

PCR and Molecular Biology

Certified quality products for (q)PCR



**Molecular
Diagnostic
Workflow**





SARSTEDT has developed and manufactured high-quality products for medical and scientific applications since 1961.

On the following pages you will discover our extensive range of molecular biology products and find additional useful tips to help you further optimize the PCR reaction process.

To ensure the consistent high quality of our products, we place great emphasis on:

- ✓ Carefully considered product and tool design to ensure uniform wall thickness
- ✓ Selection of high-quality raw materials (e.g. medical grade materials)
- ✓ Automated production under clean room conditions
- ✓ Stringent quality controls (e.g. 100% leakproofness tests)
- ✓ ISO 13485-certified quality management system
- ✓ A highly trained workforce

Together, this is how we achieve our outstanding product quality.

In addition to our standard product range, we offer high-performance products that are manufactured using the latest technology. Examples include products that have low-binding properties for certain biomolecules or that consistently display the very highest purity levels. For special requirements, we also manufacture products that are customized to meet individual customer needs. If you are interested, please do not hesitate to contact us directly.

Your **SARSTEDT** team

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Get started right away – with the highest purity!

Clean room conditions, trained staff in protective clothing and automated production processes are the basic requirements for SARSTEDT's certified quality standards.

We use an independent laboratory to regularly carry out thorough quality controls. As a result, the consumables we offer can be used reliably without additional costs.

Today, the process of autoclaving consumables is still common practice for some. Many people confuse sterile products with DNA-free ones. However, sterilization does not remove unwanted biomolecules such as DNA, RNases or pyrogens. An even more serious problem, however, is that products can become contaminated through autoclaving. Consistent

separation of clean consumables from autoclaves for sterilizing laboratory waste rarely works in the long term. In the steam-saturated environment of autoclaves, plasmids or RNases are easily transferred from previously autoclaved laboratory waste to consumables that are actually clean.

So, why not spare yourself this additional hazardous task and get started right away with SARSTEDT certified high-purity consumables?

The quality of PCR plastic consumables is important – our pioneering product standards ensure reliable performance in all (q)PCR applications

Throughout our PCR-focused manufacturing process, we take into account essential parameters that affect the quality of PCR plastic consumables. This starts with precision engineering in design and construction. After all, only precisely manufactured tools can produce highly uniform plastic consumables with uniform wells that minimize data variability. Our products are manufactured in ultraclean production units using automated processes. We implement thorough cleaning procedures, because even the smallest residual traces of chemicals could inhibit PCR amplification. From design through to final packaging, our product process are highly automated and take place under controlled conditions, in plant complexes protected by laminar flow technology.

Only selected raw materials of the highest purity and quality are used to manufacture SARSTEDT products. These materials

meet the standards of numerous international guidelines and norms (primarily medical grade). We only choose suppliers who endorse our philosophy of maximum quality. And of course, we do not use additives such as bisphenols, or any biocides. To get the most out of SARSTEDT products, all materials have been carefully selected for their particular intended application and specially validated.

Effective quality controls, such as leak testing of each individual well and verification of product geometry, augment our production standards. In particular, our quality consistency, which ensures we always produce uniform wall thicknesses, means you can rest assured that your PCR results will always be accurate and reproducible.

Maximum purity and reliability for highly sensitive analyses

PCR Performance Tested



SARSTEDT's purity certification "PCR Performance Tested" was specially developed for nucleic acid analytics. All products certified as PCR Performance Tested are tested by an independent laboratory and are free from human and bacterial DNA, DNases & RNases,

and PCR inhibitors. Additional testing for PCR inhibitors is important to us, because any additives that are used during the manufacture of consumables can have a PCR inhibitory effect.

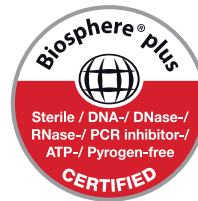
In addition, many substances that can easily be introduced into your precious samples have a strong inhibitory effect on the PCR reaction. Well-known examples are hemoglobin and ethanol, which is often used to isolate nucleic acids. However, many PCR inhibitors are largely unknown. For example, sputum samples often have a PCR inhibitory effect, but the constituents responsible for this effect have not yet been identified. The effect of PCR inhibitors is particularly serious if the inhibitory effect differs between different target genes (e.g. if the amplification of a housekeeping gene is affected less or more than the amplification of another gene of interest that is being analyzed in parallel). Subsequently it is best to only use consumables that have been tested for the absence of PCR inhibitors.

When working with RNA, the ubiquitous RNases are always a challenge. Unlike the related DNases, many RNases do not need any co-factors such as Mg^{2+} in order to be active. In addition, RNases are very stable and are able to fold themselves back into their original conformation when heated.

We guarantee that our PCR Performance Tested products meet the following threshold values:

| | |
|----------------|--|
| Human DNA | <0.5 pg/ μ l |
| Bacterial DNA | <0.02 pg/ μ l |
| DNase | < 1×10^{-5} U/ μ l |
| RNase | < 1×10^{-9} Kunitz units/ μ l |
| PCR inhibitors | <0.5 cycles C_t value shift |

Biosphere® plus – our additional security guarantee



More and more applications require the absolute guaranteed absence of DNA and other biomolecules. For these needs, SARSTEDT's Biosphere® plus-certified products undergo an additional validated decontamination process. A treatment with ethylene oxide (EtO) is

used, which destroys all possible traces of DNA and other biomolecules and sterilizes the products. Further tests to verify the absence of pyrogens and ATP (tip: important in luminescence-based assays) complete our Biosphere® plus certification.

To ensure that you can reliably rule out the possibility of even the slightest contamination, we guarantee that our Biosphere® plus-certified products meet the following threshold values:

| | |
|----------------------------------|---|
| Human DNA | < 5.0 fg/ μ l |
| Bacterial DNA | < 0.2 fg/ μ l |
| Sterility validated according to | ISO 11135 |
| ATP | < 1×10^{-12} mmol/ μ l |
| Pyrogens/endotoxins | <0.002 EU/ml |
| DNase | < 5×10^{-7} U/ μ l |
| RNase | < 5×10^{-11} Kunitz units/ μ l |
| PCR inhibitors | <0.5 cycles C_t value shift |

Optimized sensitivity and improved reproducibility

Particularly when using smaller volumes, fluorescence-based applications such as real-time PCR (qPCR) benefit from the significantly superior reflective properties of white PCR consumables. The opaque coloring ensures fluorescent light is not lost through the walls, and the reflection of the optimized white dye keeps the quantity of fluorescent light reaching the detector more constant than when transparent products are used. Accordingly, this results in substantially less variation when performing repeated experiments or applying duplicates and triplicates.

The higher fluorescence level of white PCR consumables and consistent background effects of the fluorophore used help achieve a superior signal-to-background ratio. The opaque white coloring also prevents the detection of scattered fluorescent light from neighboring wells and thus the worse-case scenario of a false-positive detection.

However, the biggest advantage is that sensitivity is substantially superior in white PCR consumables than in transparent materials. *Fig. 1* shows that the measured fluorescence intensity for the same template and enzyme quantity is significantly higher in white vessels than in transparent ones. In addition, the Ct value actually reduces from 24.87 ± 0.08 (transparent) to 23.40 ± 0.07 (white), which shows that the detection of 1000 template molecules occurs sooner in white vessels. This is another big advantage, particularly if only very small amounts of the starting material are available.

Consequently, switching from transparent to white PCR consumables also achieves a cost-effective volume reduction in experiments. Thus, the quantity of reagents used (enzyme, probe, primer, etc.) can be substantially reduced, lowering reagent costs..

Comparison of fluorescence level of white and transparent wells

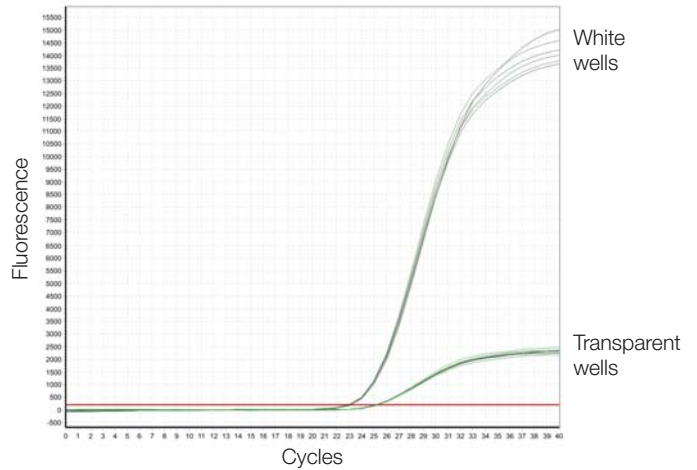


Fig. 1: Comparison of fluorescence value of product 72.985.002 (transparent) and 72.985.092 (white), both sealed with high-transparent lid strip 65.989.002. A 100 bp fragment of EmGFP plasmid (template quantity 1000 molecules) was amplified in a volume of 20 μ l using the Eppendorf realplex 4S Thermocycler (n=8).

DNA & protein low binding – for maximum sample recovery

The trend towards smaller sample volumes makes it critical to minimize any interaction between analytes and vessels. In addition, the increasing use of PCR consumables for other applications often requires maximum sample recovery. In particular, when preparing and storing (low-concentrate) nucleic acid samples and when making dilution series, great importance is attached to ensuring that all biomolecules can be recovered.

In mass spectrometry analysis using glass vials and standard PP vessels, loss of peptides and proteins is a well-known phenomenon. By using low protein binding products, substantially more protein and peptide can be recovered for subsequent analyses. Any enzymes used also remain active, because the surface of low protein binding products also

reduces enzyme denaturation caused by interaction with the vessel wall. As soon as the protein concentration falls below a critical level, it is usually no longer possible to perform reliable protein analysis with standard reaction vessels. Low protein binding products also provide maximum reliability for immunoprecipitation, purification or isolation of proteins and for storage of protein, peptide and antibody samples.

The low binding properties of our products for nucleic acids or peptides/proteins are the result of using special raw materials and a physical treatment. Our low binding properties do not require layers of silicon or similar materials.

We offer products with low DNA and low protein binding properties that are manufactured using the latest technology.

Protein low binding – comparison of protein losses:

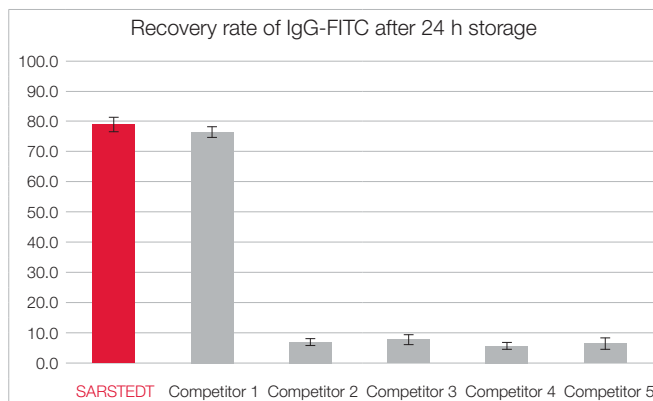


Fig. 2: 8 x 125 μ l of an IgG-FITC conjugate solution (1.0 μ g/ml in PBS; Sigma Aldrich, item no F9636) were stored for 24 hours in low protein binding products from SARSTEDT and five competitors. After incubation, 100 μ l from each vessel was transferred to black ELISA plates (SARSTEDT, item no 82.1581.220), which had been blocked beforehand for at least 2 h using 1 x Roti Block (Carl Roth, item no A151.4), and were measured in the Infinite 200 pro (Tecan) plate reader. The experiment was repeated on three consecutive days. Unlike most of the tested competitor products, storage in the SARSTEDT low protein binding products did not result in a significant loss of protein. One competitor product also showed a high recovery rate.

DNA low binding – comparison of DNA losses:

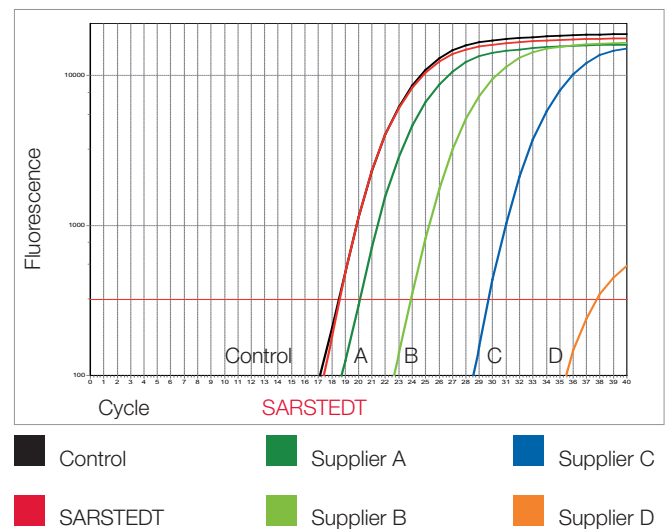


Fig. 3: Ten test tubes from various suppliers were filled with 100 μ l of a plasmid DNA solution (concentration: 10^4 copies/ μ l) and shaken at 37°C.

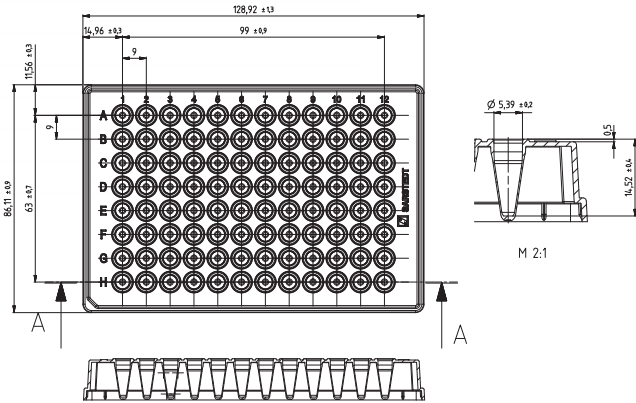
After an incubation period of 3 hours, the DNA content was determined using real time PCR.

One of the 10 test series is shown in this diagram as an example.

Multiply® PCR plates by SARSTEDT –
maximum reliability



PCR plates with skirt – maximum efficiency and reduced variability

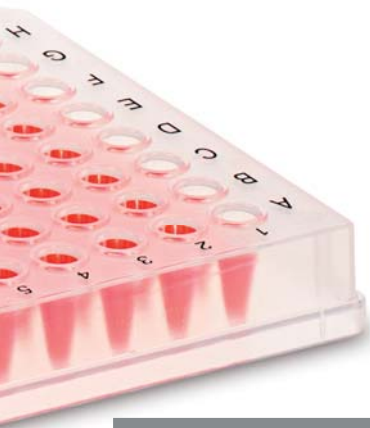


Product information:

Profile: Low profile
 Maximum well volume: 0.1 ml
 Cutaway corner: H1

Features and benefits:

- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- ANSI/SLAS-compliant dimensions enable ready use in automated systems.
- Raised well rims protect against cross contamination and facilitate secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.
- Testing of each individual well for 100% leakproofness ensures maximum security for valuable samples.
- Plates can be stacked safely and securely, enabling efficient use of space if storage is limited.



| Description | Color | Purity | Packaging | Order no: |
|---|------------------------|--------|---------------------------------------|-------------|
| 96-well PCR plate with skirt | Transparent | | 10 plates/bag & 100 plates/case | 72.1980 |
| 96-well PCR plate with skirt | Transparent | | 1 plate/blister pack & 20 plates/case | 72.1980.201 |
| 96-well PCR plate with skirt | White (qPCR-Optimized) | | 10 plates/bag & 100 plates/case | 72.1980.010 |
| 96-well PCR plate with skirt, DNA low binding | Transparent | | 10 plates/bag & 100 plates/case | 72.1980.700 |

Other colors and barcoded variants available on request.
 Suitable lid strips and sealing films and foils can be found on pages 24–27.

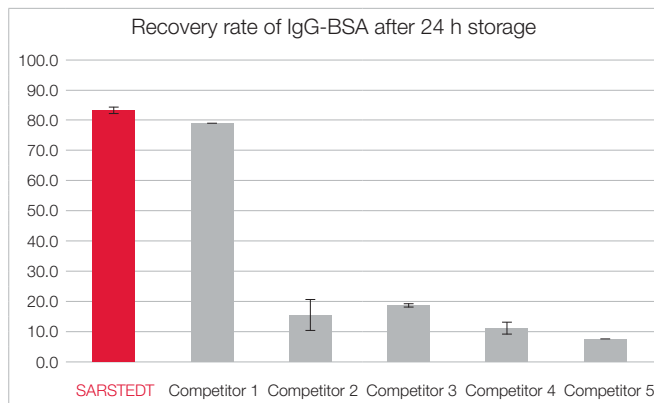




Protein low binding PCR plate with skirt

In mass spectrometry analysis using glass vials and standard PP vessels, loss of peptides and proteins is a well-known phenomenon. As soon as the protein concentration falls below a critical level, it is usually no longer possible to perform reliable protein analysis with standard reaction vessels. Subsequently SARSTEDT low protein binding 96-well plates with skirt for

sample preparation/input and for storing extremely small sample quantities in the minus temperature range (-20°C to -80°C). In addition, the plates are ideally suited for immunoprecipitation, purification or isolation of proteins and for storing protein, peptide and antibody samples.



8 x 125 µl of a BSA-FITC conjugate solution (1.0 µg/ml in PBS; ThermoFisher Scientific, item no A23015) were stored for 24 hours in low protein binding products from SARSTEDT and five competitors. After incubation, 100 µl from each vessel was transferred to black ELISA plates (SARSTEDT, item no 82.1581.220), which had been blocked beforehand for at least 2 h using 1 x Roti Block (Carl Roth, item no A151.4), and were measured in the Infinite 200 pro (Tecan) plate reader. The experiment was repeated on three consecutive days. Unlike most of the tested competitor products, storage in the SARSTEDT low protein binding products did not result in a significant loss of protein. One competitor product also showed a high recovery rate.

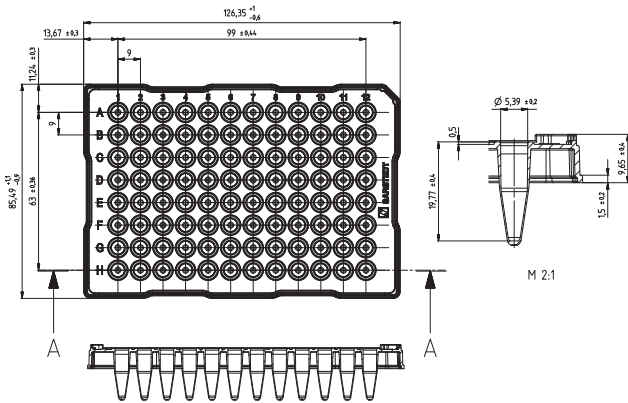


Tip:
We recommend using the compatible lid strips 65.989.002 to seal stored samples.

| Description | Color | Purity | Packaging | Order no: |
|--|------------------|--------|----------------------------------|-------------|
| 96-well PCR plate with skirt, Protein low binding | Transparent | | 10 plates/bag & 100 plates/case | 72.1980.600 |
| PCR 8-lid strips | High-transparent | | 120 strips/bag & 480 strips/case | 65.989.002 |



PCR plates with half skirt – high profile



Product information:

Profile: High profile
 Maximum well volume: 0.2 ml
 Cutaway corner: A12

Features and benefits:

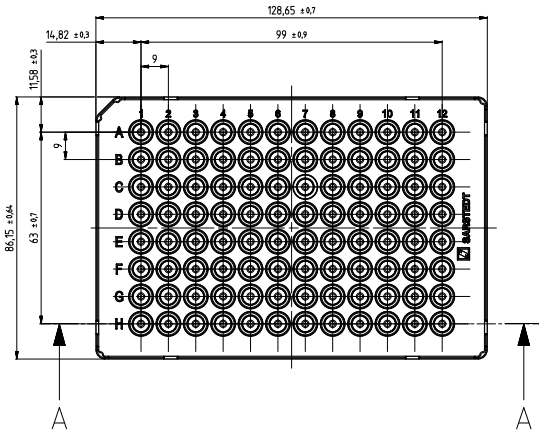
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- Raised well rims protect against cross contamination and facilitate secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.
- Testing of each individual well for 100% leakproofness ensures maximum security for valuable samples.
- Plates can be stacked safely and securely, enabling efficient use of space if storage is limited.

| Description | Color | Purity | Packaging | Order no: |
|---|------------------------|--------|---------------------------------------|-------------|
| 96-well PCR plate with half skirt | Transparent | | 10 plates/bag & 100 plates/case | 72.1979 |
| 96-well PCR plate with half skirt | Transparent | | 1 plate/blister pack & 20 plates/case | 72.1979.201 |
| 96-well PCR plate with half skirt | White (qPCR-Optimized) | | 10 plates/bag & 100 plates/case | 72.1979.010 |
| 96-well PCR plate with half skirt & barcode | Transparent | | 10 plates/bag & 100 plates/case | 72.1979.003 |
| 96-well PCR plate with half skirt, DNA low binding | Transparent | | 10 plates/bag & 100 plates/case | 72.1979.700 |
| 96-well PCR plate with half skirt and flat deck | Transparent | | 5 plates/bag & 100 plates/case | 72.1979.102 |
| 96-well PCR plate with half skirt and flat deck | White (qPCR-Optimized) | | 5 plates/bag & 100 plates/case | 72.1979.132 |

Other colors and barcoded variants available on request.
 Suitable lid strips and sealing films and foils can be found on pages 24–27.



PCR plates with half skirt – low profile



Product information:

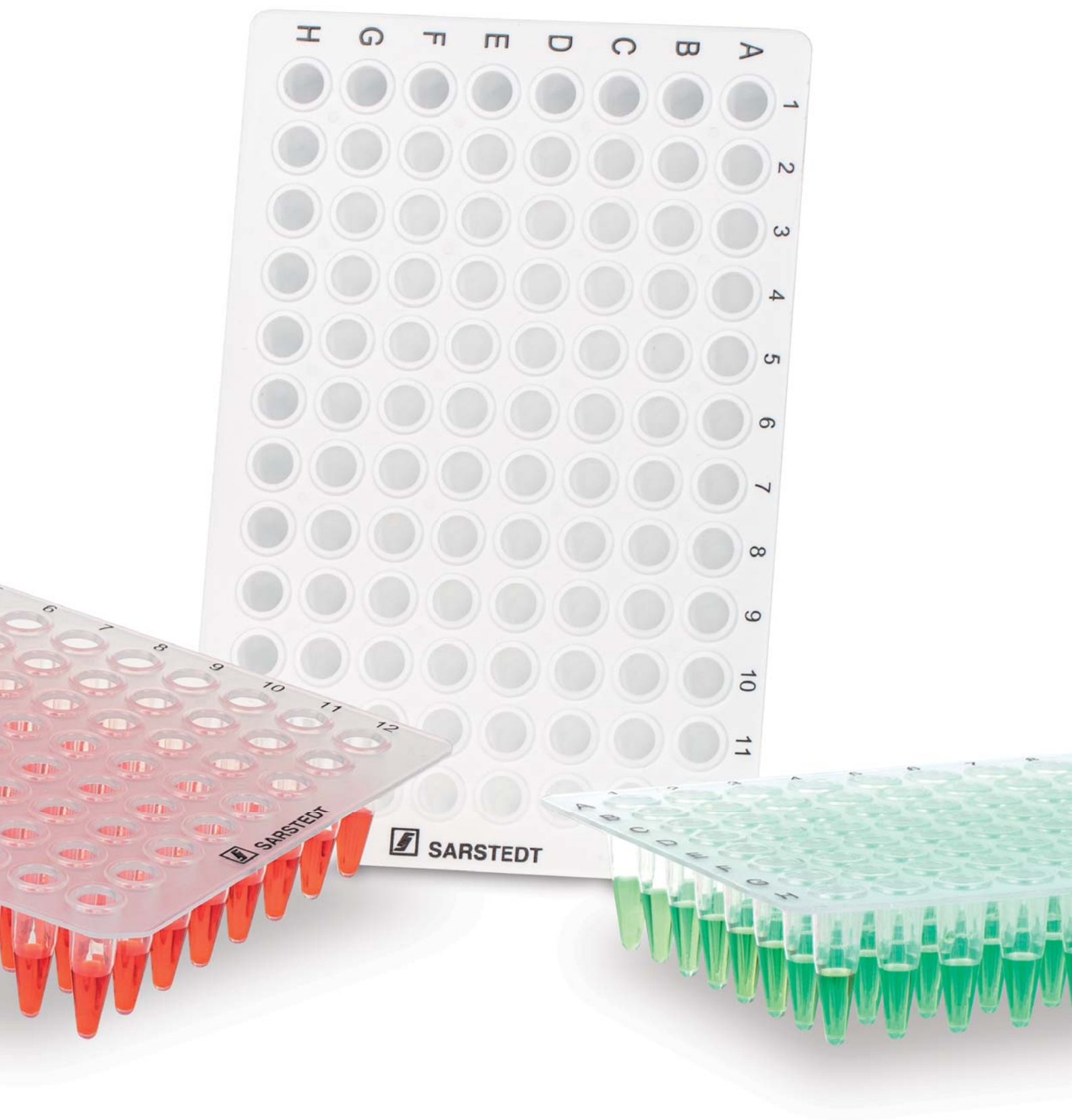
Profile: Low profile
 Maximum well volume: 0.1 ml
 Cutaway corner: A1

Features and benefits:

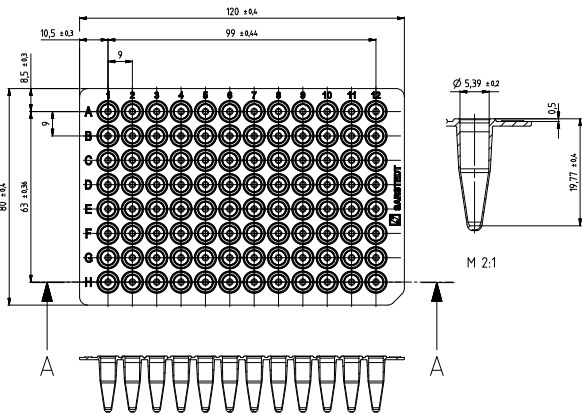
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- ANSI/SLAS-compliant dimensions enable use in automated systems.
- Raised well rims protect against cross contamination and facilitates secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested purity certification.
- Testing of each individual well for 100% leakproofness ensures maximum security for valuable samples.
- Plates can be stacked safely and securely, enabling efficient use of space if storage is limited.

| Description | Color | Purity | Packaging | Order no: |
|--|------------------------|--------|---------------------------------|-------------|
| 96-well PCR plate with half skirt | Transparent | | 10 plates/bag & 100 plates/case | 72.1981 |
| 96-well PCR plate with half skirt | White (qPCR-Optimized) | | 10 plates/bag & 100 plates/case | 72.1981.010 |
| Lightcycler 480 PCR plate with half skirt, 96-well | White (qPCR-Optimized) | | 25 plates/bag & 100 plates/case | 72.1982.202 |

Other colors and barcoded variants available on request.
 Suitable lid strips and sealing films and foils can be found on pages 24–27.



PCR plates without skirt – high profile



Product information:

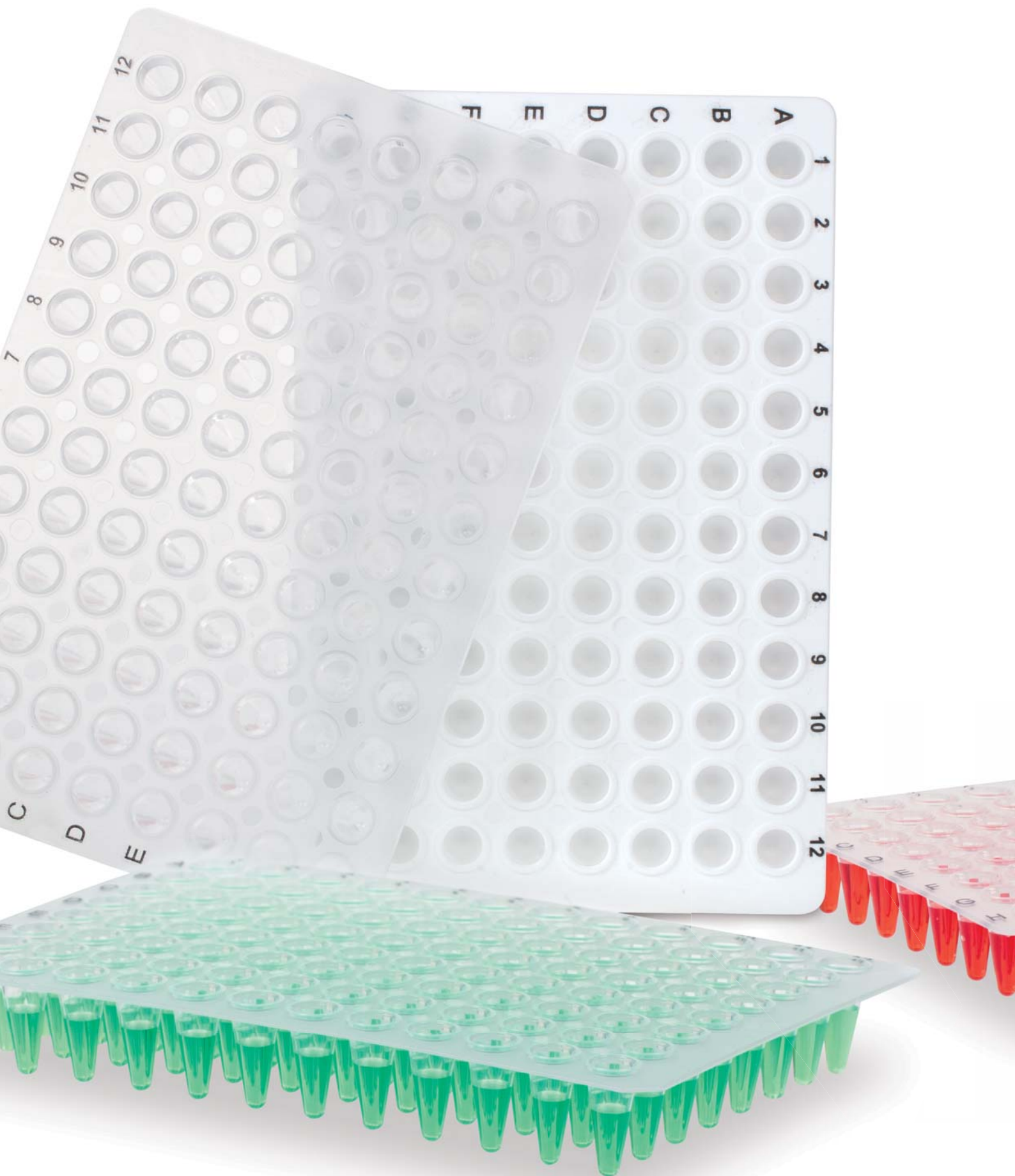
Profile:High profile
 Maximum well volume:0.2 ml
 Cutaway corner:H12

Features and benefits:

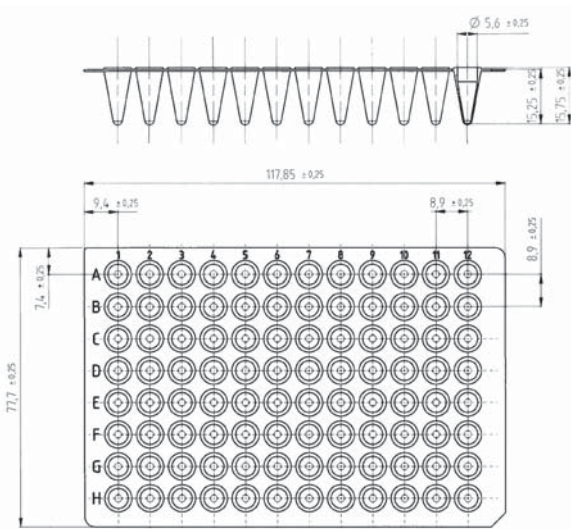
- Easy to cut if the sample volume is low or if 24- or 48-well formats are required.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- ANSI/SLAS-compliant dimensions enable use in automated systems.
- Raised well rims protect against cross contamination and facilitate secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested purity certification.
- Testing of each individual well for 100% leakproofness ensures maximum security for valuable samples.
- Plates can be stacked safely and securely, enabling efficient use of space if storage is limited.

| Description | Color | Purity | Packaging | Order no: |
|---------------------------------|------------------------|--------|---------------------------------|-------------|
| 96-well PCR plate without skirt | Transparent | | 10 plates/bag & 100 plates/case | 72.1978 |
| 96-well PCR plate without skirt | White (qPCR-Optimized) | | 10 plates/bag & 100 plates/case | 72.1978.010 |

Color variants available on request.
 Suitable lid strips and sealing films and foils can be found on pages 24–27.



PCR plates without skirt – low profile



Product information:

Profile: Low profile
 Maximum well volume: 0.1 ml
 Cutaway corner: H12

Features and benefits:

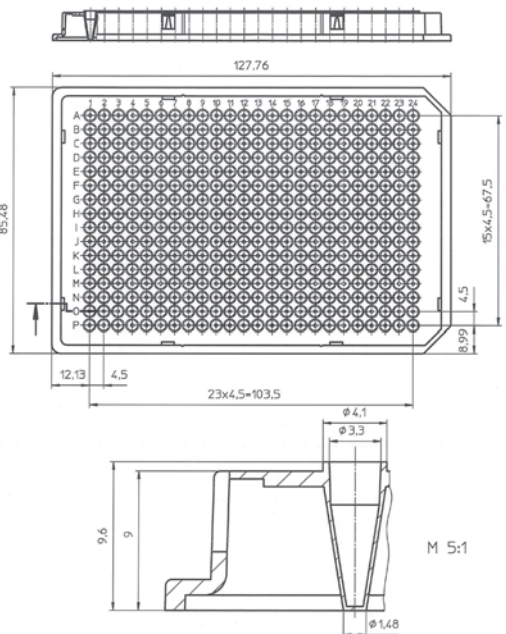
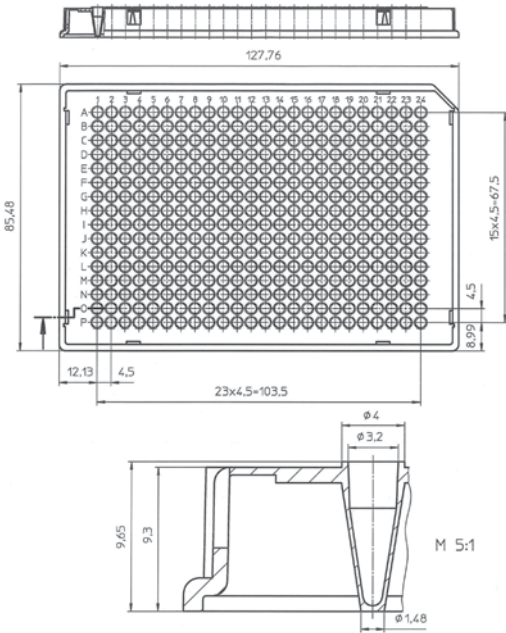
- Easy to cut if the sample volume is low or if 24- or 48-well formats are required.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- ANSI/SLAS-compliant dimensions enable use in automated systems.
- Raised well rims protect against cross contamination and facilitate secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested purity certification.
- Plates can be stacked safely and securely, enabling efficient use of space if storage is limited.



| Description | Color | Purity | Packaging | Order no: |
|---------------------------------|------------------------|--------|---------------------------------|-------------|
| 96-well PCR plate without skirt | Transparent | | 20 plates/bag & 100 plates/case | 72.1977.202 |
| 96-well PCR plate without skirt | White (qPCR-Optimized) | | 20 plates/bag & 100 plates/case | 72.1977.232 |



384-well PCR plates



Product information:

Profile: Low profile
 Maximum well volume: 40 µl
 Cutaway corner: A24 or A24 & P24

Features and benefits:

- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- ANSI/SLAS-compliant dimensions enable use in automated systems.
- Raised well rims protect against cross contamination and facilitate secure sealing with films and foils, thus preventing evaporation loss.
- Black alphanumeric labeling facilitates sample identification and traceability during manual filling.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested purity certification.

| Description | Color | Purity | Packaging | Order no: |
|-------------------------------|------------------------|--------|---------------------------------|-------------|
| 384-well PCR plate with skirt | Transparent | | 25 plates/bag & 50 plates/case | 72.1984.202 |
| 384-well PCR plate with skirt | White (qPCR-Optimized) | | 50 plates/bag & 100 plates/case | 72.1985.202 |

Multiply® PCR plates – compatibility table

| Number of wells | 96 | 96 | 96 | 96 | 96 | 384 |
|----------------------|---------|------------------------|---|---|------------------------|-------------|
| Half/full skirt | Without | Without | Half | Full | Half | Full |
| Profile | High | High | High | Low | Low | - |
| Order no. PCR plates | 72.985 | 72.1978 72.1978.010 | 72.1979 72.1979.010 72.1979.003 72.1979.201 72.1979.700 72.1979.102 72.1979.132 | 72.1980 72.1980.010 72.1980.201 72.1980.600 72.1980.700 | 72.1981 72.1981.010 | 72.1984.202 |

Amersham Biosciences®/GE Healthcare®

MegaBACE 500/1000 DNA Analysis System

MegaBACE 4000 DNA Analysis System

Analytik Jena®/Biometra®

FlexCycler² 96-well

qTOWER 2.0/2.2 SP

SpeedCycler² 96-well SP & SPR

TAdvanced

TOne

TOptical

TRobot 96-well

TRobot 384-well

TProfessional family 96-well (except TRIO)

TProfessional family 384-well (except TRIO)

Applied Biosystems®/Life Technologies®

GeneAmp® 2700/2720

GeneAmp® 7500/5700

GeneAmp® 9600

GeneAmp® 9700

GeneAmp® 9800 FAST Block

PE 2700

PE 9600

PE 9700

Prism® 2720

Prism® 7000/7700

Prism® 7300/7500

Prism® 7500 Fast

Prism® 7900HT

Prism® 7900 Fast

Prism® 7900HT Fast

QuantStudio™ (3, 5, 6, 7 & 12)

StepOne Plus™

Veriti® 96-well/384-well

Veriti® Fast 96-well

ViiA7™

310 Genetic Analyser

3100/3130 Genetic Analyser

3500/ 3500XL Genetic Analyser

3700/3730/3730XL Genetic Analyser

PeqLab®

peqSTAR 96

peqSTAR 384

Thermo Fisher Scientific®

MultiBlock System

PCR Sprint

Key:  = recommended  = not checked

* with a suitable ABI adapter

The compatibility table shows usage recommendations for the products listed. Please note that we do not routinely test the products for their compatibility with the listed devices. Product characteristics therefore cannot be guaranteed.

| Number of wells | 96 pre-inserted | 96 | 96 | 96 | 96 | 384 | 96 | 384 |
|----------------------|-----------------|------------------------|---|---|------------------------|-------------|---------------|---------------|
| Half/full skirt | Without | Without | Half | Full | Half | Full | Half | Full |
| Profile | High | High | High | Low | Low | - | 'Lightcycler' | 'Lightcycler' |
| Order no. PCR plates | 72.985 | 72.1978 72.1978.010 | 72.1979 72.1979.010 72.1979.003 72.1979.201 72.1979.700 72.1979.102 72.1979.132 | 72.1980 72.1980.010 72.1980.201 72.1980.600 72.1980.700 | 72.1981 72.1981.010 | 72.1984.202 | 72.1982.202 | 72.1985.202 |

BioRad®/MJ Research®

| | | | | | | | | |
|-----------------------------|---|---|---|---|---|---|--|--|
| CFX96 Touch™ Real-Time PCR | | | | ● | | | | |
| CFX384 Touch™ Real-Time PCR | | | | | | ● | | |
| CFX Automation System II | | | | | | | | |
| T100™ Thermal Cycler | ● | ● | | ● | ● | | | |
| S1000™ Thermal Cycler | | ● | ● | ● | | ● | | |
| C1000Touch™ Thermal Cycler | | ● | ● | ● | ● | ● | | |
| iCycler iQ™ Thermal Cycler | ● | ● | ● | | | | | |
| iQ4™ Thermal Cycler | ● | ● | ● | | | | | |
| iQ5™ Thermal Cycler | ● | ● | ● | | | | | |
| MyCycler™ Thermal Cycler | ● | ● | ● | | | | | |
| Chromo4™ | | ● | | ● | | | | |
| Opticon™, Opticon2™ | | | | ● | | | | |
| BaseStation™ | | | | ● | | | | |

Corbett Research®/Qiagen®

| | | | | | | | | |
|----------------------|--|---|--|---|--|--|--|--|
| Palm Cycler 96-well | | ● | | | | | | |
| Palm Cycler 384-well | | | | ● | | | | |

Eppendorf®

| | | | | | | | | |
|---------------------------|---|---|---|---|--|---|--|--|
| Mastercycler® nexus | ● | ● | | | | | | |
| Mastercycler® ep realplex | | ● | ● | | | ● | | |
| Mastercycler® gradient | ● | ● | | ● | | | | |
| Mastercycler® ep gradient | ● | ● | ● | ● | | | | |
| Mastercycler® pro | ● | ● | | ● | | | | |

Ericom®

| | | | | | | | | |
|-------------|--|--|---|---|--|--|--|--|
| Deltacycler | | | ● | ● | | | | |
| SingleBlock | | | ● | ● | | | | |
| TwinBlock | | | ● | ● | | | | |

MWG®

| | | | | | | | | |
|------------------|--|---|---|---|--|---|--|--|
| Primus 96-well | | ● | | ● | | | | |
| Primus 384-well | | | | | | ● | | |
| The Q-Lifecycler | | ● | ● | ● | | | | |

Roche®

| | | | | | | | | |
|-------------------------|--|--|--|--|--|--|---|---|
| Lightcycler® 96 System | | | | | | | ● | |
| Lightcycler® 480 System | | | | | | | ● | ● |

Stratagene®/Agilent®

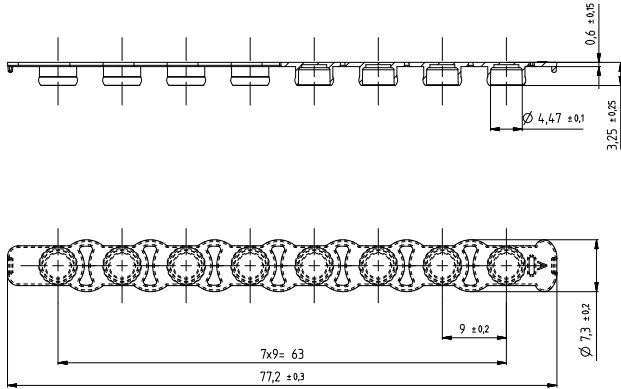
| | | | | | | | | |
|-----------------------------|---|---|---|---|---|---|--|--|
| AriaMx Real-Time PCR System | | | | ● | ● | | | |
| Mx3000P™ | ● | ● | | | | | | |
| Mx3005P™ | ● | ● | ● | ● | | | | |
| Mx4000™ | ● | ● | ● | | | | | |
| Gradient Cycler | | ● | | ● | | | | |
| Robocycler 384-well | | | | | | ● | | |

Techné®

| | | | | | | | | |
|------------------------------|---|---|---|---|---|---|--|--|
| Cyclogene | | ● | | ● | | | | |
| Flexigene | | ● | ● | ● | | | | |
| Genius/Genius Quad | | ● | ● | ● | | | | |
| OMN-E | | ● | ● | ● | | | | |
| PCR Express | ● | ● | ● | | | ● | | |
| Primus 96 | | ● | | | | | | |
| Px2/PxE | | ● | ● | | | ● | | |
| Quantica | | | ● | ● | | | | |
| TC412/TC512 | | ● | | ● | | ● | | |
| Touchgene/Touchgene Gradient | | ● | ● | ● | ● | | | |






PCR lid strips



Features and benefits:

- Suitable for sealing SARSTEDT PCR plates and strips.
- High-transparent lid strips optimized for real-time PCR and other fluorescence-based applications.
- Direction indicator on ends of lid strips makes orientation easy.
- Universal compatibility of lid strips with both SARSTEDT PCR strips and PCR plates.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.

Tip:
To achieve easy opening and re-sealing,
we recommend using lid strips to seal
samples stored in PCR plates.

| Description | Color | Purity | Suitable for | Packaging | Order no: |
|----------------|------------------|---|--|-----------------------------------|-------------|
| PCR lid strips | High-transparent |  | 72.1978 72.1978.010 72.1979 72.1979.010 72.1979.003 72.1979.201 72.1979.700 72.1980 72.1980.010 72.1980.201 72.1980.600 72.1980.700 72.1981 72.1981.010 72.985.002 72.985.092 72.985.992 | 12 strips/bag & 240 strips/case | 65.989 |
| PCR lid strips | High-transparent |  | 72.1979.102 72.1979.132 72.1982.202 | 120 strips/bag & 480 strips/case | 65.989.002 |
| PCR lid strips | Transparent |  | 72.1979.102 72.1979.132 72.1982.202 | 12 strips/bag & 1,200 strips/case | 65.1998.400 |

Adhesive sealing films

Polypropylene, polystyrene and polycarbonate micro test plates must be sealed tightly with made-to-measure film material to prevent evaporation and to protect specimens during application, storage and transport.

There are various SARSTEDT sealing films available that have been developed especially to meet the high demands in PCR, storage of active agents and high-throughput screening. All films are produced under cleanroom conditions to prevent contamination with DNases/RNases and nucleic acids.



Highly transparent adhesive film for quantitative real-time PCR (qPCR) • REF 95.1999

The 50 µm thin film is coated with a non-streak, transparent adhesive that adheres only slightly at room temperature. This makes handling easier. Stronger adhesion is achieved only after pressing on the film and leads to the lowest evaporation loss.

- Highly transparent made-to-measure film for real-time PCR (qPCR) and other fluorescence-based applications.
- Secure seal with innovative adhesive.
- Film does not adhere to gloves when being applied.
- Optimal specimen protection due to encapsulated adhesive



Transparent adhesive film for quantitative real-time PCR (qPCR) • REF 95.1993

The film consists of a 50 µm thin, especially clear polyester film coated with a thin layer of adhesive.

- High transparency
- High evaporation protection



Transparent adhesive film for PCR • REF 95.1994

Optically clear film for PCR

- Ideal for storing sample material at up to -70 °C.
- Extremely robust and resilient



Strong, transparent adhesive film for specimen storage • REF 95.1992



- Ideal for storing specimens at up to -80 °C.
- Removable film
- Highly resistant to solvents such as DMSO

Adhesive aluminium film for PCR and specimen storage • REF 95.1995



The heat-resistant, robust and pierceable 38 µm thin aluminium film features high evaporation protection and high resistance to solvents. Perforated application strips at the sides can be easily detached after application.

- The aluminium film can be easily pierced by pipette tips.
- Ideal for storing sample material/active agents at up to -70 °C.

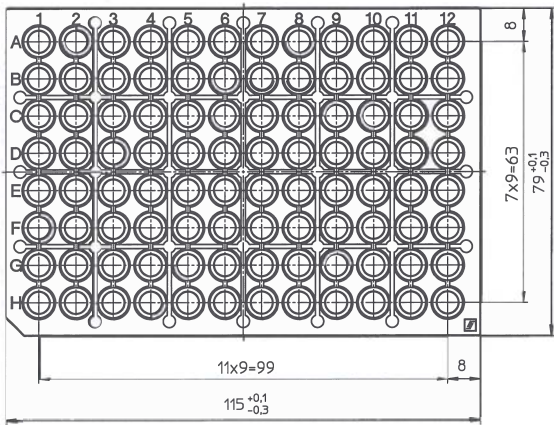
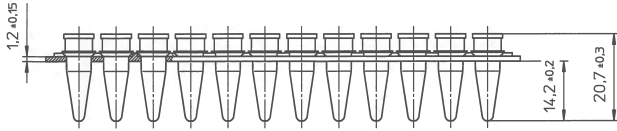
| Product description | Application | Special properties | Optical | Pierceable | Functional temperature range | Packaging | Order no |
|--|-----------------------------|---|---------|------------|------------------------------|-----------------------|----------|
| Adhesive, optically highly transparent qPCR film | qPCR, fluorescence analyses | Highly transparent, heat-sensitive adhesive, lowest evaporation rates | + | no | -80 °C to 100 °C | 100 films / inner box | 95.1999 |
| Transparent PCR film | PCR, qPCR | Thin material, high optical clarity | + | no | -40 °C to 120 °C | 100 films / inner box | 95.1993 |
| Transparent PCR film | PCR, specimen storage | High adhesive strength, highly resistant to chemicals | + | no | -70 °C to 105 °C | 100 films / inner box | 95.1994 |
| Adhesive aluminium film | Specimen storage, PCR | Pierceable, light protection for specimens, highly resistant to chemicals | - | yes | -70 °C to 105 °C | 100 films / inner box | 95.1995 |
| Transparent sealing film | Specimen storage, PCR | Extremely robust, lowest evaporation rates | + | no | -80 °C to 120 °C | 100 films / inner box | 95.1992 |

Which is the right film for my application?

| Application | Application specification | Perfect product | Pierceable | Removable |
|---|--|-----------------|------------|-----------|
| PCR & real-time PCR (qPCR) | Highest transparency & specimen safety (encapsulated adhesive) | 95.1999 | no | yes |
| | Excellent transparency & standard adhesive | 95.1993 | no | yes |
| | Standard transparency & specimen safety | 95.1994 | no | yes |
| Fluorescence- & luminescence-based assays | Highest transparency & specimen safety (encapsulated adhesive) | 95.1999 | no | yes |
| | Excellent transparency & standard adhesive | 95.1993 | no | yes |
| Specimen storage | Storage of light-sensitive specimens | 95.1995 | yes | medium |
| | Standard specimen storage at -80 °C | 95.1992 | no | yes |
| Evaporation protection (PCR) | Standard transparency & specimen safety | 95.1992 | no | yes |



Pre-loaded trays – the alternative to two-component PCR plates with polycarbonate frame



Product information:

Profile: High profile
 Maximum well volume: 0.2 ml

Twelve pre-loaded PCR 8-strips in PCR work tray with maximum purity certification

Features and benefits:

- Biosphere® plus purity, individually sterile wrapped
- Sealable with highly transparent lid strip
REF 65.989
- Rigid polycarbonate tray
- Can be used in rack system (see page 37)



| Description | Color | Purity | Packaging | Order no: |
|---------------------------------|------------------|--------|--|-----------|
| 96-well PCR strips in work tray | Transparent | | Individually wrapped in a bag, with 20 loaded trays/case | 72.985 |
| PCR lid strip, Biosphere® plus | High-transparent | | 12 strips/bag & 240 strips/case | 65.989 |



PCR strips with separate lid strip







Product information:

Profile: High profile
 Maximum well volume: 0.2 ml

Features and benefits:

- Compatible lid strips and PCR strips optimized to ensure a tight seal.
- No warping, bending or breaking – strengthened connectors prevent PCR strips from sagging.
- Direction indicator on ends of lid strips makes orientation easy (one-sided protrusion).
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- Universal compatibility of lid strips with both PCR strips and some SARSTEDT plates.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.

| Description | Color | Purity | Packaging | Order no: |
|---------------------------------------|---|---|---|------------|
| 8-well PCR strip without attached lid | Transparent |  | 120 strips/bag & 480 strips/case | 72.985.002 |
| 8-well PCR strip without attached lid | White (qPCR-Optimized) |  | 120 strips/bag & 480 strips/case | 72.985.092 |
| 8-well PCR strip without attached lid | Mixed colors (red, green, blue, purple) |  | 120 strips of one color/bag & 480 strips/case | 72.985.992 |
| High-transparent lid strips | Transparent |  | 120 strips/bag & 480 strips/case | 65.989.002 |

Additional colors on request.

PCR strips with separate lid strip

Product information:

Profile: Low profile
 Maximum well volume: 0.1 ml



Features and benefits:

- Compatible lid strips and PCR strips optimized to ensure a tight seal.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested purity certification.
- Combi-pack including lid strip.



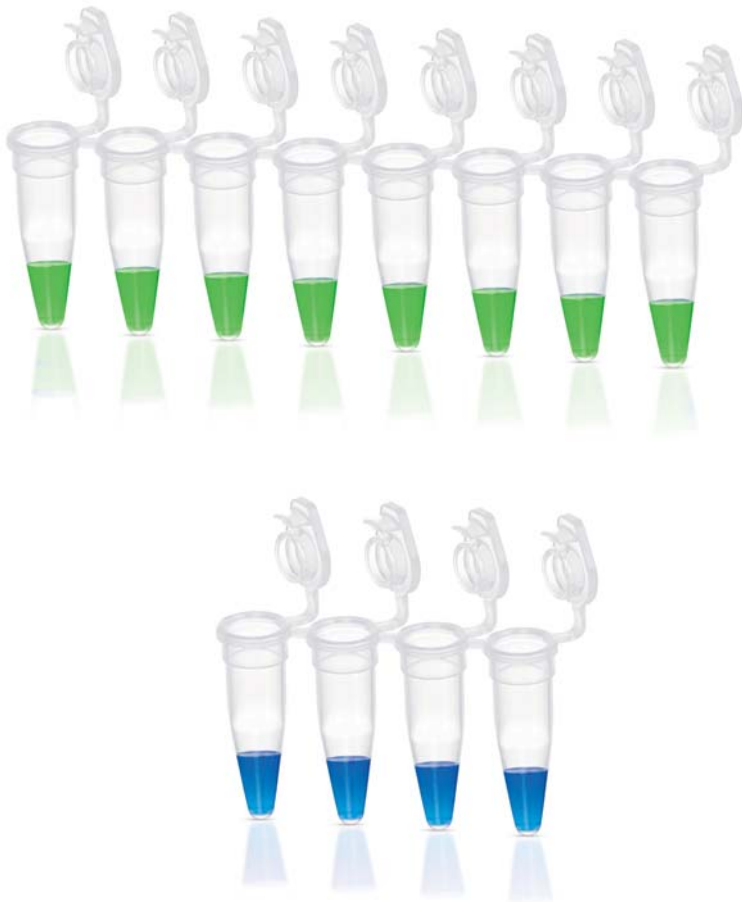
| Description | Color | Purity | Packaging | Order no: |
|---|------------------------|--------|--|------------|
| 8-well PCR strip, low profile, without attached lid strip | Transparent | | 125 strips/bag & 1250 tube and lid strips/case | 72.982.002 |
| 8-well PCR strip, low profile, without attached lid strip | White (qPCR-Optimized) | | 125 strips/bag & 1250 tube and lid strips/case | 72.982.092 |

PCR strips with individually attached lid



Product information:

Profile: High profile
Maximum well volume: 0.2 ml



Features and benefits:

- Increased security with no handling interference – integrated anti-contamination shield prevents accidental contact with the inner surface of the lid.
- Strengthened connectors prevent strip warping, bending, breaking, and sagging.
- Flat lid with large writing surface.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.

| Description | Color | Purity | Packaging | Order no: |
|-------------------------------------|---|--------|---|------------|
| 8-well PCR strip with attached lids | Transparent | | 120 strips/bag & 480 strips/case | 72.991.002 |
| 8-well PCR strip with attached lids | Mixed colors (red, green, blue, purple) | | 120 strips of one color/bag & 480 strips/case | 72.991.992 |
| 4-well PCR strip with attached lids | Transparent | | 120 strips/bag & 480 strips/case | 72.990.002 |
| 4-well PCR strip with attached lids | Transparent | | 50 strips/bag & 400 strips/case | 72.990 |
| 4-well PCR strip with attached lids | Mixed colors (red, green, blue, purple) | | 120 strips of one color/bag & 480 strips/case | 72.990.992 |

Low-profile PCR strips (0.1 ml) with individually attached lids

| Description | Color | Purity | Packaging | Order no: |
|-------------------------------------|-------------|--------|-----------------------------------|------------|
| 8-well PCR strip with attached lids | Transparent | | 12 strips/bag & 1,200 strips/case | 72.991.103 |



PCR single tubes with attached lid



Product information:

Profile: High profile
 Maximum well volume: 0.2 ml & 0.5 ml



Features and benefits:

- Increased security with no handling interference – integrated anti-contamination shield prevents accidental contact with the inner surface of the lid.
- 0.5 ml tubes suitable for use with the Qubit™ fluorometer
- Flat lid with large writing surface.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and reproducible results.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.

Tip:
 In principle, you should always fill up the block of your cycler symmetrically, to ensure uniform distribution of pressure on the PCR tubes by the cycler lid and an even distribution of heat.

| Description | Color | Purity | Packaging | Order no: |
|--|---|--------|--|------------|
| 0.2 ml PCR single tube with attached lid | Transparent | | 500 tubes/bag & 2,000 tubes/case | 72.737.002 |
| 0.2 ml PCR single tube with attached lid | Transparent | | 250 tubes/bag & 2,000 tubes/case | 72.737 |
| 0.2 ml PCR single tube with attached lid | Mixed colors (red, orange, green, blue, purple, yellow) | | 500 tubes of one color/bag & 3000 tubes/case | 72.737.992 |
| 0.5 ml PCR single tube with attached lid | Transparent | | 500 tubes/bag & 2,000 tubes/case | 72.735.002 |
| 0.5 ml PCR single tube with attached lid | Transparent | | 100 tubes/bag & 1,000 tubes/case | 72.735.100 |
| 0.5 ml PCR single tube with attached lid | Mixed colors (red, orange, green, blue, purple, yellow) | | 500 tubes of one color/bag & 3000 tubes/case | 72.735.992 |

Intelligent rack and pipetting system

Reliable refrigeration of your valuable samples – the IsoFreeze® PCR rack

Sample preparation often requires consistent and reliable refrigeration of samples. SARSTEDT offers a pipetting and storage station with reliable temperature control for temperature-sensitive applications, in the form of the IsoFreeze® PCR rack.

Features and benefits:

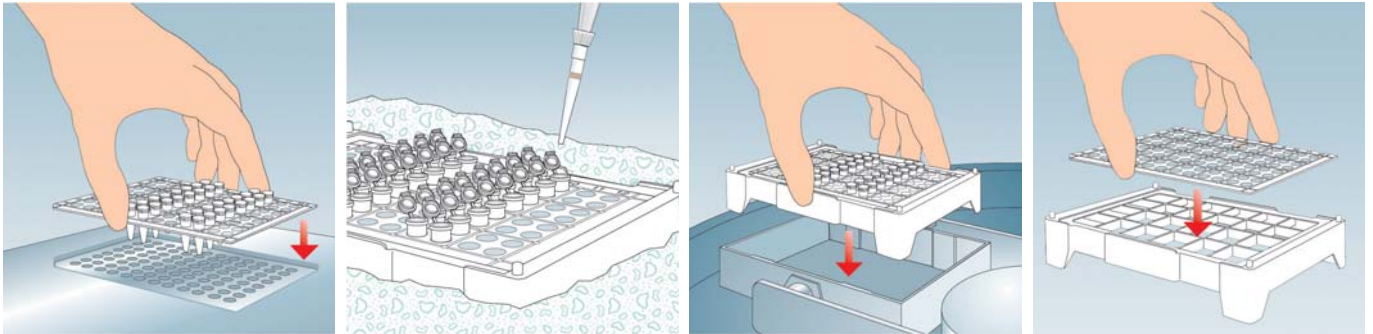
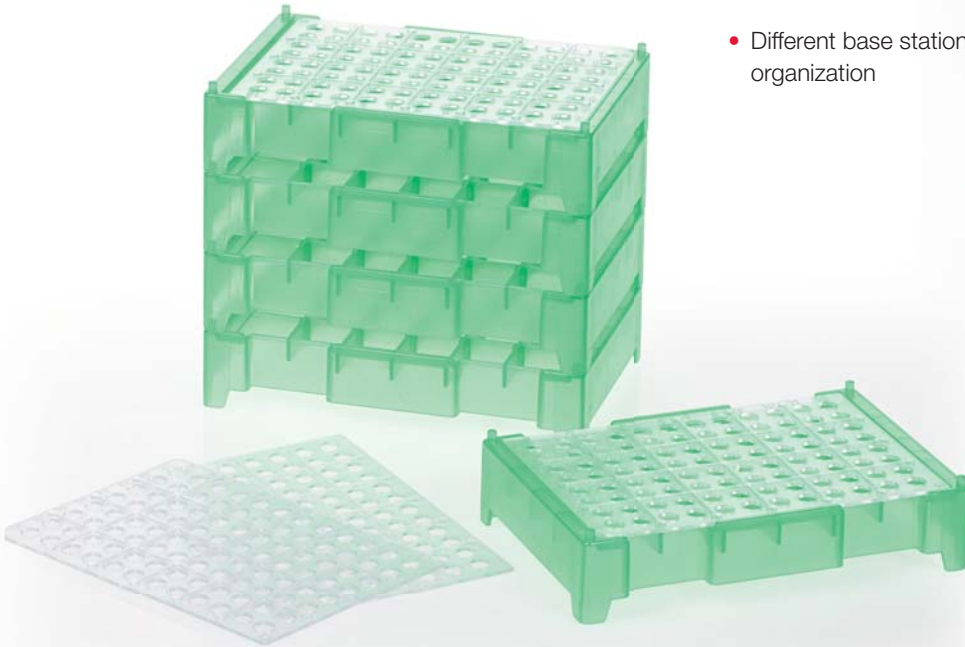
- Noticeable color change from purple to pink when temperature moves outside the optimum range (above 7°C).
- Minimizes the risk of contamination, as there is no need to store samples on ice.
- At normal ambient temperature, the temperature of samples is held in the optimum range for up to three hours (with lid on)
- 8 x 12 format for 0.1 ml and 0.2 ml PCR plates, strips and tubes, or 6 x 4 format, suitable for 1.5 ml & 2 ml micro tubes

| Description | Format | Packaging | Order no: |
|---------------------|----------------|-------------|-----------|
| IsoFreeze® PCR rack | 96-well format | 2 racks/box | 95.984 |
| IsoFreeze® MCT rack | 24-well format | 1 racks/box | 95.983 |



The SARSTEDT rack system – the flexible storage and pipetting station

- Flexible two-component system comprising work tray and base station
- Efficient handling of PCR strips and tubes, as they can be transferred to the thermocycler in the work tray
- Different base station color options for easy laboratory organization



| Description | Color | Order no: |
|--------------------------|---------------|------------|
| 96-well work tray | 5 trays/bag | 95.987.002 |
| Transparent base station | 5 pieces/bag | 95.988 |
| Red base station | 5 pieces/bag | 95.988.001 |
| Blue base station | 5 pieces/bag | 95.988.002 |
| Green base station | 5 pieces/bag | 95.988.003 |
| Yellow base station | 5 pieces/case | 95.988.004 |

Tips/guidelines for successful PCR reactions

General recommendations

- To prevent degradation, always store DNA in Tris-EDTA buffer (pH 8) and not in water.
- Use filtered pipette tips and wear gloves to prevent (cross)contamination.
- Avoid pipetting reaction mixtures in ventilated clean benches, as this increases the risk of cross contamination.
- Pipette reaction mixtures in a clean area that is used for the lowest number of other molecular biology applications possible.
- When pipetting the reaction mixture, DNA polymerases should be the last component added.
- Avoid repeatedly thawing and refreezing nucleotides (dNTPs), because this can destroy them. It is advisable to aliquot nucleotides (and primers) and to store the aliquots at -70°C .
- For amplification, calculate one minute extension time per 1 kb DNA template.
- Use consumables that have been certified as free from DNA, DNases, RNases, and PCR inhibitors. Avoid autoclaving consumables before use, because this introduces the risk of contaminating products with unwanted biomolecules.
- When cutting PCR products out of gel, ensure they are exposed to UV light for the shortest time possible, to avoid DNA sequencing errors.

Guidelines for using the DNA template

- To detect the PCR product in 25–30 cycles, approximately 100 template copies are required. Use at least 40 cycles if it is likely that there are fewer than ten copies of the template DNA.
- Rule of thumb: When using plasmid DNA, use template concentrations of 1 pg – 1 ng. When using genomic DNA, use template concentrations of 1 ng – 1 μg . Higher template concentrations reduce the specificity of the reaction and thus increase the occurrence of non-specific PCR products.
- Check the purity of the DNA template photometrically (the 260/280 nm ratio should be larger than or the same as 1.8) to ensure that the template is not contaminated with PCR inhibitors, and use a DNA isolation kit or perform ethanol precipitation if contamination is detected.
- If necessary, use gel electrophoresis to check whether the DNA template is degraded.

Guidelines for using the primer

- Rule of thumb: Use a final primer concentration of 0.05–1 μM per primer. Higher primer concentrations increase the occurrence of non-specific PCR products, as a result of non-specific binding of the primer. A concentration of 0.2 μM per primer is often best in the final reaction.
- Ideally, primers should be between 20 and 30 nucleotides in length.
- The GC content of the primer should ideally be between 40% and 60%, and the GC molecules should be evenly distributed along the length of the primer. To optimize the amplification of PCR products with a high GC content, you can add the reaction mixture DMSO. When using additives such as DMSO, the annealing temperatures may need to be adapted, because high concentrations can weaken the primer bond. In this case, use the lowest possible concentration and do not exceed 10% in experiments.
- The annealing temperatures (T_m) of the applied primer pair should not differ by more than 5°C , and should be in a temperature range of between 50°C and 72°C .
- Use an annealing temperature that is $0\text{--}5^{\circ}\text{C}$ below the calculated T_m of the primer with the lower T_m .

PCR troubleshooting checklist

| Problem | Potential cause | Solution |
|--|---|---|
| No amplification product | PCR inhibitors in reaction mix | Use consumables that have been certified as free from DNA, DNases, RNases and PCR inhibitors. Check the purity of the DNA templates photometrically to determine whether the template is contaminated with PCR inhibitors (phenol, proteinase K, K ⁺ , Na ⁺ , etc.). If the 260/280 nm ratio is below 1.8, use a DNA purification kit or perform ethanol precipitation to eliminate any PCR inhibitors. Dilute the template (and thus the PCR inhibitors) and increase the DNA polymerase concentration alternately. |
| | PCR template is degraded | Use gel electrophoresis to check whether the PCR template is degraded. If there are signs that the initial DNA is degraded (DNA smearing, bands are too small, etc.), repeat template isolation. Minimize DNA shearing during isolation. To prevent the template DNA from degrading, store it in Tris-EDTA buffer (pH 8). |
| | Suboptimum reaction conditions | The annealing temperature may have been too high, the denaturation time may have been too long, or the number of cycles may have been too low. Optimize the annealing temperature by incrementally reducing it in steps of 1–2°C; denature the DNA for 3 minutes initially (denaturation times that are too long can degrade the DNA) and for 30 seconds during the reaction cycles; and/or increase the number of cycles by 5 cycles. |
| | Forgotten elements in reaction mixture | Repeat the PCR. |
| Non-specific amplification products | Contaminated reagents (e.g. water) | PCR reagents (often the water used) can accidentally become contaminated during previous pipetting processes. Use fresh PCR reagents. |
| | Suboptimum reaction conditions | The annealing temperature may have been too low, the number of cycles may have been too high, or the extension time may have been too long. Annealing temperatures that are too low promote non-specific primer binding. Use a temperature gradient to try to determine the optimum annealing temperature that produces the cleanest PCR product. If cycle numbers are too high, this can also sometimes cause the amplification of non-specific PCR products. If non-specific PCR products occur, try reducing the number of cycles by 5. Long extension times also promote non-specific amplification. Based on the size of the PCR product, use the most precise extension time possible (for amplification per 1 kb DNA template, taq polymerases require an extension time of approximately one minute). |
| | Too much Mg ²⁺ in reaction mixture | If Mg ²⁺ concentrations are too high, this increases the likelihood that non-specific binding of the primer will occur and thus that unwanted PCR products will be formed. In this situation, reduce the amount of Mg ²⁺ used. |
| | PCR template is degraded | Use gel electrophoresis to check whether the PCR template is degraded. If there are signs that the initial DNA is degraded (DNA smearing, bands are too small, etc.), repeat template isolation. Minimize DNA shearing during isolation. To prevent the template DNA from degrading, store it in Tris-EDTA buffer (pH 8). |

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