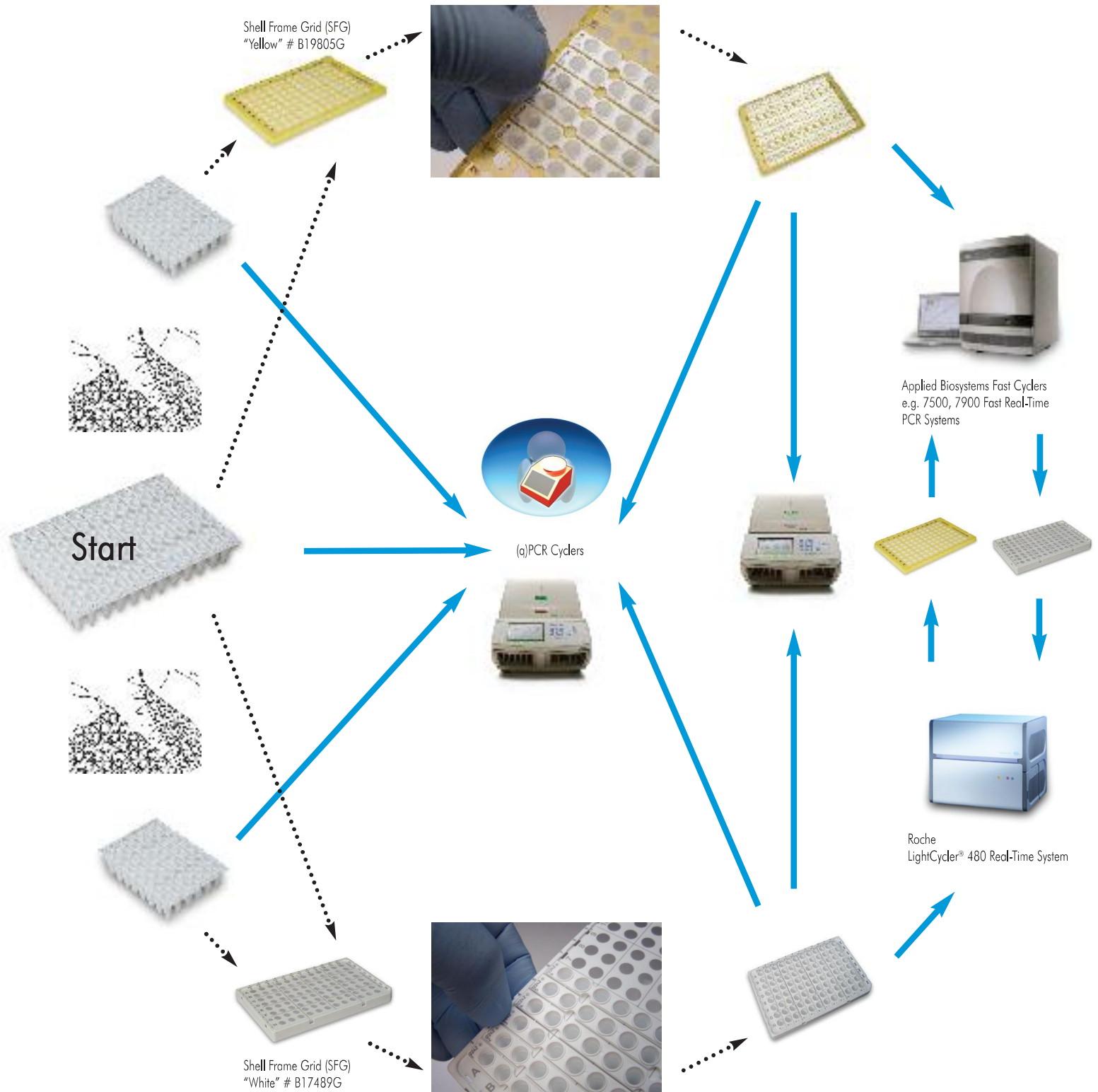


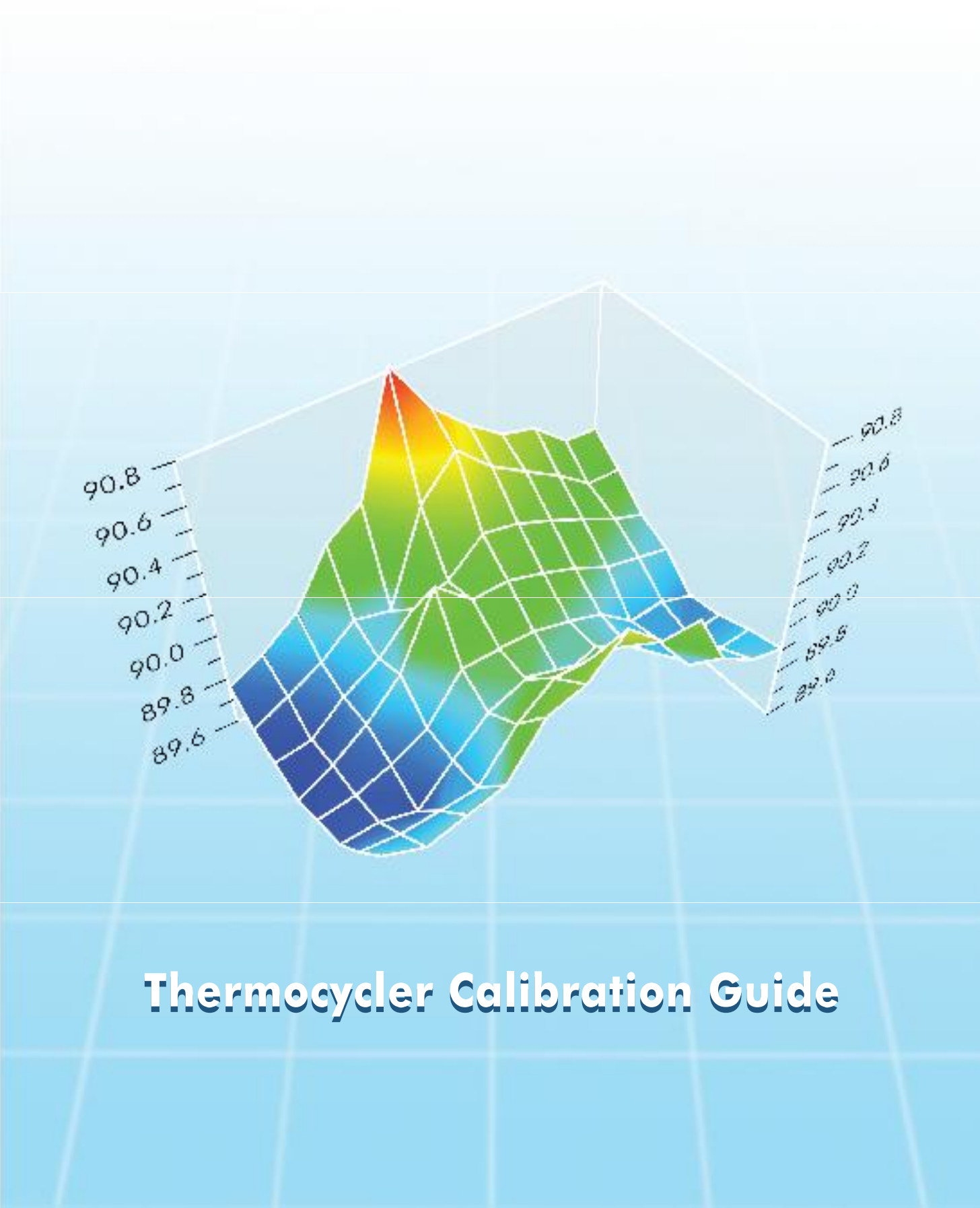
Your 8-Tube Strip Mat (partition) can be removed from SFG



# Instructions for Shell Frame Grid Assemblies

## Flexibility and interchangeability of Shell Frame Grid Assemblies





# Thermocycler Calibration Guide

Information provided on pages 144 to 163 is licensed by CYCLERtest BV.

# Thermocycler Calibration Guide

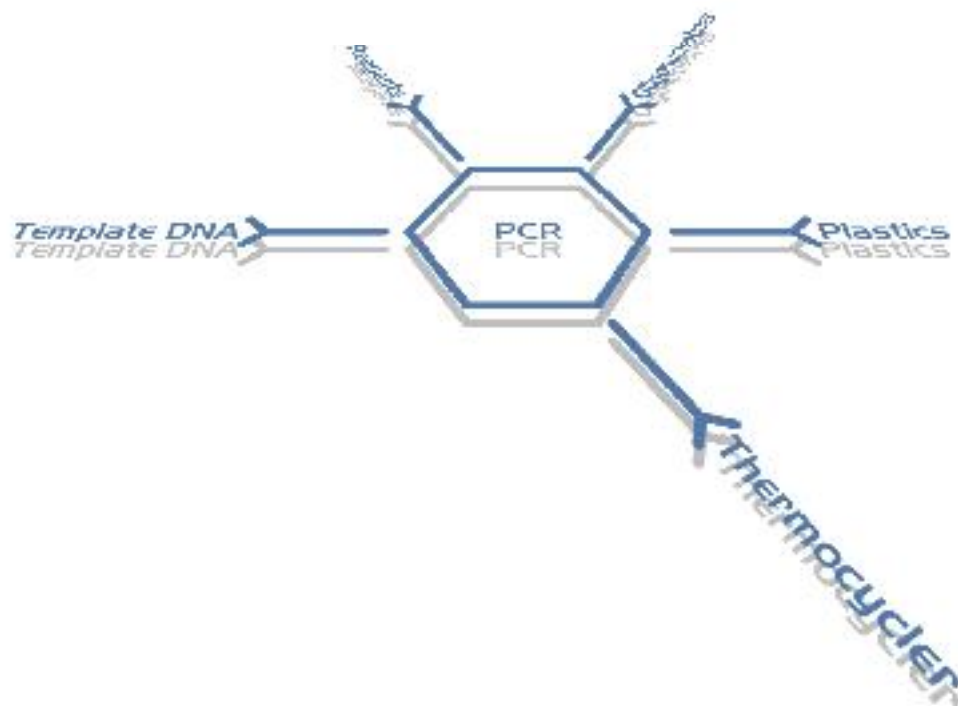
## Introduction

PCR was invented over 25 years ago by Kary Mullis [Saiki, 1985], for which he received the Nobel Prize in chemistry in 1993 [Malmström, 1997]. PCR is considered to be the innovation which allowed molecular biology to evolve to the current level. It has become an indispensable technique in life science research and more recently in routine human and veterinary diagnostics. PCR has evolved over the past decades from a technically complicated method to a simple and easy to apply method. There is a wide variety of ready-to-use reagents available that allows those with some basic training and who master the skill of pipetting to perform a PCR. Enzymes and instruments have been continuously engineered to speed up the PCR process, so that a PCR can presently be performed in less than half an hour. However, the simplicity of the method is its strength and weakness at the same time.

As it is relatively easy to generate a result many PCR users fail to appreciate the quality control that is required to generate reliable and meaningful results. With the more recent use of PCR in diagnostics the call for quality control is increasing in accredited and quality aware laboratories. An increasing number of laboratories either elect or are required to obtain an ISO 17025 [CEN, 2005] or ISO 15189 [CEN, 2007] accreditation to guarantee the quality of the results generated. At the same time, the research community's call for biologically meaningful conclusions is increasing in parallel. In 2009 a group of leading PCR scientists published guidelines (MIQE) [Bustin, 2009], that assist qPCR users to design a robust qPCR experiment that leads to trustworthy and biologically meaningful results which can be reproduced in any other laboratory. The main variables of the (q)PCR reaction are the purity and quality of the template DNA or cDNA, the design, purity and concentration of the primers and probes, the concentration of the different reagents, the type of buffer and the type of enzyme, the tubes, strips or plates and the thermocycler used (figure 1). The vast majority of (q)PCR optimizations are performed on the variables of DNA, primers and template. Yet, very little attention is paid to the contribution of the variability of tubes and thermocycler to the (q)PCR result, as they are incorrectly considered to be constants rather than variables.

The goal of this Thermocycler Calibration Guide is to illustrate which types of thermocycler variability do exist, show the impact of thermocycler variability on the outcome of PCRs or qPCRs, and offer practical solutions how to eliminate or control thermocycler variability. The practical protocols allows us to put into practical use the data from CYCLERtest Calibration Certificates and Reports. Examples will be given showing how thermocyclers can be aligned and programmed to mimic each other. Furthermore, examples will be given showing how calibration results can be used for validation purposes when working under ISO 17025, ISO 15189 accreditation and many other regulations. This guide will allow PCR and qPCR users to explore the full potential of CYCLERtest thermocycler calibration data.

Figure 1. Main variables of (q)PCR process





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# Thermocycler Calibration Guide

## Terms and definitions

### Calibration

The total set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system or values represented by a material measure, and the corresponding values realized by an international traceable reference standard. Traceability is guaranteed by the use of international traceable reference standards, by the calculated uncertainty of a calibration and the fact that calibrations are performed by technically competent calibration engineers. Calibration does not include adjustment.

### Adjustment

Adjustment of an indicated value of the instrument back within given specifications or tolerances. Adjustments are always accompanied with an as found/as received calibration certificate and an as left/after adjustment calibration certificate.

### Validation

Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are met. For example if certain assays in combination with certain equipment generate the required results.

### Verification

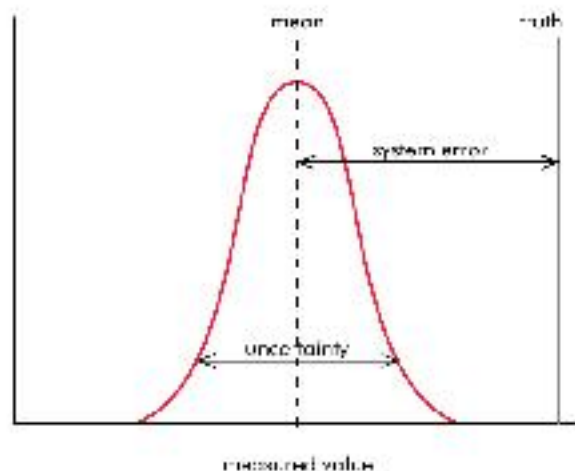
Quality control, via a defined procedure, to check if systems still meets the specifications.

### Uncertainty

Parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the quantity intended to be measured

### Error

Error is the difference between the measured value and the true value. Error can be divided in a systematic error and random error. The systematic error, also called bias, stays constant during repeated measurements; the random error, also called deviation, varies during repeated measurements.



### Traceability

Property of a measurement, whereby the result, can be related to a reference standard, through an unbroken chain of calibrations, each contributing to the measurement uncertainty. The result should preferably be expressed in SI units and a calculated uncertainty should be indicated.

### ITS-90

International Temperature Scale of 1990. The international temperature standard.

### MTAS®

Professional dynamic thermocycler temperature calibration system, measuring accuracy, uniformity, overshoots and undershoots, ramp rates and hold times of thermocyclers. The MTAS® system permits operation only by qualified calibration engineers.

### DRIFTCON®

End user dynamic thermocycler temperature calibration system measuring accuracy, uniformity, overshoots and undershoots, ramp rates and hold times of thermocyclers. The DRIFTCON® system permits operation by end users.

### Plateau phase/hold phase

Phase of the PCR process at which temperature is kept steady.

### Ramp phase

Phase of the PCR process at which temperature is changing towards the next plateau phase.

### Set temperature

The temperature which was programmed to be reached.

### Accuracy

Difference between average reaction block temperature and set temperature at a defined moment in time (figure 2b).

### Uniformity/Spread

Difference in temperature between hottest and coldest well in the reaction block at a defined moment in time (figure 2c).

### Overshoot

Overshooting of temperature, above set temperature when ramping up (figure 2d). Undershoot Overshooting of temperature, below set temperature when ramping down.

Note: an undershoot is defined as an overshoot going down

### Ramp rate

Speed of heating (heat rate) or cooling (cool rate) while cycling up or down. Hold time/plateau time Time duration of the plateau phase (figure 2f).

### Manufacturer specifications

Technical specifications of a particular brand and model thermocycler as provided by manufacturer. Typically uniformity, accuracy, maximum ramp rate and if applicable maximum gradient are specified. These specifications are typically stated without measurement uncertainty, measurement method and environmental conditions.

### Market specifications

Specifications of a particular brand and model thermocycler based on calibrations for that type of thermocycler. The values represent average plus/minus 2 standard deviations and are based on measurements performed with a defined measurement uncertainty, a defined measurement method and under defined environmental conditions. Uniformity and accuracy at several moments in time, ramp rates, average and maximum overshoots plus hold times are specified.

For more detailed metrology definitions please refer to International Vocabulary of Metrology [JCGM, 2008]

## 1 Thermocycler technical design

### 1.1 Various technologies

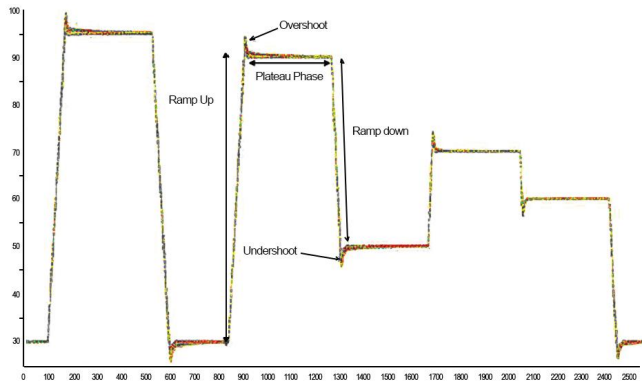
Since the invention of PCR many different types and models of thermocyclers have been designed and manufactured. Due to the continuous development, a wide variety of heating and cooling techniques and temperature control mechanisms have been used in thermocyclers over the past decades.

In the early days of PCR a typical thermocycler would use a heater combined with a liquid compression cooling system. With the need to design faster thermocyclers, Peltier based thermocyclers were introduced. The latest developments permit completing a PCR under 30 minutes, and use either minimized blocks, ceramic heaters or heated air. However, the Peltier based thermocycler is the most common type of thermocycler.

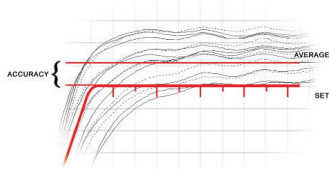
The principle of a Peltier element is that it either heats or cools dependent on how the electrical current is applied to the elements. As a result these elements can very quickly alternate from heating to cooling and reversely. Most Peltier based thermocyclers are designed according to the sandwich construction as shown in figure 3.

Figure 2. Graphical explanation of temperature parameters

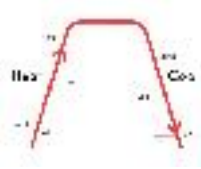
a. Plateau phase, ramp phase, overshoot and undershoot



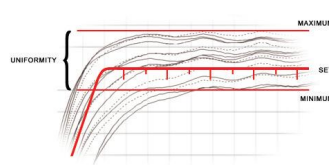
b. Accuracy



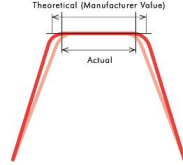
e. Ramp rates



c. Uniformity



f. Hold time



d. Overshoot

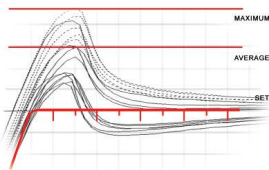
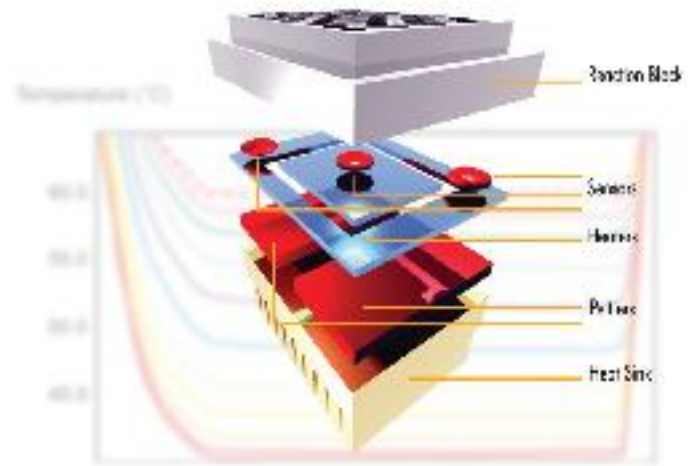


Figure 3. "Sandwich" construction of Peltier based thermocyclers



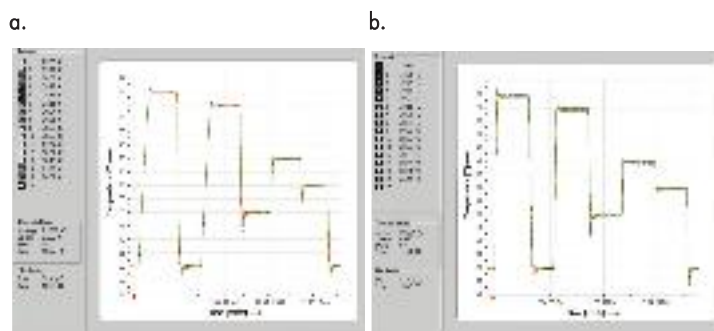
The reaction block that is visible to the user is the top of the sandwich construction. Underneath the block, one or more temperature sensors are positioned that monitor the reaction block temperature and provide input to the control mechanism that regulates the heat generated by the heater and Peltier element. During the heating phase the heat of the heater and the Peltier element is transferred to the reaction block and then to the reaction tubes and the reagents inside. During the cooling phase the Peltier element gets cold on one side and transfers this cold to the reaction block, on the other side the Peltier element generates heat, which is transferred to the heat sink and then ventilated to the environment via the fan.

# Thermocycler Calibration Guide

## 1.2 Speed versus uniformity

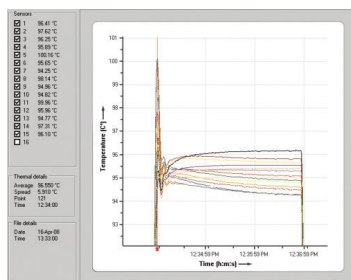
Thermocyclers are designed to function as instruments that can hold a defined steady temperature during a defined time, then change temperature, and then hold again a defined steady temperature during a defined time. This requirement, as simple as it may seem, is the largest challenge to design and construct an accurate and uniform thermocycler. To design a fast thermocycler, the mass that needs to be heated should be reduced to a minimum to allow fast energy transfer during heating and cooling. However, to design an instrument that can hold its temperature in a defined, steady and uniform way, a high mass is required. Thermocyclers with massive blocks are much more uniform, but also relatively slow (figure 4a).

**Figure 4.** Thermal profile of thermocycler with a high mass (a) and low mass (b) block



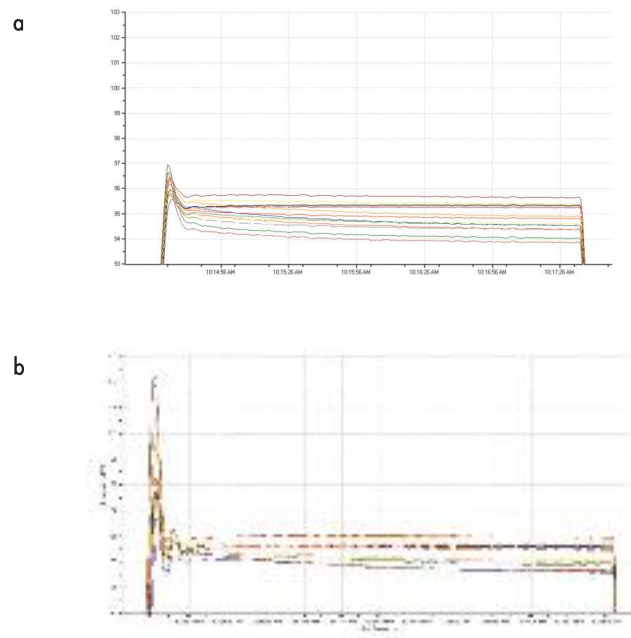
Thermocyclers with low mass blocks are fast, but due to their speed also less controlled and therefore these blocks may easily overshoot the set temperature by several degrees before falling back to the set temperature (figure 4b). Depending on the control mechanism and the number of sensors that monitors the reaction block temperature these fast thermocyclers can not only show high overshoots, but also highly non uniform ramping phases, overshoots and plateau phases. This is especially the case in thermocyclers which are controlled by only a single sensor (figure 5).

**Figure 5.** Poor controlled fast thermocycler which results in high overshoots plus high non uniformity, both during overshoot and plateau phase



For those thermocyclers that can be programmed in “standard” or “fast” mode, the two different modes can lead to substantially different thermal profiles, which do not only differ in ramp rate, but also in height and duration of the overshoot and, uniformity of both overshoot and plateau phase (figure 6).

**Figure 6.** Thermal performance of the same thermocycler in standard (a) and fast (b) mode



Summarizing, in block based thermocyclers, high ramping speeds can be associated with high non-uniformities, especially during ramping, and high and poorly controlled overshoots. Therefore, when selecting thermocyclers for certain applications it is worth reviewing what is the more important criterium, speed or temperature uniformity.

## 2 Thermocycler variability and practical consequences

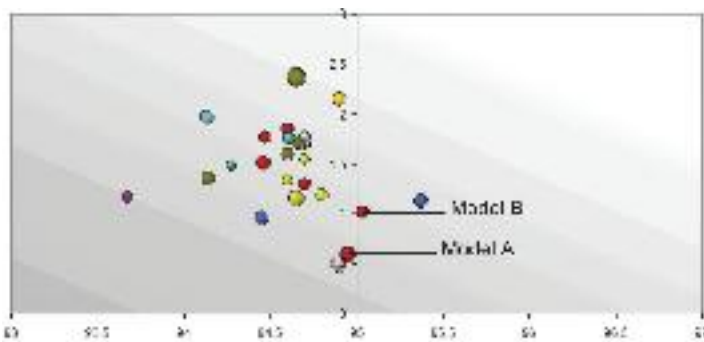
### 2.1 Inter and intra thermocycler variability

The thermal performance of a thermocycler is dependent on a number of variables. The main variables are the block “sandwich” construction, the different types and qualities of components used, the differences in technical design, the number of sensors and the temperature control mechanism.

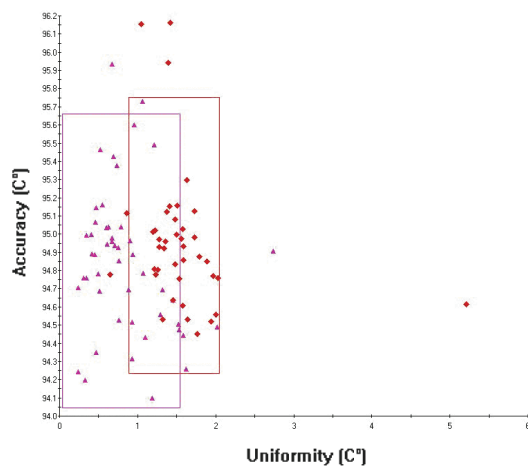
Most PCR users know from experience that some PCRs provide good results on certain thermocyclers, but fail on others. When these thermocyclers are of different brands this is considered to be common sense as they are perceived to be different. However, different models of the same brand are often expected to function similarly while different serial numbers of the same model are considered to perform as identical copies.

As can be seen in the figures below, thermocyclers show a substantial variation, not only between brands (figure 7), but also between models (figure 7 and 8) of the same brand, between individual serial numbers of the same model and brand (figure 8) and even within one thermocycler (figure 9). Each thermocycler has a unique thermal “fingerprint”.

**Figure 7.** Average temperature accuracy and temperature uniformity of different models and brands of thermocyclers at 30 s at 95 °C (dots of the same color represent thermocyclers of the same brand, size of the dots represent spread within subpopulation)

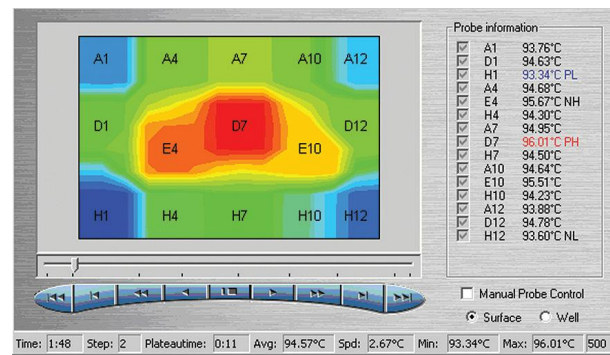


**Figure 8.** Individual temperature accuracy and non-uniformity at 30 s at 95 °C of thermocyclers of model A (triangle) and model B (diamond) of the same brand (dots represent individual serial numbers)



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**Figure 9.** Temperature non uniformity within individual thermocycler block



### 2.2 Consequences of thermocycler variability

The inter thermocycler variability is the reason why PCRs function on certain thermocyclers and fail on others, or lead to different results on different thermocyclers [Vermeulen, 2009]. The intra thermocyclers variability is the reason why certain wells generate false negatives while in other wells positive results are generated during the same run on the same thermocycler [Adams, 2004]. But thermocycler variability can cause more than just false negatives. The effects move on a sliding scale from slightly less efficient PCRs, which still give a result, to complete failure.

The first category is often not noticed. In case of expression profiling via qPCR this category can lead to incorrect conclusions of gene up or down regulation. Less efficient PCRs with lower yields can, in case of minimal residual disease in leukemia, lead to lower cancer cell counts and a clinical decision to not administer a second chemotherapy, although in reality it is required.

False negatives are extremely risky in general as they can lead to incorrect conclusions and results, treatment or categorization. False negatives can lead, for example, to patients being diagnosed as healthy, whereas in reality they might be infected with a life threatening virus.

## 3 Effect of thermocycler variability on a PCR or qPCR

### 3.1 Different effects on different phases

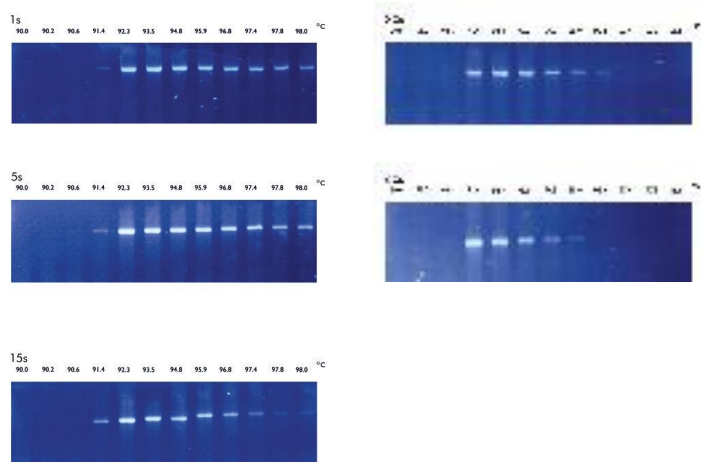
Because PCR is a dynamic process with ramping phases of different rates and plateau phases of different temperatures, several types of variability can occur. The most common types of variability are: deviating plateau temperatures, high overshoots/undershoots, and non uniform plateau temperatures, ramping phases and overshoots/undershoots.

The effects of these types of variability are dependent on the phase of the PCR, as will be described in the paragraphs below.

### 3.2 Denaturation phase

The purpose of the denaturation phase is to denature the double stranded DNA, in order to obtain two single strands to which the primers can bind. Denaturation is typically performed at 94 °C-95 °C. However, at the same time the Taq polymerase is inactivated by the high temperature required for the denaturation. This inactivation is mainly temperature, but also time dependent (figure 10).

**Figure 10.** Influence of temperature and time (1 s, 5 s, 15 s, 30 s and 60 s) on PCR result during denaturation phase



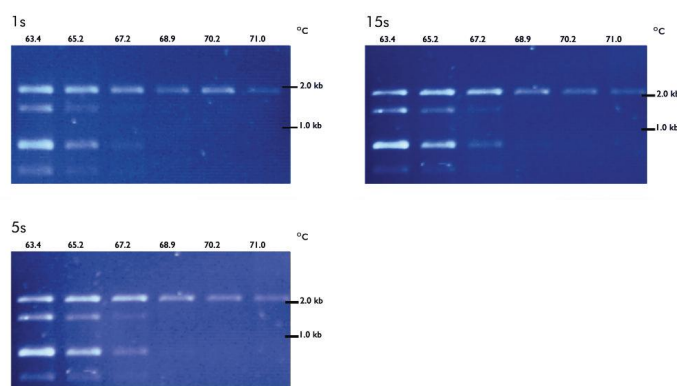
At 95 °C the half life time of Taq polymerase is 40 minutes, whereas at 98 °C it is already reduced to 5 minutes. Therefore incubating a PCR reaction long at high temperatures, or overshooting the target temperature by several degrees, can quickly lead to negative results, due to inactivation of the enzyme before detectable levels of amplicon are generated. Most false negative PCR results are caused by problems in the denaturation phase, especially by high overshoots or high plateau temperatures [Adams, 2004].

If the temperature of the denaturation phase is too low, no denaturation will occur and therefore also no amplification. The minimum denaturation temperature is mainly dependent on the GC content of the DNA and secondary structures. Typically denaturation functions over a temperature range of about 2-3 °C at 30 s denaturation time.

### 3.3 Annealing phase

The purpose of the annealing phase is to allow the primers that initiate the elongation to bind to the correct target sequence. This binding should preferably be as specific as possible. The specificity is highly temperature and salt concentration dependent, but hardly time dependent (figure 11). Annealing is typically performed between 45 °C and 70 °C.

**Figure 11.** Influence of temperature and time (1 s, 5 s and 15 s) on PCR result during annealing phase



As temperature optimization of a PCR is typically only done for the annealing phase and not for the other phases, the annealing temperature is perceived as the most critical temperature step to allow a PCR to succeed. The annealing temperature is indeed critical for the specificity of a PCR [Uribe, 2004], but much less critical to produce a result at all.

Annealing functions over a much wider temperature range than denaturation. Typically annealing functions over a temperature range of about 5-7 °C, albeit in varying degrees of specificity. Therefore the risk of missing a result, due to a false negative, is significantly higher in the denaturation phase. Thermal performance problems at annealing phase typically express themselves as non specificity or lower yields and are therefore more easily identified.

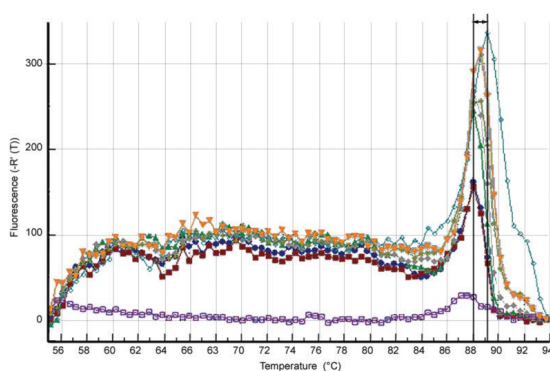
### 3.4 Elongation phase

The purpose of the elongation phase is to synthesize the new strand of DNA complementary to the template strand. The polymerization rate of Taq polymerase is temperature dependent (2000 bases/minute at 72 °C), but elongation functions over a range of 55-85 °C. To obtain highly efficient PCRs, many users design PCR products to be smaller than 200 bp, which means that elongations only take a few seconds, often much shorter than the protocol times programmed. Elongation is generally insensitive to temperature variability at the level that occurs in thermocyclers. Non uniformity of the thermocycler could lead to different polymerization rates. However, in general excess times of elongation are used and therefore slower rates are compensated by longer times.

## 3.5 Meltcurve

Although the meltcurve, as post qPCR analysis step, is not part of the actual qPCR, it also is influenced by thermal variability. The goal of a meltcurve is to identify if the correct amplicon has been amplified and if no non specific products or primer dimers are present in the reaction. In case of HRM (High Resolution Melting) the goal is genotyping or mutation scanning. Temperature non uniformity during ramping can lead to shifts in meltcurves as shown in figure 12.

**Figure 12.** Shifted meltcurves on non uniform thermocycler



What seem to be amplicons of different lengths and/or sequences, due to their differing  $T_m$  (melting temperature), are in reality identical amplicons melted at different moments in time.

The meltcurve plots the 1st negative derivative of the relative fluorescence versus the temperature, but in reality relative fluorescence versus time instead of temperature is plotted. If a thermocycler is non uniform, one well after the other will reach the  $T_m$  and therefore a shift in time, depicted as temperature, occurs.

## 4 Thermocycler calibration methods

### 4.1 How to calibrate a thermocycler?

With the increasing need to calibrate thermocyclers an increasing number of groups have views on how a thermocycler should be calibrated. These views range from “the molecular biologists view” of mimicking a PCR reaction to “the metrologists view” of calibrating in a defined and traceable manner, by qualified personnel, at defined environmental conditions circumstances, with the lowest achievable and known measurement uncertainty. The paragraphs below will discuss the pros and cons of the different views and describe which method of calibrating a thermocycler is the most certain.

### 4.2 Calibration by mimicking the PCR process

From a molecular biologist perspective the best way to calibrate a thermocycler is by mimicking the PCR process. In other words, put tubes in all wells of the block, fill them with reaction mix and put sensors in, closed the tubes lids, close the thermocyclers heated lid and run the PCR protocol normally used in the laboratory. This would come as close as possible to the real temperature inside a particular tube, filled with a particular reaction mix, during a particular PCR protocol, in a particular instrument. The phrasing already illustrates the major shortcoming of the method in that it can not be used in a standardized way. For each combination of tube, mix, protocol and instrument this “calibration” should be repeated, requiring a tremendous workload, generating results that can neither be compared to each other nor to any kind of standard, nor to specifications of the thermocycler manufacturer.

Furthermore, this way of “calibrating” would introduce many variables which are uncontrolled and therefore add a large component to the measurement uncertainty, ending up with uncertainties well over 2 °C.

Practically, when the uncertainty would be for example 2 °C, while measuring 96 °C, the thermocycler’s temperature could be anywhere between 94 °C and 98 °C. As described in paragraph 3.2 this difference in temperature does have tremendous effects on the inactivation of the Taq polymerase. Therefore this level of uncertainty is not acceptable for thermocycler calibration, although mimicking the PCR process may seem a simple and attractive choice.

### 4.3 Calibration representative of the process

From a clinical chemist perspective the best way to calibrate a thermocycler is by measuring in a standardized method representative of the PCR process. This standardized method allows one calibration for all the different types of PCRs used and also allows comparison to a standard.

For a calibration to be representative of the PCR process it needs to take into account both the dynamic and the static part of the PCR process, as certain problems can not be diagnosed by just checking the static part of a PCR [Adams, 2004]. Furthermore, a number of different temperatures, preferably close to the denaturation, annealing and elongation temperatures, should be evaluated since effects can vary with temperature (see chapter 3).

### 4.4 Calibration conforming to international standards

From a metrologist perspective the best way to calibrate a thermocycler is measuring in a defined and traceable manner, by qualified personnel, at defined environmental conditions, with the lowest achievable and known measurement uncertainty, excluding as many non controlled variables as possible.

In metrology, calibration is defined as the total set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system or values represented by a material measure, and the corresponding values realized by an international traceable reference standard.

Traceability is guaranteed by the use of international traceable reference standards and the expression of the calibration values in SI units, but also by the calculated uncertainty of a calibration and the fact that calibrations are only performed by technically competent and qualified calibration engineers. The uncertainty should be as small as technically possible.

Only if the requirements above are met a calibration is considered to be fully traceable to the ITS-90 (International Temperature Standard). To be compliant to the ISO 10725 standard [ISO, 2005], additional requirements need to be met. Any PCR test laboratory that is accredited under ISO 17025 or ISO 15189 or any CE-IVD PCR kit manufacturer that is certified under ISO 13485, should, according to these international standards, calibrate their thermocyclers in a traceable way and therefore conform to ISO 17025.

## 4.5 Most certain method of calibrating a thermocycler

For a calibration to be certain, compliant to ISO 17025, and representative of the PCR process, a number of criteria should be met. The calibration should be (1) measuring all thermal characteristics that influence the outcome of a PCR, including accuracy, uniformity, overshoot/undershoot, heat/cool rate and hold time, (2) performed in a dynamic way, as PCR is a dynamic and not a static process, (3) performed simultaneously with multi-channels to exclude any time effects between wells, (4) performed under controlled environmental conditions, (5) performed by qualified and trained personal and (6) traceable to the ITS-90 and expressing calibration values in SI units with a calculated uncertainty.

To be able to meet these criteria a typical thermocycler calibration system will be a physical sensor-based multichannel system that measures dynamically with a frequency of more than once per second and that can be calibrated traceable to the ITS-90 via a temperature reference standard (Hendriks, 2003). To minimize the measurement uncertainty, the influence of poorly controlled variables like reaction tubes and thermocycler heated lids is excluded.

By calibrating with traceably calibrated equipment, under defined environmental conditions, with qualified personal, directly in the block, in a statistically relevant number of the wells, it is possible to obtain total measurement uncertainties as low as 0.1 °C for a multichannel system. This allows making a certainty statement about the measured value and allows comparison to specifications, either lab defined or manufacturer defined.

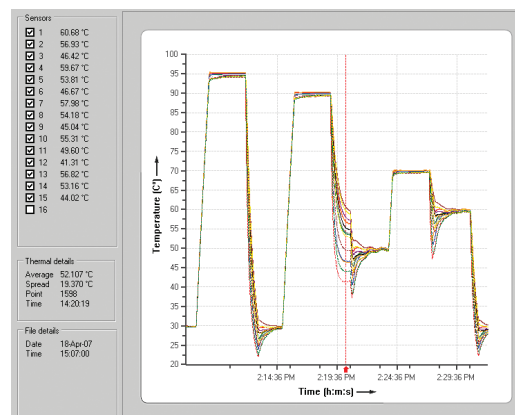
The following methods are either uncertain, not ISO 17025 compliant or not representative of the PCR process due to the reasons discussed. Any method based on PCR assays, qPCR assays, TLCs (thermochromic liquid crystals), single channel thermometers (analog and digital) and multichannel static measurements will not show all of the characteristics that determine the thermal profile of a thermocycler and are therefore these methods are not representative of the PCR process. Any method based on in-tube measurements is linked to large uncertainties due to contact errors between tubes and reaction block, and errors due to non uniformity in wall thickness and heat conductivity of the tubes. Results are therefore connected to high uncertainties, disallowing certainty statements about the thermocyclers' performance. Any method based on measuring all wells of the reaction block simultaneously will require the addition of a substantial mass to the block, and will lead to biased dynamic values since ramp rates and overshoots can be strongly influenced by the addition of mass, leading to incorrect results.

## 5 Evaluating calibration results

### 5.1 Introduction

Calibration results are often evaluated by categorizing a thermocycler to be "in" or "out" of manufacturer specifications. However, evaluating the thermal performance of a thermocycler goes far beyond categorizing a thermocycler to be in or out of specifications. For example, a thermocycler can be well within manufacturer specifications for accuracy and uniformity at 95 °C and, at the same time show severe cooling problems and high non uniformity at annealing temperatures (figure 13). Therefore, to evaluate the performance of a thermocycler it is necessary to review the complete data in a calibration report.

Figure 13. Thermocycler that is in specifications, but has severe cooling problems



### 5.2 CYCLERtest calibration reports

CYCLERtest offers a calibration service using the MTAS® system, and an end user calibration system that is called the DRIFTCON® system.

Both systems measure the same thermal characteristics of accuracy, uniformity, overshoot/undershoot, heat/cool rate and hold time, but present them differently in the reports. DRIFTCON® provides information about uniformity at defined moments in time during plateau phases, whereas MTAS® provides information about uniformity during the complete calibration, including uniformity during ramping and overshooting/undershooting.

DRIFTCON® provides graphical presentation of the results in a thermal map in the software whereas MTAS® reports contain overview graphs of all data, average data and uniformity data, plus detailed graphs of every static step. For more detailed information please refer to either DRIFTCON® or MTAS® reports.

### 5.3 MTAS® calibration certificates and reports

MTAS® calibration certificates and reports are very detailed and contain an extensive amount of information. The calibration certificates contain the thermal performance categories that categorize a thermocycler to function in or out of manufacturer and market specifications.

The reports contain a data overview chart, average chart and uniformity chart that are highly informative and give a good overview of the thermocycler's performance. In addition to the graphs, the reports contain static data tables with detailed information of all channels at defined moments in time.

To evaluate the thermocycler's performance it is advisable not just to review the certificate, but also the complete data in the report, especially the overview graphs. The guidelines in table 1 can be used as a check list to verify thermocyclers performance based on MTAS® reports. The guidance criteria in table 3 can be used to categorize a thermocycler based on objective universal values.



## 5.4 DRIFTCON® calibration reports

DRIFTCON® reports are less detailed than MTAS® Certificates and Reports, but still contain a large amount of information. The data in DRIFTCON® reports are presented by default as values after 30 seconds at plateau phase. However, the DRIFTCON® software provides a setting to report data after 15 and 90 seconds plateau phases. DRIFTCON® reports contain recommended control positions. The recommended control positions are the hottest and coldest spots of the thermocycler during the first 10 seconds of the 95 °C step. By putting the positive and negative controls of an assay on these positions it is possible to determine if an assay functions in the wells which represent the temperature extremes of a thermocycler.

In DRIFTCON® reports the calibration data are only compared to market specifications if the default protocol is selected. By a green check, blue exclamation mark, or red cross the thermocycler is categorized to be in or out of market specifications for heat rate, hold time, maximum overshoot, average overshoot, accuracy and uniformity.

To evaluate the thermal performance of the thermocycler it is not advisable to just categorize the thermocycler to be in or out of market specifications, but also to evaluate the complete data in the calibration report to assure the thermocycler is suitable for the assay. This is called assay validation. Chapter 7 describes how these assay validations can be performed for PCRs and qPCRs, taking into account the thermocycler variability.

The guidelines in table 2 can be used as a check list to verify thermocycler performance based on DRIFTCON® reports. The guidance criteria in table 3 can be used to categorize a thermocycler based on objective universal values. These guidance criteria are based on uniformity and overshoots/undershoots, as these characteristics of a thermocycler can in most cases not be directly modified by programming the thermocycler differently. The average temperature (accuracy) can be adjusted by modifying the set temperature and therefore is not the most crucial criterium for categorizing a thermocycler.

Chapter 6 discusses how thermocyclers can be adjusted and aligned by modifying programmed protocols.

**Table 1. Thermocycler performance guidelines for MTAS calibration reports**

Item calibration report	Comment	Performance criterium to check
<b>Results overview</b>		
Manufacturer specifications	Manufacturer specifications are specifications as provided by the thermocycler manufacturer. These specifications are stated without any measurement uncertainty, measurement method and environmental conditions. The manufacturer specifications allow categorizing a thermocycler to be in or out of manufacturer specifications.	Check if thermocycler is specified at 90 °C or 95 °C as thermocyclers specified at 90 °C or 95 °C are typically more uniform than those specified at 70 °C or 50 °C. Check if thermocycler is in or out of specifications for accuracy, uniformity, heat and cool rate.
Market specifications	Market specifications are specifications based on all calibrations done on a particular brand and model thermocycler. The value represents average $\pm$ 2 standard deviation and data are based on measurements performed with a defined uncertainty. The market specifications allow categorizing a thermocycler as being representative for the total population or not.	Check if thermocycler is specified at 90 °C or 95 °C as thermocyclers specified at 90 °C or 95 °C are typically more uniform than those specified at 70 °C or 50 °C. Check if thermocycler is in or out of specifications for accuracy, uniformity, heat and cool rate.
Static results	Static results at 30 seconds after set plateau temperature was reached. This table provides a summary of minimum temperatures, maximum temperatures, maximum overshoots, average overshoots, average temperatures, deviation from set temperatures and uniformities at all plateau temperatures. This table allows a good overview of the thermocycler at all measured temperatures.	Check for extreme values in all columns, especially in maximum overshoot, average overshoot and uniformity. See table 2a and b for categorization.
<b>Data chart</b>		
Curve morphology	The curve morphology is dependent on brand and model of thermocycler, either a curve in which the plateau temperatures are approached, or a curve with overshoots after which the plateau temperatures are achieved.	Check if thermocyclers of the same brand and model show similar curve morphologies.
Outlying channels	Outlying channels are an indication of extreme hot or cold spots in block.	Check if one or more channels lie above or below the rest of the curves.
Large temperature non uniformities	Large non uniformities are an indication for suboptimal thermal control of the reaction block and are more frequently found in thermocyclers monitored by a single sensor or in worn out blocks.	Check if no large non uniformities are present during ramping, overshoot or plateau. See table 3a for categorization
Divergation/convergence of channels at plateau phase	Divergation of channels at plateau phase is an indication for suboptimal thermal control of the reaction block.. Typically plateau uniformity improves (converges) when a thermocycler is programmed for a longer time at plateau phase.	Check if divergation/convergence of channels at plateau phase occurs.
Height of overshoots	High overshoots are an indication for suboptimal thermal control of the reaction block and can be typically found in fast or air driven thermocyclers. High average overshoots at 95°C lead to increased Taq polymerase inactivation. High average overshoots at 50°C and 60°C can cause mispriming during annealing.	Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures.
Slow ramping going down	Slow ramping going down can be an indication of cooling problems, either caused by the environment or the instrument. In air driven thermocycler that cool by convection the lowest achievable temperature is typically 10-15 °C above ambient temperature.	Check if no slow ramping going down occurs. If slow ramping occurs check if room temperature is within range as indicated by manufacturer, if the cyclers-to-cycler or cyclers-to-wall distance is more than 20 cm and/or if fan is not clogged by dust or malfunctioning.
<b>Average chart</b>		
Average temperature	Large deviations in plateau temperatures from set temperatures can already be identified in the average chart.	Check visually if average temperature does not strongly deviate from set temperature.

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# Thermocycler Calibration Guide

Item calibration report	Comment	Performance criterium to check
Curve morphology	The curve morphology of the average chart can differ from the data chart. Sometimes clusters with overshoots and clusters without overshoots can be observed. This can indicate left-right or top-bottom effects. The effects can be caused by variations in the heating mechanism or by wearing of the reaction block over time.	Check if curve morphology of average chart is different from data chart. If different, analyze data per cluster of curves with identical curve morphology.
<b>Uniformity chart</b>		
Uniformity during ramping	Large non uniformities during ramping are an indication for suboptimal thermal control of the block. Fast thermocyclers typically show larger non uniformities during ramping than standard thermocyclers. Typically the ramping uniformity improves when the ramping speed is reduced. Furthermore, the ramping uniformity improves when the difference in temperature between two plateaus decreases, i.e. the ramping non uniformity while heating from 30 °C to 95 °C is larger than while heating from 50 °C to 70 °C.	Check if no large non uniformities are present during ramping. See table 3a for categorization. Check if ramping uniformity improves with decreasing delta temperature.
Uniformity during overshoot	Large non uniformities during overshoots are an indication for suboptimal thermal control of the block. Fast thermocyclers typically show larger non uniformities during overshoots than standard thermocyclers. Typically, the overshoot uniformity improves as the set temperature gets closer to the environmental temperature.	Check if no large non uniformities are present during overshoots. See table 3a for categorization. Check if overshoot uniformity improves with decreasing set temperature.
Uniformity during plateau	Large non uniformities during plateau phases are an indication for suboptimal thermal control of the block. Fast and single sensor thermocyclers frequently typically show larger non uniformities during plateau phases than standard and multi sensor thermocyclers. Typically the uniformity improves as the set temperature gets closer to the environmental temperature.	Check if no large non uniformities are present during plateaus. See table 3a for categorization. Check if plateau uniformity improves with decreasing set temperature.
<b>Ramp results</b>		
Average ramp rate	The average ramp rate is determined between 10% and 90% of the ramp. The ramp rate is strongly dependent on brand and model of thermocycler. Typically cooling rates are slower than heating rates, especially in air driven thermocyclers. Thermocyclers with fast ramp rates typically show higher overshoots, especially in air driven thermocyclers.	Check if thermocycler is in or out of specifications.
Maximum ramp rate	The maximum ramp rate is determined between 10% and 90% of the ramp and represents the point during the ramp where the thermocycler heats or cools the fastest. Fast thermocyclers typically show larger non uniformities during ramping than standard thermocyclers. Furthermore, the ramping uniformity improves when the difference in temperature between two plateaus decreases, i.e. the ramping non uniformity while heating from 30 °C to 95 °C is larger than while heating from 50 °C to 70 °C.	Check if thermocycler is in or out of specifications. Check if ramping uniformity improves with decreasing delta temperature.
<b>Room conditions</b>		
Temperature	Room temperature is not a characteristic of the thermocycler, but does influence its performance. At room temperatures above 28 °C slower cooling can be observed. In air driven cyclers also failure to reach set temperatures of 50 °C and lower can be observed.	Check if room temperature does not exceed 28 °C in case of slow cooling (see data chart and ramp results). Check if environmental conditions are within limits of operation conditions as recommended by the thermocycler manufacturer.
Relative humidity	Relative humidity is not a characteristic of the thermocycler, but does influence its long term performance. High relative humidities can lead to condensation inside the thermocycler during cooling, which may reduce the life span of a thermocycler, and are often induced by frequent overnight 4 °C steps.	No direct influence on thermocycler visible, only increased wearing over time. Can only be checked by comparing calibration reports over time. Check if environmental conditions are within limits of operation conditions as recommended by the thermocycler manufacturer
<b>Static data at all temperatures</b>		
Hold time	The hold time is the duration of the plateau phase.	Check if hold time corresponds to protocol of instrument (page 4 of report)
Temperature per channel per time point	Values at 30s are most representative as thermocycler has completed overshoot or approach of plateau and has had some time to reach equilibrium.	Check for values strongly deviating from set temperature
t90(avg), st. dev.	t90(avg) ± st.dev. is the average temperature of all active channels ± standard deviation. Typically t90(avg) shows less deviation from set temperature with increasing hold times.	Check if t90(avg) approaches better tset with increasing hold time
Uniformity	Uniformity improves with increasing hold times.	Check if uniformity improves with increasing hold times. See table 3a for categorization.
t90(avg)-tset	t90(avg)-tset is the deviation between average temperature and set temperature. If thermocycler needs to be adjusted because it is too low or high in temperature take the 30 s value and correct by programming the thermocycler respectively - (t90(avg)-tset) °C higher.	Check value of t90(avg)-tset and if necessary correct for the plateau temperatures of the assay protocols by -(t90(avg)-tset) °C to obtain the required reaction block temperatures.

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# Thermocycler Calibration Guide

Item calibration report	Comment	Performance criterium to check
Uncertainty	Uncertainty of measurement is not a characteristic of the thermocycler, but a requirement for a calibration to be ISO 17025 compliant calibration. In MTAS® reports the uncertainty is not taken into account for the categorization.	
Minimum	Minimum temperature. Minimum temperatures that strongly deviate from the average temperature are an indication for cold spots.	Check if minimum is not strongly deviating from average temperature. In case of extreme cold spots over all moments in time avoid using the well.
Maximum	Maximum temperature. Maximum temperatures that strongly deviate from the average temperature are an indication for hot spots.	Check if maximum is not strongly deviating from average temperature. In case of extreme hot spots over all moments in time avoid using the well.
Average overshoot	High average overshoots at 95 °C lead to increased Taq polymerase inactivation. High average overshoots at 50 °C and 60 °C can cause mispriming during annealing.	Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures. See table 3b for categorization.
Maximum overshoot	High maximum overshoots at 95 °C lead to increased Taq polymerase inactivation. High maximum overshoots at 50 °C and 60 °C can cause mispriming during annealing.	Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures. See table 3b for categorization.
<b>Detailed graphs at all temperatures</b>		
Overshoot	High and long overshoots at 95 °C lead to increased Taq polymerase inactivation. If the overshoot at 95 °C is highly non uniform the Taq polymerase inactivation can vary substantially per well and can lead to positive results in certain reactions and false negative in others. High and long overshoots at 50 °C and 60 °C can cause mispriming during annealing. If the overshoot at 50 °C and 60 °C is highly non uniform mispriming can occur in certain wells and not in others, leading to non specific results in certain wells and not in others.	Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures. Check if overshoot does not last longer than 10 seconds for all temperatures. Check if all channels go through overshoot for all temperatures. Check non uniformity during overshoot for all temperatures. See table 3b for categorization.
Plateau	Oscillation and divergation during the plateau phase at 50 °C and 60 °C can cause mispriming during annealing. Oscillation and divergation during the plateau phase at 95 °C can cause variation in Taq polymerase inactivation and therefore variation in yields.	Check for oscillation at all temperatures. Check for divergation at all temperatures.

Table 2. Thermocycler performance guidelines for DRIFTCO<sup>®</sup> reports

Item calibration report	Comment	Performance criterium to check
<b>Recommended control positions</b>		
Positive/Negative	Positive indicates the hottest and coldest spot of the reaction block during the first 10 seconds of the 95 °C step. Negative indicated the second hottest and second coldest spot of the reaction block during the first 10 seconds of the 95 °C step. During the denaturation phase false negatives can be caused by a too low temperature or a too high temperature. If the temperature is too low no denaturation will occur and therefore also no annealing. If the temperature is too high, fast inactivation of the Taq polymerase will occur leading to premature stopping of the reaction, before the detection threshold is exceeded. By positioning positive controls on the most extreme position it is possible to control for both these effects. Negative controls are positioned on the second hottest and second coldest spot.	Check if hot and cold spots give aberrant results in a PCR test or put a positive control on the hottest and coldest spot and a negative control on the second hottest and second coldest spot. Take a positive control of the same order of magnitude as the samples, as strong positive controls might still function while lower copy number samples might start to fail.
<b>Environmental conditions</b>		
Temperature	Room temperature is not a characteristic of the thermocycler, but does influence its performance. At room temperatures above 28 °C slower cooling can be observed. In air driven cyclers also failure to reach set temperatures of 50 °C and lower can be observed.	Check if room temperature does not exceed 28 °C in case of slow cooling (see step results of 30 °C, cool rate). Check if environmental conditions are within limits of operation conditions as recommended by the thermocycler manufacturer.
Relative humidity	The relative humidity is not a characteristic of the thermocycler, but does influence its long term performance. High relative humidities can lead to condensation inside the thermocycler during cooling, which may reduce the life span of a thermocycler, and are often induced by frequent overnight 4 °C steps.	No direct influence on thermocycler visible, only increased wearing over time. Can only be checked by comparing calibration reports over time. Check if environmental conditions are within limits of operation conditions as recommended by the thermocycler manufacturer.
Pressure	The air pressure is not a characteristic of the thermocycler, but does influence its performance. At altitudes above 4000 m the measurement uncertainty can be higher than stated.	No direct influence on thermocycler performance visible.

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# Thermocycler Calibration Guide

Item calibration report	Comment	Performance criterium to check
<b>Values after 30 seconds at all temperatures</b>		
Measured	Measured indicates the measured temperature after 30 seconds into plateau phase. + and – indicate hottest and coldest channel after 30 seconds. These channels can differ from the channels indicated under Recommended control positions, as they are calculated in a different way.	Check for extreme temperatures. Check if minimum/maximum is not strongly deviating from average temperature. In case of extreme cold/hot spots over all moments in time, at all temperatures, avoid using the well.
T(meas-set)	T(meas-set) indicated the difference between set temperature and measured temperature after 30 seconds into the plateau phase.	Check for temperatures strongly deviating from set temperature.
Status	Status indicates if the channel was active during the measurement. This is based on deviation of the channel from the average measured temperature. If this deviation is too wide this can be an indication that the channel is not functioning correctly. However, it can also be the thermocycler causing this large deviation. To identify the cause repeat the measurement with the fixture turned 180°, so sensor 1 ends up in well H12. If the problem moves with the sensor, the sensor is malfunctioning. If the problem occurs on a different sensor, the thermocycler is causing the deviation, which is then real.	Check if all channels stay active during the whole measurement. If sensors become inactive and are not visibly broken turn fixture 180° and repeat measurement to determine if channel is broken or thermocycler has certain largely deviating well temperatures.
<b>Step results</b>		
N	N indicates the number of data sets on which the market specifications have been based. The way of calculating the standard deviation is different with smaller numbers and less certain. Market specifications become more certain with increasing numbers of measurements and can also change over time. Therefore it is possible that a thermocycler which has given close to identical measured values over time, has been in specifications over many years and can get out of specifications because of the narrowing of the specifications. Take into account that specifications based on N<50 are wider than specifications based on N>250 data sets.	Check if market specifications have stayed identical when comparing actual DRIFTCON® reports with historical DRIFTCON® reports as specifications do narrow with increasing numbers of measurements.
Heat rate	In DRIFTCON® reports heat rates are only calculated in the 30-95 °C ramp. The way of determining differs slightly from MTAS and therefore the MTAS and DRIFTCON® heat rates are not directly comparable.	Check if measured result is within market specification.
Cool rate	In DRIFTCON® reports cool rates are only calculated in the 95-30 °C ramp. The way of determining differs slightly from MTAS® and therefore the MTAS® and DRIFTCON® heat rates are not directly comparable.	Check if measured result is within market specification. If slow cooling occurs check if room temperature is within range as indicated by manufacturer, if the cyler-to-cycler or cyler-to-wall distance is more than 20 cm and/or if the fan is not clogged by dust or malfunctioning.
Plateau start	Moment of plateau start	
Hold time	Duration of plateau phase	Check if measured result is within market specifications. Check if measured result is corresponding with programmed time.
Max. overshoot	Max. overshoot is maximum overshoot during heating and maximum undershoot during cooling. High maximum overshoots at 95 °C lead to increased Taq polymerase inactivation. High maximum overshoots at 50 °C and 60 °C can cause mispriming during annealing.	Check if measured result is within market specification. Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures. See table 3b for categorization.
Avg. overshoot	Avg. overshoot is average overshoot during heating and average undershoot during cooling. High average overshoots at 95 °C lead to increased Taq polymerase inactivation. High average overshoots at 50 °C and 60 °C can cause mispriming during annealing.	Check if measured result is within market specification. Check if overshoots do not exceed plateau temperatures by more than 5 °C for all temperatures. See table 3b for categorization.
<b>Accuracy results</b>		
N	N indicates the number of data sets on which the market specifications have been based. The way of calculating the standard deviation is different with smaller numbers and less certain. Market specifications become more certain with increasing numbers of measurements and can also change over time. Therefore it is possible that a thermocycler which has given close to identical measured values over time and has been in specifications over many years, can get out of specifications because of the narrowing of the specifications. Consider specifications based on N<50 as less certain than specifications based on N>250.	Check if market specifications have stayed identical when comparing actual DRIFTCON® reports with historical DRIFTCON® reports as specifications do narrow with increasing numbers of measurements.

Item calibration report	Comment	Performance criterium to check
Measured	Measured indicates accuracy results at a particular moment or within a certain time interval during a particular plateau phase. By comparing the values of 15, 30 and 90 seconds it is possible to check for divergation or convergence during the plateau phase. Divergation during the plateau phase at 50 °C and 60 °C can cause mispriming during annealing. Divergation during the plateau phase at 95 °C can cause variation in Taq polymerase inactivation and therefore variation in yields. If a thermocyclers should be aligned take the 30 seconds value.	Check if measured results are within market specifications. Check if no drift occurs during plateau phase by comparing 15, 30 and 90 seconds values. Check if measured accuracy approaches better set temperature with increasing hold time
N	N indicates the number of data sets on which the market specifications have been based. The way of calculating the standard deviation is different with smaller numbers and less certain. Market specifications become more certain with increasing numbers of measurements and can also change over time. Therefore it is possible that a thermocycler which has given close to identical measured values over time and has been in specifications over many years, can get out of specifications because of the narrowing of the specifications. Consider specifications based on N<50 as less certain than specifications based on N>250.	Check if market specifications have stayed identical when comparing actual DRIFTCON® reports with historical DRIFTCON® reports as specifications become more narrow with increasing numbers of measurements.
Measured	Measured indicates spread (uniformity) results at a particular moment or within a certain time interval during a particular plateau phase. By comparing the values of 15, 30 and 90 seconds it is possible to check for divergation/convergence during the plateau phase. Divergation of channels at plateau phase is an indication for suboptimal thermal control of the reaction block and is frequently found in blocks monitored by a single sensor. Typically plateau uniformity improves (convergence) when a thermocycler is programmed for a longer time at plateau phase.	Check if measured results are within market specifications. See table 3a for guidance criteria. Check if no divergation/convergence occurs during plateau phase by comparing 15, 30 and 90 seconds values. Check if uniformity improves with increasing hold times

**Table 3a. Guidance criteria for uniformity**

Phase	Excellent cycler	Good cycler	Moderate cycler	Poor cycler
Poor cycler	<3 °C	3-4 °C	5-8 °C	>8 °C
Overshoot	<2 °C	<2 °C	2-3 °C	>3 °C
Plateau (95°C 30s)	<0.6 °C	0.6-1 °C	1-2 °C	>2 °C

**Table 3b. Guidance criteria for overshoots at 95 °C – duration of maximum overshoot**

Max overshoot @ 95 °C	Good cycler	Moderate cycler	Poor cycler
105 °C	< 0.3 s	0.3 - 0.5 s	> 0.5 s
102 °C	< 0.7 s	0.7 - 1 s	> 1 s
100 °C	< 2 s	1 - 4 s	> 4 s
97.5 °C	< 7 s	7 - 10 s	> 10 s
96.5 °C	< 12 s	12 - 15 s	> 15 s

## 6 Modifying thermocycler performance

### 6.1 Introduction

Objective evaluation of thermocycler performance leads to the insight that each thermocycler has a unique thermal fingerprint. No thermocycler is an identical copy of another thermocycler, even when comparing cyclers with different serial numbers of the same model and brand. Currently, most cyclers can only be calibrated and not adjusted, neither by the user, nor by the manufacturer. However, by modifying the programmed protocol any user can modify the performance.

The programmed protocols will differ by thermocycler, but the resulting thermal profiles will be identical or close to identical. The parameters that can be modified by programming are accuracy, ramp rate, overshoot and hold time.

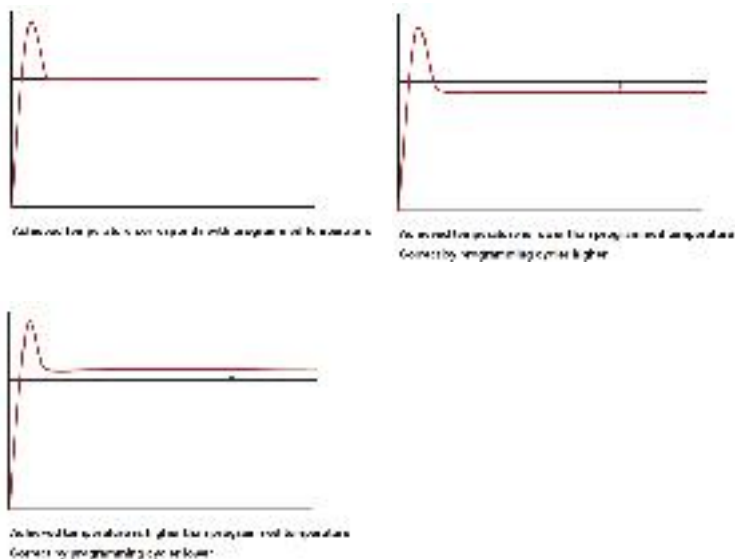
Uniformity can be indirectly influenced by modifying other parameters, but can not be modified directly and is therefore the most difficult parameter in a thermocycler to adjust and to control.

### 6.2 Modifying average plateau temperature

Average plateau temperatures (accuracies) can be modified by adapting the set temperature. Thermocyclers with average temperatures below/above the required temperature can be programmed at higher/lower set temperatures so that the required temperature will be achieved (Figure 14). Take the accuracy of 30 seconds at plateau and increase/decrease by the difference between average and set temperature to obtain the required temperature. For example, if a thermocycler reaches 94.5 °C when it is programmed at 95 °C, change the set temperature to 95.5 °C to allow the thermocycler to reach 95 °C. Verify the result of the adapted programming by a calibration and check if the correct result has been achieved. If not, fine tune the correction required.

Register modified program and resulting temperatures in the lab journal.

Figure 14. Modifying accuracies



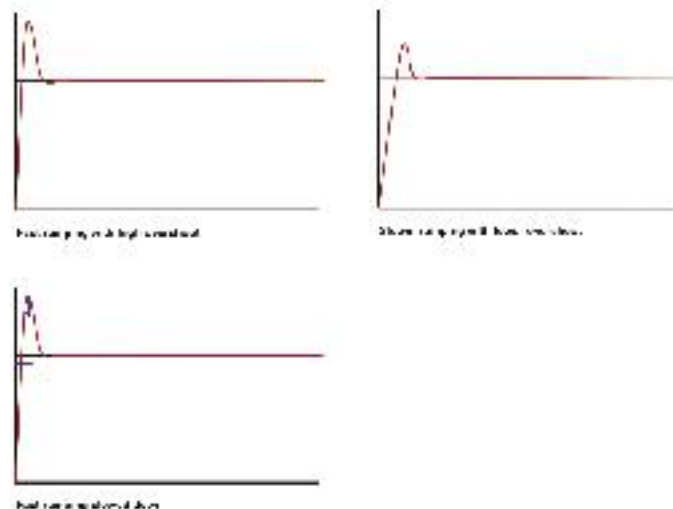
### 6.3 Modifying ramp rates

Ramp rates can be modified by adapting the heat and cool rates (figure 15). When maximum ramp is the default setting be aware that the ramp rate can only be reduced and not increased. So, if two thermocyclers should function alike, adapt to the thermocycler with the lowest ramp rate or to a fixed ramp rate. Register modified program and resulting ramp rates in the lab journal. If adapted to a fixed ramp rate, the total run time of a PCR will, under defined environmental conditions, always be the same. The total run time can be used as a

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routine check to control for incorrect protocols, strongly deviating environmental conditions and daily QC of the thermocycler. Register total run time in the lab journal. Reducing the ramp rate will in general also result in an improved uniformity during ramping and overshooting. Furthermore, the height of the overshoot will be reduced.

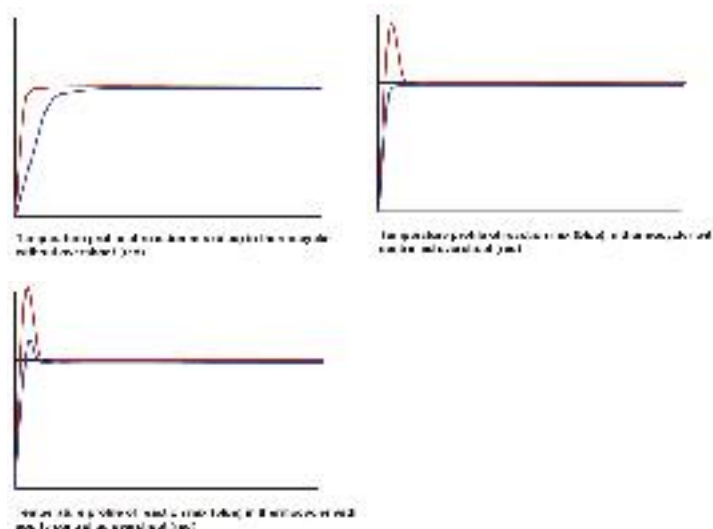
Figure 15. Modifying ramp rates



### 6.4 Modifying temperature overshoots

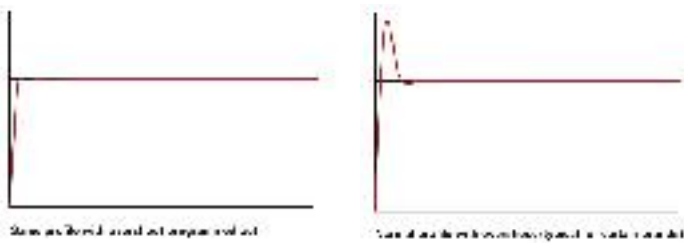
Thermocyclers have a thermal profile which is inherent to model and brand. Certain thermocyclers have a thermal profile with overshoots, others without overshoot. The advantage of an overshoot at denaturation is that plateau times can be drastically reduced as the reaction mix heats up much faster (figure 16). The disadvantage is that, in case of high and poorly controlled overshoots, fast inactivation of the Taq polymerase occurs as also the reaction mix goes through the overshoot.

Figure 16. Effect of reaction block temperature (red curve) on reaction mix temperature (blue curve) in thermocycler without overshoot, with controlled overshoot and with poorly controlled overshoot

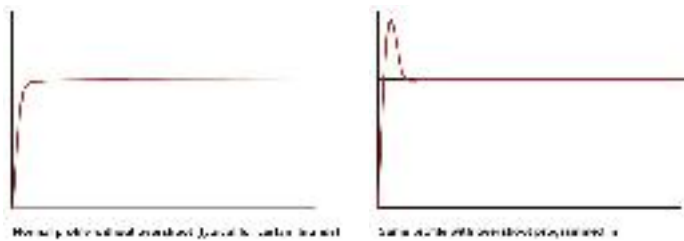


Depending on the requirement, overshoots can be programmed in or out. If the requirement is fast cycling and fast results it is recommendable to leave overshoots at denaturation in or program them in. If the requirement is minimal Taq polymerase inactivation, maximum number of cycles and sensitive detection, it is recommendable to leave overshoots at denaturation out, minimize them or program them out. Overshoots at denaturation can be programmed out by adding a short plateau at a slightly lower temperature to the program. For example, 30 s 95 °C, 30 s 62 °C, 30 s 72 °C can be modified into 1 s 90 °C, 30 s 95 °C, 30 s 62 °C, 30 s 72 °C. In this way the thermocycler ramps up with maximum speed to 90 °C, overshoots it, continues to 95 °C in a slower more controlled way and therefore hardly overshoots 95 °C, saving the Taq polymerase (figure 17a). Depending on brand and model of thermocycler this requires fine tuning. Programming overshoots in is also possible. For example 30 s 95 °C, 30 s 62 °C, 30 s 72 °C can be modified into 1 s 98 °C, 30 s 95 °C, 30s 62 °C, 30 s 72 °C (figure 17b). In this way the plateau times of the denaturation phase can be reduced, reducing the total run time.

**Figure 17a.** Programming overshoots out

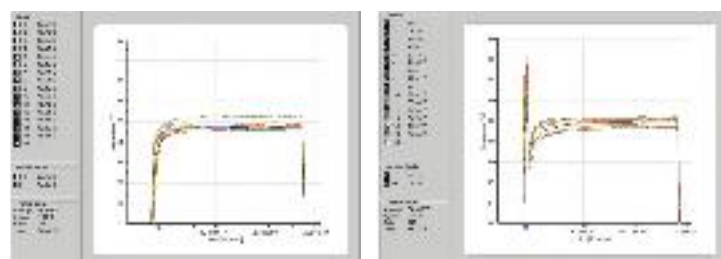


**Figure 17b.** Programming overshoots in



To control the overshoots well also the duration of the overshoot should be well defined. It is advisable to also define the ramp rate. Certain thermocyclers allow to program the reaction volume. In these thermocyclers the overshoot can also be reduced/increased by programming a volume that is lower/higher than the volume used (figure 18). The effect is not linear and should be verified by a calibration.

**Figure 18.** Effect of programming 0  $\mu$ l or 20  $\mu$ l reaction volume on height of overshoot



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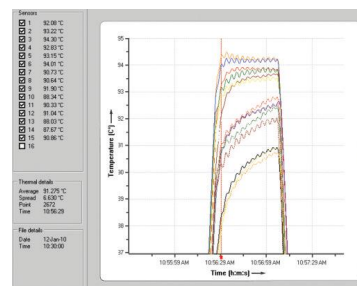
## 6.5 Modifying temperature uniformity

The only parameter that, unfortunately, can not be modified is the uniformity of a thermocycler. Uniformity can only be indirectly influenced by modifying the ramp rate or by adding mass to the reaction block and loading it evenly. It is therefore the most difficult parameter in a thermocycler to modify and to control. The effect of modifying the ramp rate is depending on the design and construction of the thermocycler, mainly on the number of Peltier elements, the number of sensors and the control mechanism. Slowing down the ramping rate typically leads to lower overshoots and improved uniformity during both the ramping phase and plateau phase (figure 15).

The same phenomenon can in certain thermocyclers also be obtained by filling all unused wells with tubes with water (same volume as the samples). In this way more mass is added to the reaction block and the mass is distributed evenly, slowing the thermocycler down, forcing it to heat evenly and therefore improving its uniformity. In well regulated thermocyclers adding mass does have little effect on the uniformity. It will mainly increase the height of the overshoot.

Uneven loading can lead to deteriorated thermocycler uniformity over time (figure 19). The left side of thermocycler blocks is often more worn out than the right side due to left to right loading when using single tubes or strips. The best thermal performance of a block is obtained if it is loaded evenly. In other words, distribute the tubes or strips evenly over the block, starting from the middle of the block.

**Figure 19.** Example of worn out reaction block due to asymmetric use of block



## 6.6 Aligning thermocyclers

Adapted thermocycler protocols can be used to bring the thermocycler's performance back to the required performance. However, adapted protocols can also be used to align several thermocyclers. This can be done between different thermocyclers of the same model, but also between models and even between brands. It is straightforward to put in place, and once all thermal characteristics are known it allows a laboratory to use its full thermocycler capacity, in the sense that each assay can be run on each thermocycler. Be aware that the uniformity can not be directly adapted and that ramp rates can only be decreased and not increased. Therefore initial validation (see chapter 7) should always be done on the least uniform thermocycler.

### Protocol aligning thermocyclers

1. Calibrate all thermocyclers to be aligned using DRIFTCON® or MTAS®.
2. Select thermocycler with the lowest ramp rate or define a ramp rate.
3. Adjust the ramp rates of all thermocyclers to the slowest thermocycler or to the defined ramp rate.
4. Adjust the accuracy either to an absolute temperature or to a selected thermocycler (take 30 s plateau values from calibration data).
5. Program overshoots in or out to obtain desired thermal profile (take overshoot value from 95 °C step).
6. Verify by a second calibration the effects of adapting the protocol.
7. fine tune if necessary and verify again.
8. During assay validation (chapter 7), validate the assay on the thermocycler with the highest non uniformity. If the reaction produces a positive result in all 96 wells it will also function on all aligned thermocyclers and does not require additional validation on these instruments.

NOTE: In case of a defined ramp rate the total run time can be used as daily QC to monitor the thermocycler performance and to check if no modifications to the protocol have been made

### Alignment example

All thermocyclers are aligned for accuracy to 95 °C and ramp rate to model A, as this thermocycler has the slowest ramp rate. The uniformities are not adjusted as they can not be adjusted.

Data as measured	Model A	Model B	Model C
Accuracy	96.14 °C (30 s)	95.12 °C (30 s)	95.42 °C (30 s)
Uniformity	1.37 °C (30 s)	0.85 °C (30 s)	0.40 °C (30 s)
Ramp rate	2.43 °C/s	3.50 °C/s	4.53 °C/s
<b>Target accuracy</b>	<b>95.00 °C</b>	<b>95.00 °C</b>	<b>95.00 °C</b>
Program after alignment	Model A	Model B	Model C
Accuracy	93.86 °C	94.88 °C	94.58 °C
Uniformity	Can not be programmed	Can not be programmed	Can not be programmed
Ramp rate	2.43 °C/s	2.43 °C/s	2.43 °C/s

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## 7 Assay validation

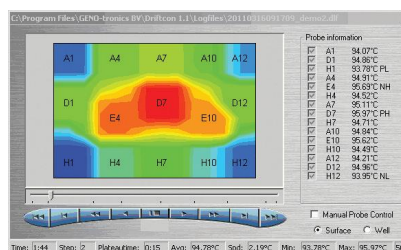
### 7.1 Introduction

Both the ISO 17025 and ISO 15189 standard and also many other regulations do require (q)PCR assay validation in addition to thermocycler calibration. The principle is to prove that the thermocycler is suitable to run a particular assay, as being within specifications is not a guarantee that a certain kit will function on a particular thermocycler, even when initially validated by the manufacturer on that particular model and brand. As all thermocyclers are more or less non uniform, a validation done in just one row or column of the reaction block is not sufficient as it might not cover the most extreme positions, the hot and the cold spots of the block. An assay might function in the validation test wells and not function in others as they are too cold to denature or too hot, leading to Taq polymerase inactivation before a detectable result is generated. Therefore, intra thermocycler variability should be taken into account during the validation process, not only by the laboratory, but also by the kit manufacturer. The methods below describe several ways to perform assay validation, taking intra thermocycler variability in account. Depending on the equipment available, the workload involved and the type of laboratory one of the methods described below will be most suitable.

### 7.2 Hot-cold spot method

In the hot-cold spot method the hottest and the coldest positions in the reaction block are determined via a calibration (figure 20).

Figure 20. Hot and cold spots of a 96-well block thermocycler



Two positive controls and two negative controls are used. The two positive controls are positioned on the hottest spot and the coldest spot. The two negative controls are positioned on the second hottest and second coldest spot. If the (q)PCR assay functions correctly on the temperature extremes it will also do at all temperatures in between and hereby the proof is provided that the assay will function in all wells. The advantage of this method is that it can be put very easy and quickly into place on any thermocycler and therefore is the recommended method for labs doing many different assays over time, like research laboratories. The disadvantages are that controls can end up in the middle samples series or that the hot and cold spots can move through the reaction block over time.

### Protocol hot-cold spot method

1. Calibrate the thermocycler using DRIFTCON® or MTAS® (include a 95 °C step).
2. DRIFTCON®: take the PH, PL, NH, NL positions from the report in section Recommended control positions.  
MTAS®: take the highest and second highest temperature and the lowest and second lowest temperature at 10 s into the 95 °C step in section Static data step 2: 95 °C.
3. Position positive and negative controls in recommended wells.
4. Run PCR protocol as usual.
5. Check if positive and negative controls give correct result.
6. If yes, from a temperature perspective, the assay will give reliable results in all other wells.

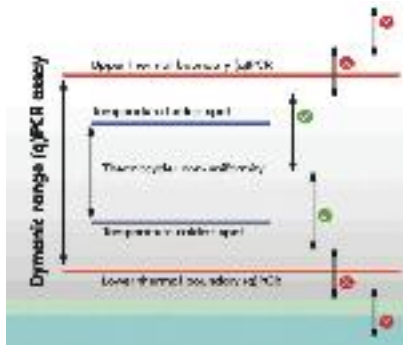
If no, avoid hottest/coldest wells and position positive and negative controls on second hottest/coldest and third hottest/coldest well and start from step 4 or decrease/increase set temperature thermocycler closer to target temperature and start from step 1.



## 7.3 Thermal boundary method

The thermal boundary method comes down to determining the temperature extremes at which the (q)PCR assay still gives a correct result. The minimum and maximum denaturation, annealing and elongation temperatures are determined and then a thermocycler is qualified as being within these thermal boundaries or not. If the thermocycler, including its full non uniformity, lies within the thermal boundaries the cyclers is qualified as suitable (figure 21).

Figure 21. Thermal boundaries of a (q)PCR assay



The advantage of this method is that it is very exact and allows laboratory technicians to position controls wherever they like. It also allows kit manufacturers to specify the thermal boundaries of a kit, instead of protocols for particular models and brands of thermocyclers on which the kit has been validated by the manufacturer. The thermal boundary method is a solution for CE-IVD kits that do not function correctly in the hands of end users and do not achieve the sensitivity and reproducibility claimed, although used exactly according to protocol, on the thermocycler on which the kit has been validated. The cause for this is in many cases limited validation by the manufacturer, not taking thermocycler variability into account (see chapter 7.5).

Laboratories that use CE-IVD kits can also determine these thermal boundaries themselves. In this way kits can be used on alternative thermocyclers, than on which the kit was originally validated. According to the ISO 17025 and ISO 15189 standard, this is called use of a standardized method outside its intended scope. The thermal boundaries method allows using the laboratory's full thermocycler capacity and allows universal thermocycler use. The disadvantage of this method is that it is initially labour intensive as the thermal boundaries need to be sorted out for the denaturation, annealing and elongation phase. Sometimes, it is also necessary to verify the define the ramp rates and the height and length of overshoots. But once sorted out, it can be used for a long time. This method is, therefore, recommended for PCR and qPCR kit manufacturers and diagnostic laboratories that repeat the same test frequently over a long period of time. The workload of this initial validation by thermal boundaries can be reduced by designing all assays to function at the same denaturation, annealing and elongation temperature. On other words, in the design phase the thermal boundaries can already be defined and then only a verification needs to be done.

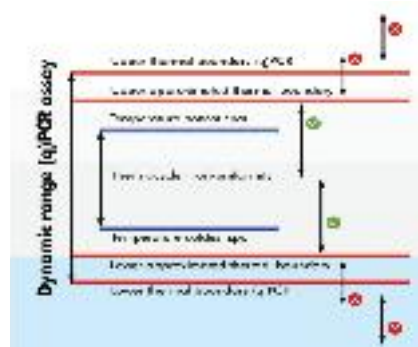
## Protocol thermal boundaries method

1. Calibrate the used thermocycler in non gradient mode and gradient mode (if available) with MTAS® or DRIFTCON®, as the performance in gradient mode can differ from performance in non gradient mode, and determine the real temperatures the thermocycler reaches, in both modes.
2. If two different thermocyclers are used, in case the normally used thermocycler does not have a gradient, check the relation between both cyclers and align them or take the difference into account in the calculations as made below.
3. Set up 2.5 ml mastermix of the selected (q)PCR assay, pipet 25 µl in each well of a BIOplastics 96 well plate
4. Run PCR with a gradient at the denaturation temperature (90-100 °C)
5. Determine the lowest (D<sub>L</sub>) and highest (D<sub>H</sub>) denaturation temperature at which the PCR still gives a result, based on the calibration data, not based on thermocycler program
6. Determine optimal denaturation temperature ( $D_O = (D_L + D_H) / 2$ )
7. Run PCR with D<sub>O</sub> as denaturation temperature and gradient at annealing temperature (±5 °C theoretical annealing temperature)
8. Determine the lowest (A<sub>L</sub>) and highest (A<sub>H</sub>) annealing temperature at which the PCR still gives a result, based on the calibration data, not based on thermocycler program
9. Determine optimal annealing temperature ( $A_O = A_L + A_H / 2$ )
10. Elongation less critical, but can also be done
11. Optimal protocol: D<sub>O</sub>, A<sub>O</sub>, E<sub>O</sub>
12. Thermal boundaries: D<sub>L</sub>- D<sub>H</sub>, A<sub>L</sub>-A<sub>H</sub>, E<sub>L</sub>-E<sub>H</sub>
13. Calibrate unknown cyclers, check if within D<sub>L</sub>- D<sub>H</sub>, A<sub>L</sub>-A<sub>H</sub> and E<sub>L</sub>-E<sub>H</sub>
14. If within boundaries the cyclers can be used without any adjustment
15. If completely or partially outside boundaries either adjust the protocol to bring the thermocycler within boundaries (see paragraph 6.6) or do qualify as not suitable
16. Optional: Use recommended + and - control positions (based on calibration) to check for drifting in time
17. Optional: Define ramp rate and height and length of overshoots. In case of a defined ramp rate the total run time can be used as daily QC to monitor the thermocycler performance and to check that no modifications to the protocol have been made

## 7.4 Approximated thermal boundary method

In the approximated thermal boundary method the thermal boundaries are not determined exactly, but are approximated by programming the thermocycler a few degrees off-plateau. The resulting approximated temperature boundaries are more narrow than with the thermal boundary method, but for the rest the method is comparable. If the thermocycler, including its full non uniformity, lies within the approximated thermal boundaries the cyclers is qualified as suitable (figure 22).

Figure 22. Approximated thermal boundaries of a (q)PCR assay



The advantage of this method is that it is exact and allows laboratory technicians to position controls wherever they like. It also allows kit manufacturers to specify the approximated thermal boundaries of a kit, instead of protocols for particular models and brands of thermocyclers on which the kit has been validated by the manufacturer.

This method is also suitable for laboratories that do not have a gradient thermocycler in their instruments portfolio. The disadvantage of this method is that it is initially labour intensive as the approximated thermal boundaries need to be sorted out for the denaturation, annealing and elongation phase. Sometimes, it is also necessary to verify the effect of the ramp rates and the overshoots.

But once sorted out, it can be used for a long time. This method is, therefore, recommended for PCR and qPCR kit manufacturers and diagnostic laboratories that repeat the same test frequently over a long period of time.

The workload of this initial validation by thermal boundaries can be reduced by designing all assays to function at the same denaturation, annealing and elongation temperature. In other words, in the design phase the thermal boundaries can already be defined and then only a verification needs to be done.

## Protocol approximated thermal boundary method

1. Calibrate the used thermocycler with MTAS® or DRIFTCON® and determine the real temperatures the thermocycler reaches.
2. Set up 2.5 ml mastermix of the selected (q)PCR assay, pipet 25 µl in each well of a BIOplastics 96 well plate
3. Run PCR with denaturation temperature 1 or 2 °C below and above normally used temperature.
4. Check if PCR still gives a result at lowest programmed denaturation temperature ( $D_{AL}$ ) and at highest programmed denaturation temperature ( $D_{AH}$ ), based on the calibration data, not based on thermocycler program
5. Run PCR with annealing temperature 1 or 2 °C below and above normally used temperature.
6. Check if PCR still give a result at lowest programmed annealing temperature ( $A_{AL}$ ) and at highest programmed annealing temperature ( $A_{AH}$ ), based on the calibration data, not based on thermocycler program
7. Elongation less critical, but can also be done
8. Thermal boundaries:  $D_{AL}$ - $D_{AH}$ ,  $A_{AL}$ - $A_{AH}$ ,  $E_{AL}$ - $E_{AH}$
9. Calibrate unknown cyler, check if within  $D_{AL}$ - $D_{AH}$ ,  $A_{AL}$ - $A_{AH}$  and  $E_{AL}$ - $E_{AH}$
10. If within boundaries the cyler can be used without any adjustment
11. If completely or partially outside boundaries either adjust the protocol to bring the thermocycler within boundaries (see paragraph 6.6) or qualify as not suitable
12. Optional: Use recommended + and – control positions (based on calibration) to check for drifting in time
13. Optional: Define ramp rate and height and length of overshoots. In case of a defined ramp rate the total run time can be used as daily QC to monitor the thermocycler performance and to check if no modifications to the protocol have been made

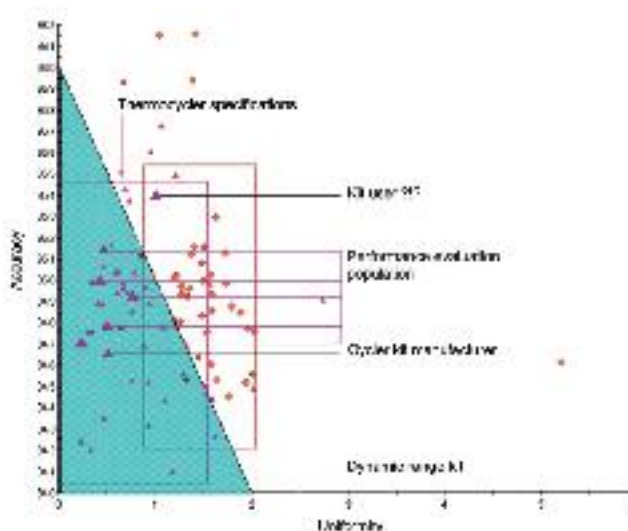
## 7.5 CE-IVD kit validation, verification and revalidation

Most CE-IVD kits are validated on a large number of samples to check for matrix effects. However, the number of thermocyclers on which the kits are validated are in general very modest, often not more than 10 thermocyclers.

Given the substantial variability present in the population of a particular model, low numbers of thermocyclers are not statistically representative for the total population. Therefore the “coldest”, “hottest”, and “least uniform” thermocyclers, although within specifications, are often missing in these validation studies by the manufacturer (figure 23). As a result the kit will produce results in most laboratories, but a small percentage of the laboratories are not capable of obtaining positive results in all wells or no results at all with a particular kit. Specifying thermal boundaries in a kit manual would allow an end-user to use any model of thermocycler, as long as the thermocycler lies with its full non uniformity, within these thermal boundaries.

However, the laboratory which uses the kit can also perform an initial verification to check if the kit produces the result as claimed. If not, the laboratory can also determined the thermal boundaries themselves and revalidate the kit to meet the requirements of the ISO 17025 or ISO 15189 standard in order to guarantee the human diagnostic results they produce.

Figure 23. Thermocycler variability versus dynamic range of a diagnostic kit



## 8 Conclusions

Thermocyclers show a substantial variation, not only between brands, but also between models of the same brand, between individual serial numbers of the same model and brand and even within one thermocycler.

The effects of this variation differ by phase of the PCR. Increased plateau temperatures and high and long overshoots typically cause problems during the denaturation phase due to premature inactivation of the Taq polymerase.

In the annealing phase deviating temperatures, either too high or too low typically cause problems due to non specific or inefficient priming. The effects on the final PCR results move on a sliding scale from slightly less efficient PCRs, which still give a result, to complete failure. The first category is often not noticed and in case of quantitation can lead to incorrect counts.

Due to thermocycler variation it is necessary to calibrate thermocyclers and validate thermocycler – assay combinations.

To perform a calibration that is representative of the process and measures all parameters of thermal performance, including uniformity, accuracy, overshoot, ramp rate and hold time, a thermocycler calibration should be performed in a dynamic and multichannel manner. To be ISO 17025 compliant the temperature calibration should furthermore be traceable by comparison to the internal reference standard ITS-90, performed by trained and qualified person, under controlled environmental conditions and with a calculated measurement uncertainty. The calibration results can be compared to manufacturer specifications, but should also be analyzed in an objective manner.

Thermocyclers can be adjusted or synchronized by adapting the programmed protocol.

They fulfill the requirement of validation under ISO 17025 and ISO 15189 accreditation and many other regulations. Either the hot-spot method, thermal boundary method or approximated thermal boundary method can be used, depending on the type of laboratory.

Most important is to realize that thermocyclers do vary and that solutions must be sought to manage this variation in daily use to ensure that correct and reliable data are produced.

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**Note:** According to CYCLERtest a new patented calibration tool for optical calibration of qPCR cyclers will be available shortly.

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