

PCR and Molecular Biology

Certified quality products for (q)PCR



**Molecular
Diagnostic
Workflow**





Sarstedt has been developing and manufacturing high-quality products for medical and scientific applications since 1961.

On the following pages you will discover our extensive range of products and find additional useful tips to help you further optimise 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 “Made in Germany” product quality.

In addition to our standard product range, we offer high-performance products that have been 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 in some places. Many people confuse sterile products with DNA-free ones. However, sterilisation does not remove unwanted biomolecules such as DNA, RNases or pyrogens. An even more serious problem, however, is that fact that products can become contaminated through autoclaving.

Consistent separation of clean consumables from autoclaves for sterilising 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 our 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-focussed 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 minimise 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 our 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, round off 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



Our 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.

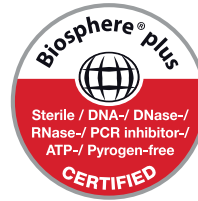
In addition, many substances that can easily be introduced into your precious samples have a strong inhibitory effect on the PCR reaction. Well-known examples are haemoglobin and ethanol, which is often used to isolate nucleic acids, for example. However, many PCR inhibitors are largely unknown. For 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 analysed in parallel). That is why 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 they have been heated.

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

Human DNA	<0.5 pg/μl
Bacterial DNA	<0.02 pg/μl
DNase	<1 x 10 ⁻⁵ U/μl
RNase	<1 x 10 ⁻⁹ Kunitz units/μl
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. That is why 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, as well as sterilising 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/μl
Bacterial DNA	< 0.2 fg/μl
Sterility validated according to	ISO 11135
ATP	< 1 x 10 ⁻¹² mmol/μl
Pyrogens/endotoxins	<0.002 EU/ml
DNase	<5 x 10 ⁻⁷ U/μl
RNase	<5 x 10 ⁻¹¹ Kunitz units/μl
PCR inhibitors	<0.5 cycles
	C _t value shift

Optimised 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. In addition, the opaque colouring means fluorescent light is no longer lost through the walls, and the reflection of the optimised white dye means that the quantity of fluorescent light reaching the detector remains more constant than when transparent products are used. Accordingly, this means substantially less variation can be obtained when performing repeated experiments or applying duplicates and triplicates.

In addition, the higher fluorescence level of white PCR consumables and consistent background effects of the fluorophore used mean that a superior signal-to-background ratio is achieved. The opaque white colouring also prevents the detection of scattered fluorescent light from neighbouring 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 substantially 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, which means reagent costs can be brought down.

Using white PCR consumables brings considerable advantages. So, don't compromise your results just for the sake of being able to visually inspect wells from the side or below.

Comparison of fluorescence level of white and transparent wells

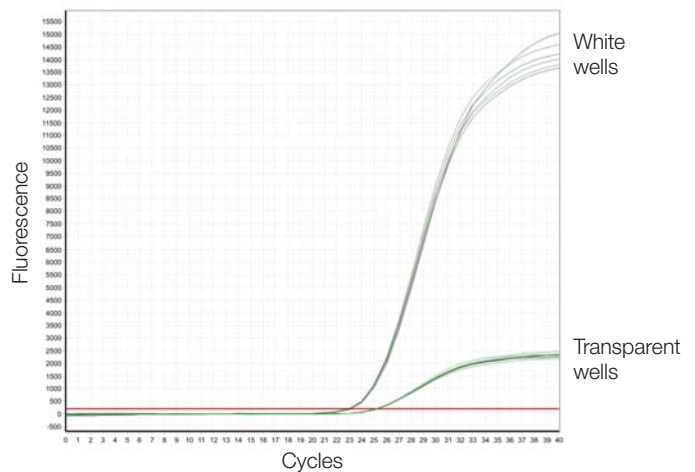


Fig. 1: Comparison of fluorescence value of product 72.985.002 (transparent) and 72.985.092 (white), both sealed with high-transparent lid strip 65.989.002. A 100 bp fragment of EmGFP plasmid (template quantity 1000 molecules) was amplified in a volume of 20 μ l using the Eppendorf realplex 4S Thermocycler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

DNA & protein low binding – for maximum sample recovery

The trend towards ever smaller sample volumes is making it more important to minimise 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 from the cavities.

In mass spectrometry analysis of proteins and peptides, in which glass vials and standard PP vessels are usually used, 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 special physical treatment. And of course, these special properties are not achieved by using layers of silicon or similar materials.

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

Protein low binding – comparison of protein losses:

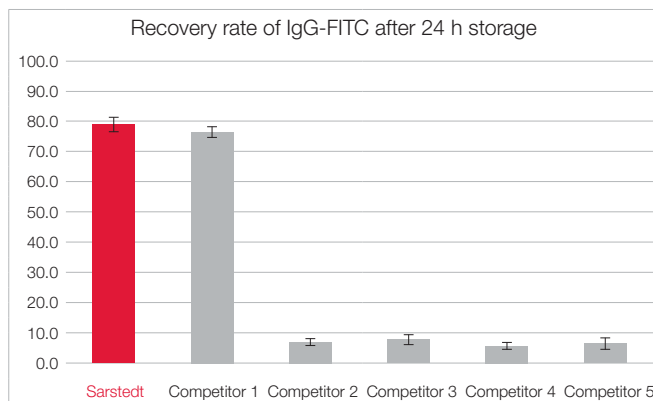


Fig. 2: 8 x 125 µl of an IgG-FITC conjugate solution (1.0 µg/ml in PBS; Sigma Aldrich, item no F9636) were stored for 24 hours in low protein binding products by SARSTEDT and five competitors. After incubation, 100 µl from each vessel was transferred to black ELISA plates (SARSTEDT, item no 82.1581.220), 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.

DNA low binding – comparison of DNA losses:

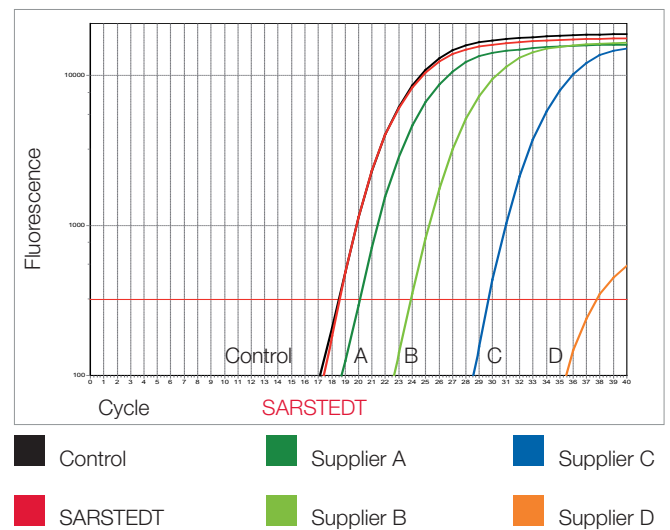


Fig. 3: Ten test tubes from each of a range of suppliers were filled with 100 µl of a plasmid DNA solution (concentration: 10⁴ copies/µl) and shaken at 37°C.

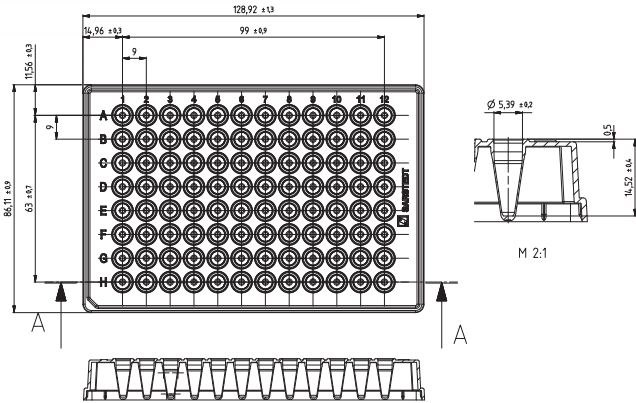
After an incubation period of 3 hours, the DNA content was determined using real time PCR.

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

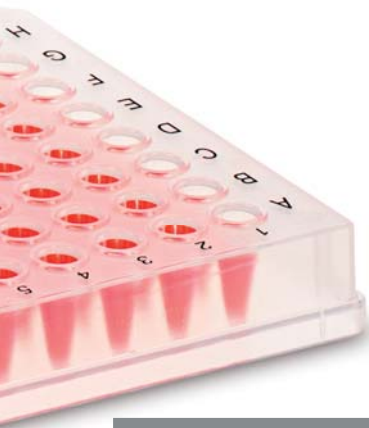


Product information:

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 highly reproducible results.
- ANSI-compliant dimensions enable use in automated systems.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
96-well PCR plate with skirt	Transparent		10 units/bag & 100 units/box	72.1980
96-well PCR plate with skirt	Transparent		1 unit/blister pack & 20 units/box	72.1980.201
96-well PCR plate with skirt	White (qPCR-optimised)		10 units/bag & 100 units/box	72.1980.010
96-well PCR plate with skirt, DNA low binding	Transparent		10 units/bag & 100 units/box	72.1980.700

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

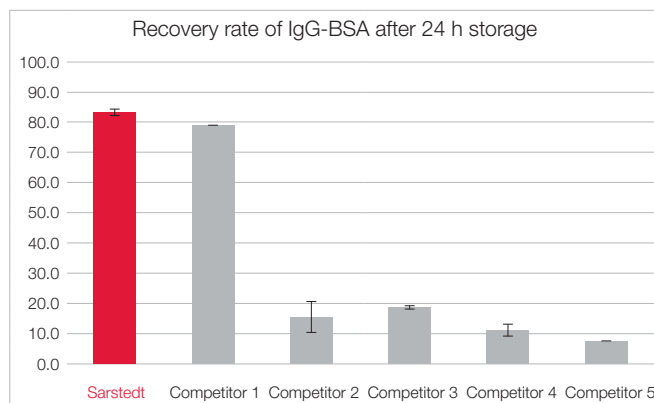




Protein low binding PCR plate with skirt

In mass spectrometry analysis of proteins and peptides, in which glass vials and standard PP vessels are usually used, 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. That is why we offer 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 using in the 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 by 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.

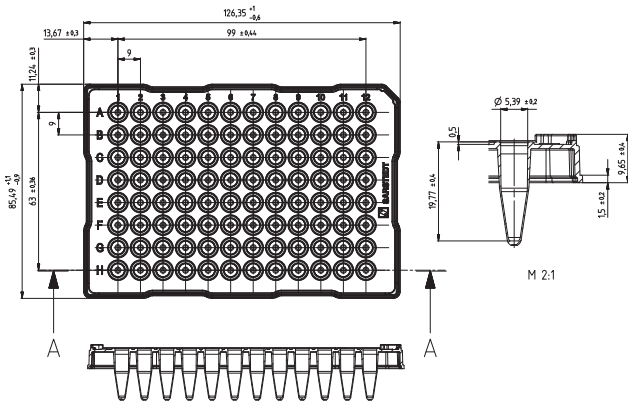


Tip:
We recommend using the compatible lid strips 65.989.002 to seal stored samples.

Description	Colour	Purity	Packaging	Order no:
96-well PCR plate with skirt, Protein low binding	Transparent		10 units/bag & 100 units/box	72.1980.600
PCR lid strips	High-transparent		120 units/bag & 480 units/box	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:

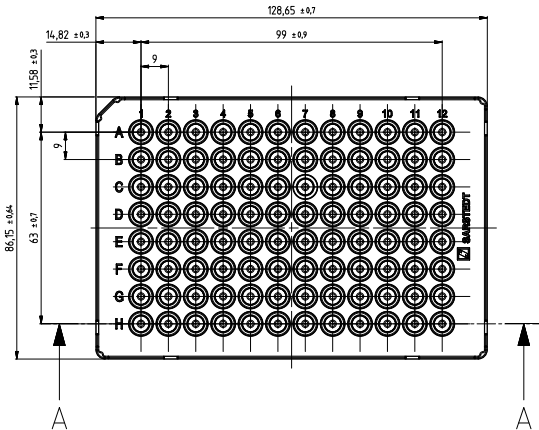
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and highly reproducible results.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
96-well PCR plate with half skirt	Transparent		10 units/bag & 100 units/box	72.1979
96-well PCR plate with half skirt	Transparent		1 unit/blister pack & 20 units/box	72.1979.201
96-well PCR plate with half skirt	White (qPCR-optimised)		10 units/bag & 100 units/box	72.1979.010
96-well PCR plate with half skirt & barcode	Transparent		10 units/bag & 100 units/box	72.1979.003
96-well PCR plate with half skirt, DNA low binding	Transparent		10 units/bag & 100 units/box	72.1979.700
96-well PCR plate with half skirt and flat deck	Transparent		5 units/bag & 100 units/box	72.1979.102
96-well PCR plate with half skirt and flat deck	White (qPCR-optimised)		5 units/bag & 100 units/box	72.1979.132

Other colours 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:

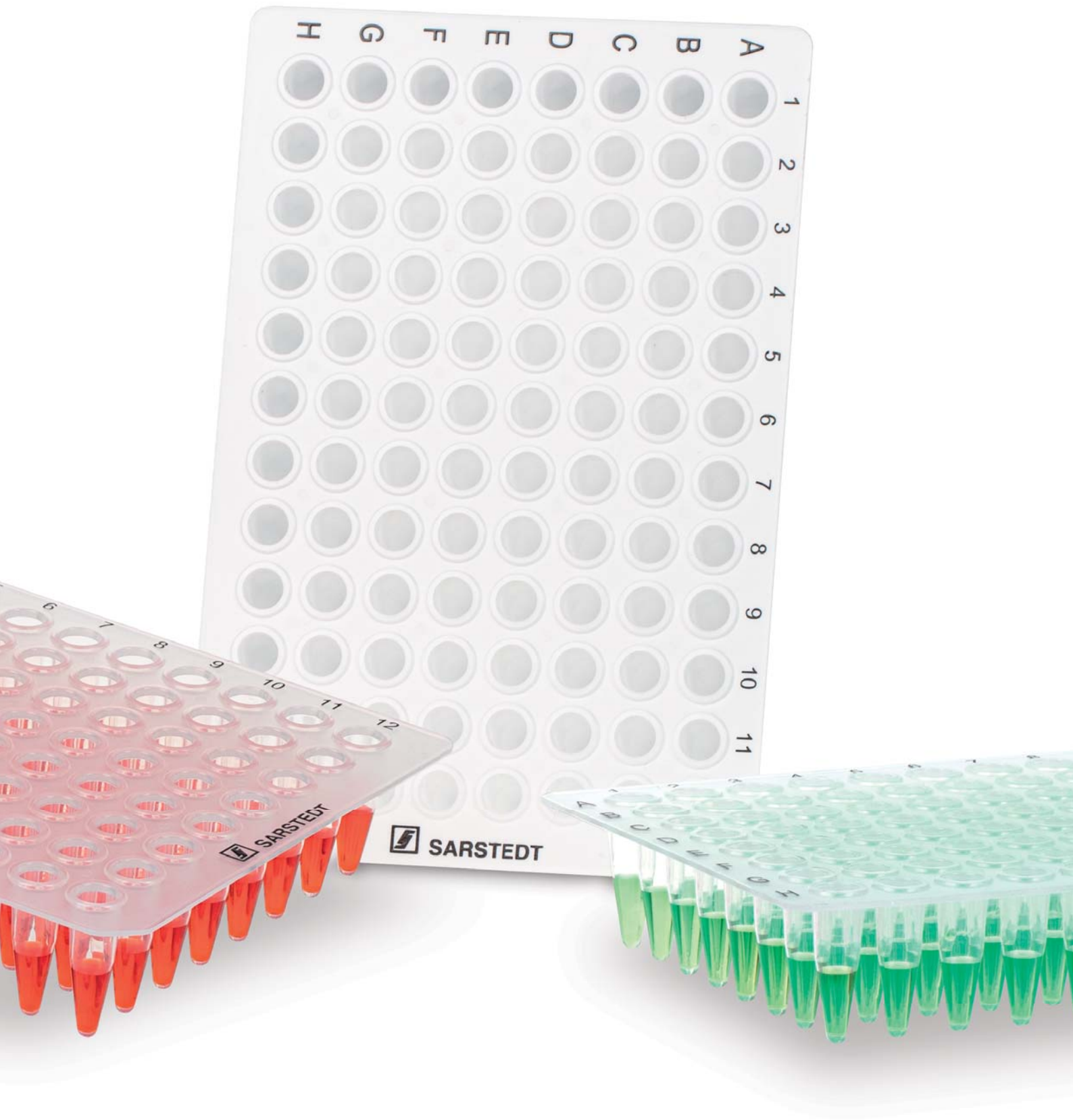
Profile: Low profile
 Maximum well volume: 0.1 ml
 Cutaway corner: A1

Features and benefits:

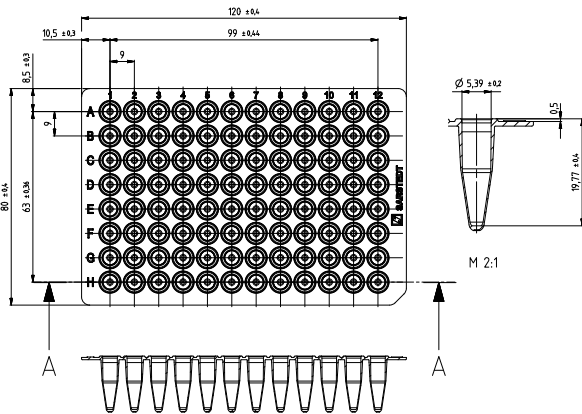
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and highly reproducible results.
- ANSI-compliant dimensions enable use in automated systems.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
96-well PCR plate with half skirt	Transparent		10 units/bag & 100 units/box	72.1981
96-well PCR plate with half skirt	White (qPCR-optimised)		10 units/bag & 100 units/box	72.1981.010
Lightcycler 480 PCR plate with half skirt, 96-well	White (qPCR-optimised)		25 units/bag & 100 units/box	72.1982.202

Other colours 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:

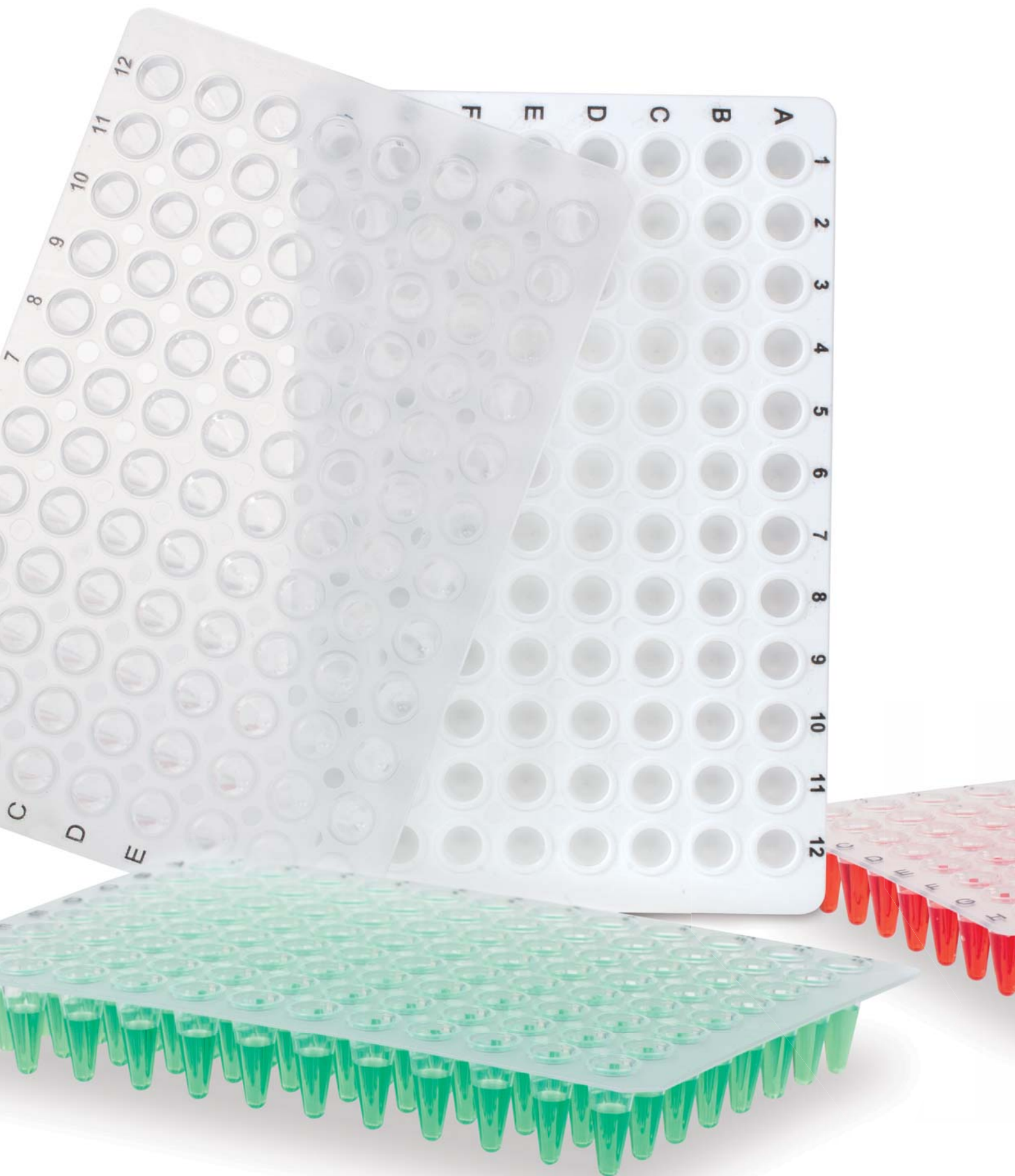
Profile:High profile
 Maximum well volume:0.2 ml
 Cutaway corner:H12

Features and benefits:

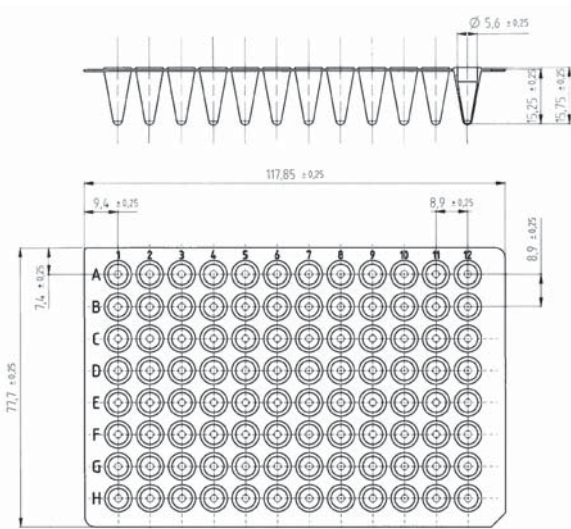
- Easy to cut if the sample volume is low or if 24- or 48-well formats are required.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and highly reproducible results.
- ANSI-compliant dimensions enable use in automated systems.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
96-well PCR plate without skirt	Transparent		10 units/bag & 100 units/box	72.1978
96-well PCR plate without skirt	White (qPCR-optimised)		10 units/bag & 100 units/box	72.1978.010

Colour 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:

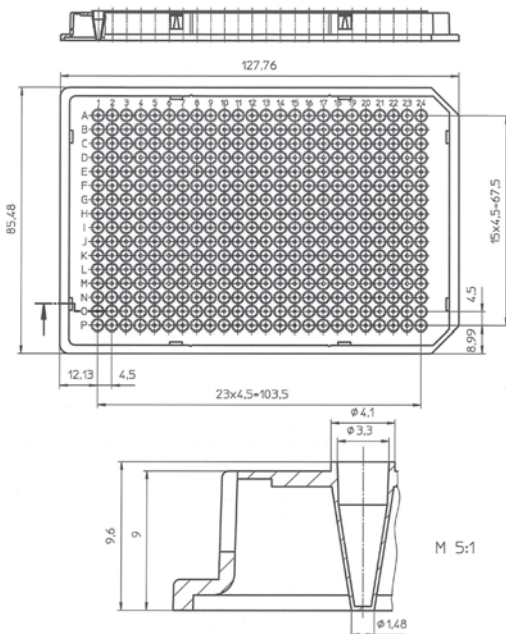
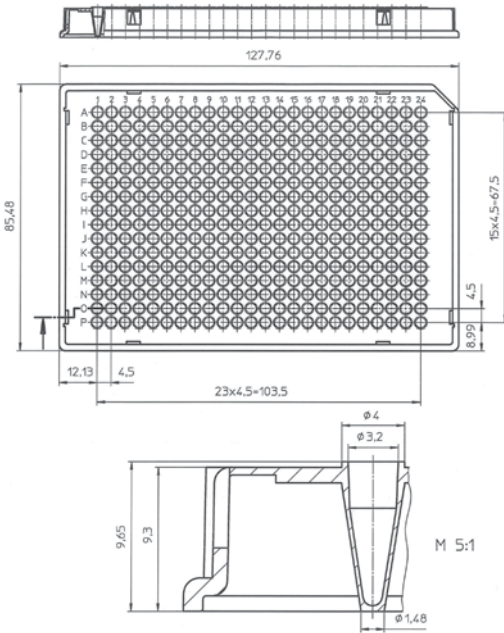
- Easily cuttable if the sample volume is low or if 24- or 48-well formats are required.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and highly reproducible results.
- ANSI-compliant dimensions enable use in automated systems.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
96-well PCR plate without skirt	Transparent		20 units/bag & 100 units/box	72.1977.202
96-well PCR plate without skirt	White (qPCR-optimised)		20 units/bag & 100 units/box	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 highly reproducible results.
- ANSI-compliant dimensions enable use in automated systems.
- The raised skirt around each well provides protection against cross contamination and facilitates secure sealing with films and foils, thus protecting against evaporation loss.
- Black alphanumeric labelling 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	Colour	Purity	Packaging	Order no:
384-well PCR plate with skirt	Transparent		25 units/bag & 50 units/box	72.1984.202
384-well PCR plate with skirt	White (qPCR-optimised)		50 units/bag & 100 units/box	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®

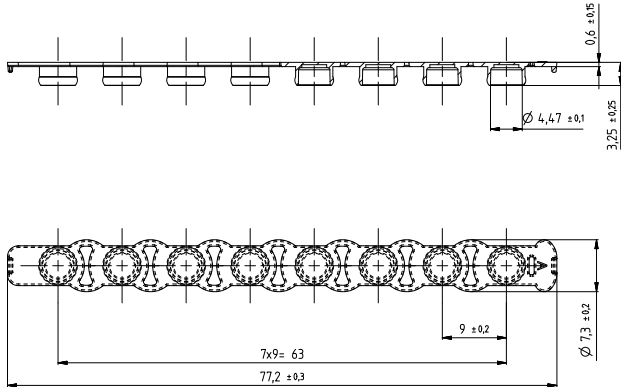
AriaMx Real-Time PCR System				●	●			
Mx3000P™	●	●						
Mx3005P™	●	●	●	●				
Mx4000™	●	●	●					
Gradient Cycler		●		●				
Robocycler 384-well						●		

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 PCR plates and strips.
- High-transparent lid strips optimised for real-time PCR and other fluorescence-based applications.
- Optimised compatible lid strips and PCR plates and strips to ensure a tight seal.
- Direction indicator on ends of lid strips makes orientation easy.
- Universal compatibility of lid strips with both 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	Colour	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 units/bag & 240 units/box	65.989
PCR lid strips	High-transparent		72.1979.102 72.1979.132 72.1982.202	120 units/bag & 480 units/box	65.989.002
PCR lid strips	Transparent		72.1979.102 72.1979.132 72.1982.202	12 units/bag & 1,200 units/box	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.

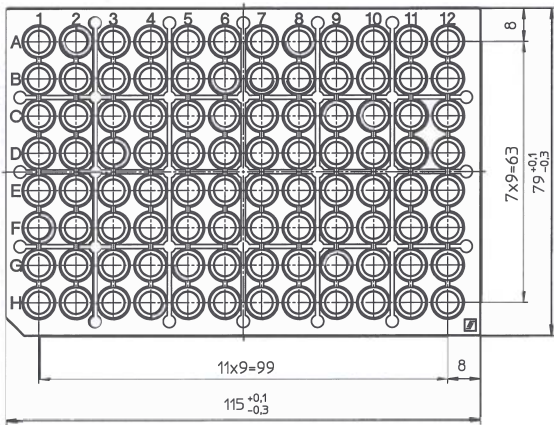
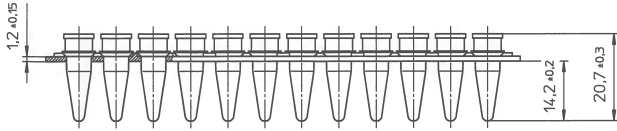
Product description	Application	Special properties	Optical	Pierceable	Functional temperature range	Packaging	Order no
Adhesive, optically highly transparent qPCR film	qPCR, fluorescence analyses	Highly transparent, heat-sensitive adhesive, lowest evaporation rates	+	no	-80 °C to 100 °C	100 films / inner 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



Handily pre-inserted – the alternative to two-component PCR plates with polycarbonate frame



Product information:

Profile: High profile
 Maximum well volume: 0.2 ml

Twelve pre-inserted PCR strips in PCR working tray with maximum purity certification

Features and benefits:

- Biosphere® plus version, individually sterile wrapped
- Sealable with high-transparent lid strip REF 65.989
- Polycarbonate frame
- Can be used in rack system (see page 37)



Description	Colour	Purity	Packaging	Order no:
96-well PCR strips in work tray	Transparent		Individually wrapped in a bag, with 20 items/box	72.985
PCR lid strip, Biosphere® plus	High-transparent		12 units/bag & 240 units/box	65.989



PCR strips with separate lid strip







Product information:

Profile: High profile
 Maximum well volume: 0.2 ml

Features and benefits:

- Optimised compatible lid strips and PCR strips 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 highly reproducible results.
- Universal compatibility of lid strips with both 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.

Description	Colour	Purity	Packaging	Order no:
8-well PCR strip without attached lid	Transparent		120 units/bag & 480 units/box	72.985.002
8-well PCR strip without attached lid	White (qPCR-optimised)		120 units/bag & 480 units/box	72.985.092
8-well PCR strip without attached lid	Mixed colours (red, green, blue, purple)		120 units of one colour/bag & 480 units/box	72.985.992
High-transparent lid strips	Transparent		120 units/bag & 480 units/box	65.989.002

Additional colours on request.

PCR strips with separate lid strip

Product information:

Profile: Low profile
 Maximum well volume: 0.1 ml



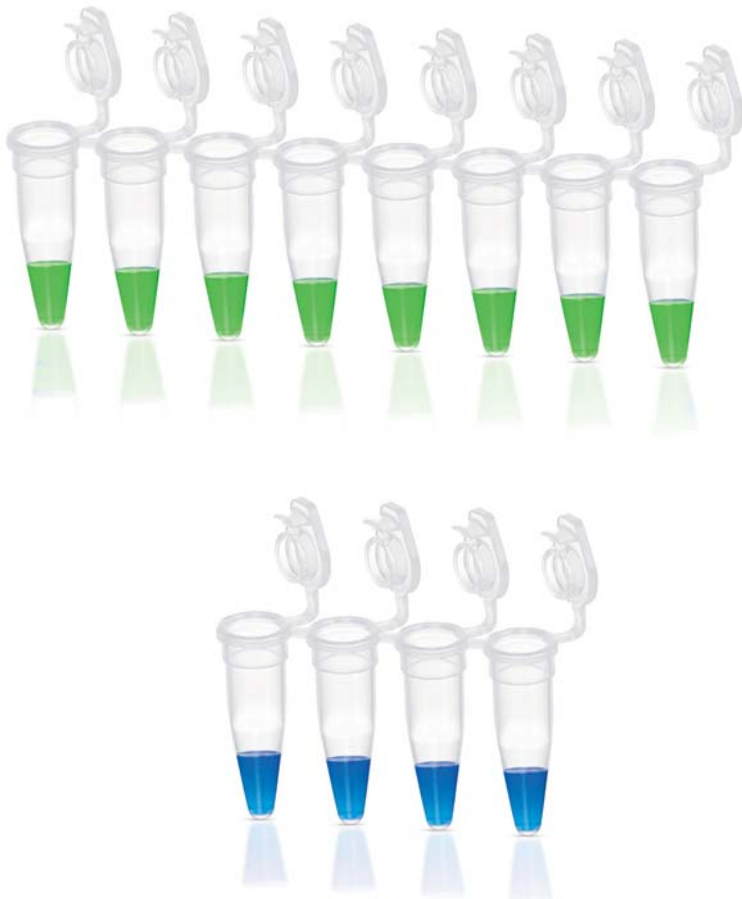
Features and benefits:

- Optimised compatible lid strips and PCR strips to ensure a tight seal.
- Highly uniform and thin well walls ensure consistently even and quickest possible transfer of heat. This guarantees reliable and highly 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	Colour	Purity	Packaging	Order no:
8-well PCR strip without attached lid	Transparent		125 units/bag & 1250 units/box	72.982.002
8-well PCR strip without attached lid	White (qPCR-optimised)		125 units/bag & 1250 units/box	72.982.092

PCR strips with attached lid



Product information:

Profile: High profile
Maximum well volume: 0.2 ml

Features and benefits:

- Increased security and no handling interference – integrated anti-contamination protection prevents accidental contact with the inner surface of the lid.
- No warping, bending or breaking strengthened connectors prevent PCR strips from 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 highly reproducible results.
- Production under clean room conditions and independently conducted biological tests allow for outstanding PCR Performance Tested and Biosphere® plus purity certifications.

Description	Colour	Purity	Packaging	Order no:
8-well PCR strip with attached lids	Transparent		120 units/bag & 480 units/box	72.991.002
8-well PCR strip with attached lids	Mixed colours (red, green, blue, purple)		120 units of one colour/bag & 480 units/box	72.991.992
4-well PCR strip with attached lids	Transparent		120 units/bag & 480 units/box	72.990.002
4-well PCR strip with attached lids	Transparent		50 units/bag & 400 units/box	72.990
4-well PCR strip with attached lids	Mixed colours (red, green, blue, purple)		120 units of one colour/bag & 480 units/box	72.990.992

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

Description	Colour	Purity	Packaging	Order no:
8-well PCR strip with attached lids	Transparent		12 units/bag & 1,200 units/box	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 and no handling interference – integrated anti-contamination protection 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 highly 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	Colour	Purity	Packaging	Order no:
0.2 ml PCR single tube with attached lid	Transparent		500 units/bag & 2,000 units/box	72.737.002
0.2 ml PCR single tube with attached lid	Transparent		250 units/bag & 2,000 units/box	72.737
0.2 ml PCR single tube with attached lid	Mixed colours (red, orange, green, blue, purple, yellow)		500 units of one colour/bag & 3000 units/box	72.737.992
0.5 ml PCR single tube with attached lid	Transparent		500 units/bag & 2,000 units/box	72.735.002
0.5 ml PCR single tube with attached lid	Transparent		100 units/bag & 1,000 units/box	72.735.100
0.5 ml PCR single tube with attached lid	Mixed colours (red, orange, green, blue, purple, yellow)		500 units of one colour/bag & 3000 units/box	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. That is why 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:

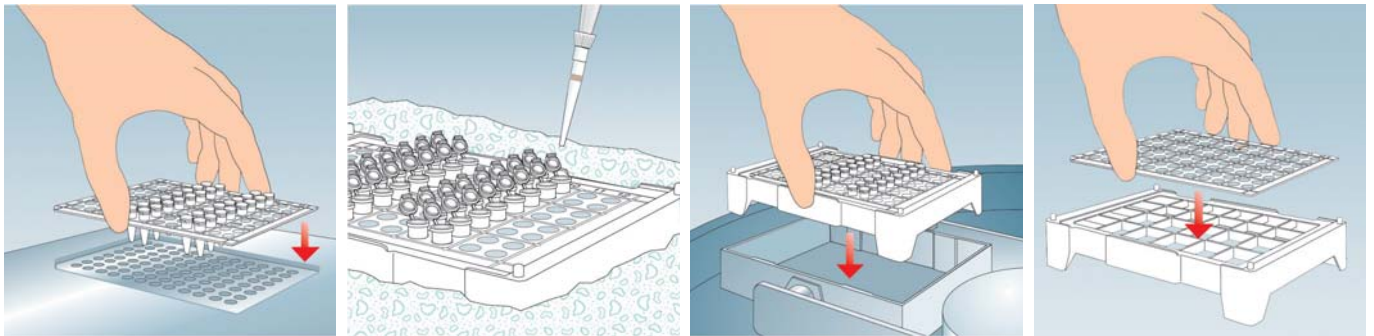
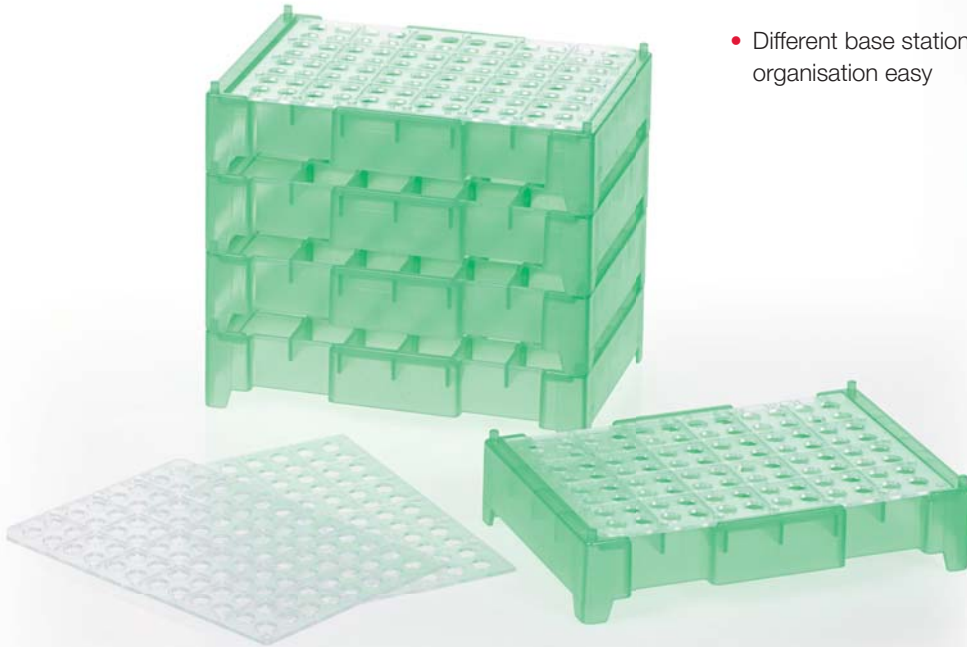
- Noticeable colour change from purple to pink when temperature moves outside the optimum range (above 7°C).
- Minimises the risk of contamination, as there is no need to store samples on ice.
- At normal ambient temperature, the temperature of samples is held in the optimum range for up to three hours (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 reaction tubes

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



The SARSTEDT rack system – the flexible storage and pipetting station

- Flexible two-component system comprising work tray and base station
- Time-saving handling of PCR strips and tubes, as they can be transferred to the thermocycler along with the work tray
- Different base station colour options make laboratory organisation easy



Description	Colour	Order no:
96-well work tray	5 items/bag	95.987.002
Transparent base station	5 items/box	95.988
Red base station	5 items/box	95.988.001
Blue base station	5 items/box	95.988.002
Green base station	5 items/box	95.988.003
Yellow base station	5 items per box	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 runs 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 optimise 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. Minimise 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. Optimise 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. Minimise DNA shearing during isolation. To prevent the template DNA from degrading, store it in Tris-EDTA buffer (pH 8).

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