Axygen® Gel Documentation System

Cat. №: GDBL-1000

Axygen gel documentation system-BL

Axygen® Gel Documentation systems easily capture publication quality, 16 bit TIFF images. The systems are quick to set up and have an intuitive user interface for image capture, annotation, and contrast adjustment. Images are easily saved and opened in common gel analysis software for more detailed analysis.

- Auto exposure—you never have to manually manipulate the camera
- Ready-to-use—just connect the computer* and load the software
- Long-life dual wavelength transilluminators
- Exceptionally high resolution (5.4 MP) camera
- The cabinet is compact with an ultra-violet (UV) cut-off switch to prevent exposure to UV light if the cabinet door is opened while the UV light is on.

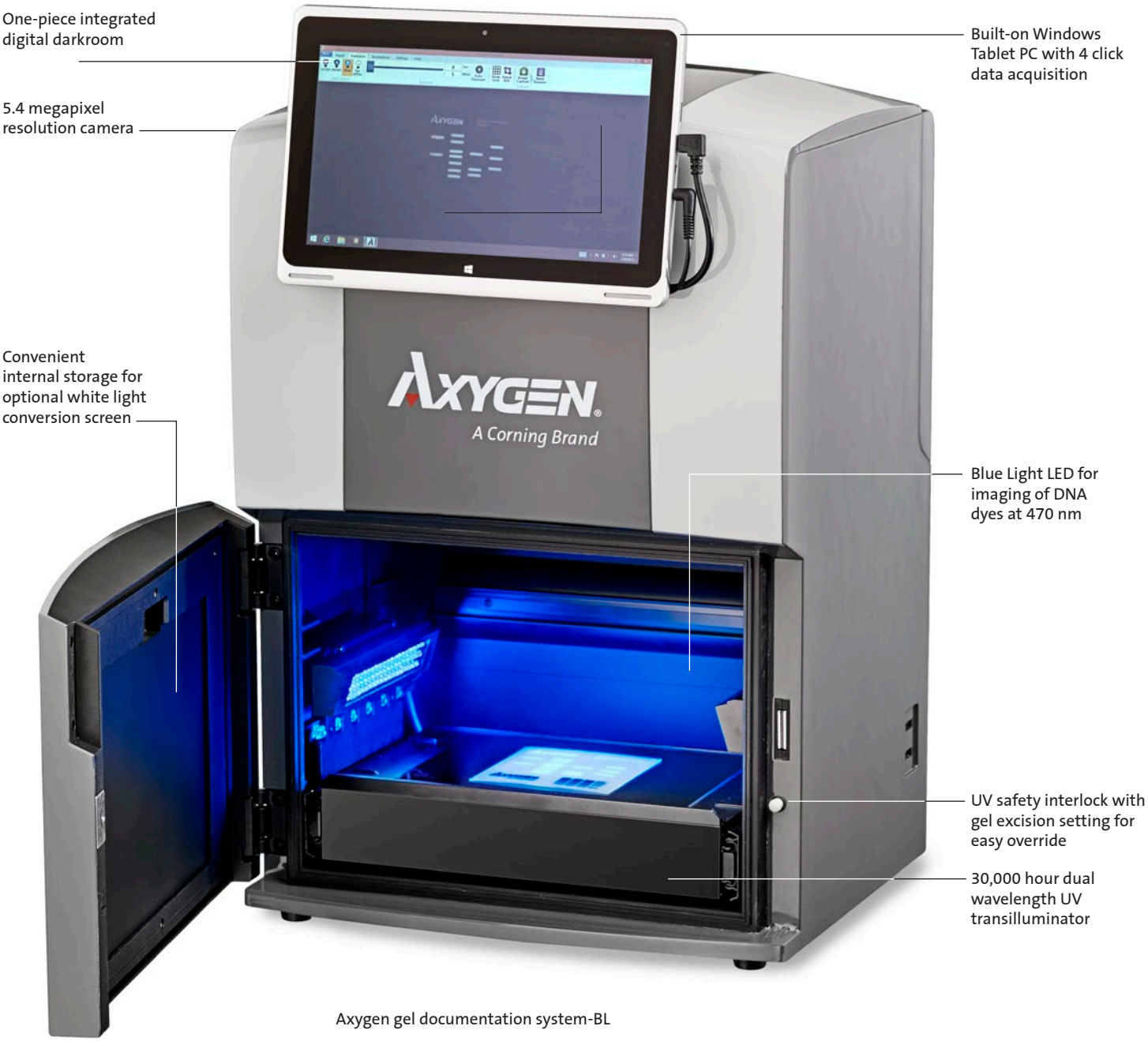
Features

- Darkroom tab lets you select from UV 302, UV 365, Epi White, or Epi Blue (BL system only) light sources, as well as an optional Trans White light illumination tray.
- Auto Exposure tool calculates the optimal exposure time with just a single click. You can also use the Slider tool to manually adjust the exposure time and view an updated live image.
- Select ROI tool allows you to select a region of interest. The Auto Exposure calculations are only based on the selected region. This feature is especially useful for gels that have either intense or faint bands.
- Band Excision tool allows you to temporarily override the safety precautions in the system to view the gel with the lights on.**
- Imaging tools include crop, rotate, resize, contrast, saturation, and zoom. Annotation tools include a variety of text and drawing tools. Finished images can be saved, printed, emailed, or exported for further analysis.
- Transillumination bulbs last for 30,000 hours—which equals over 3.5 years if the bulbs were in continuous use.

Axygen Gel Documentation System-BL has all the features of the standard Axygen Gel Documentation system, as well as built-in blue lights and a built-on Microsoft® Windows® tablet. The blue lights are designed for use with EtBr replacement dyes to prevent damage to DNA that will be excised for subsequent analysis.

* BL model includes tablet computer.
** Always wear protective eyewear when working with UV light.

Everything You Expect From a High Resolution Gel Doc System — Except the High Price.



Axygen gel documentation system-BL

Australian distributors:
Fisher Biotec Australia
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Specifications

Axygen® System	Gel Documentation System-BL
Camera	5.4 MP image resolution
Lens	f1.8
Light Sources	◗ Epi White ◗ Dual wavelength transillumination at 302 nm and 365 nm ◗ Epi Blue
Trans White Light Illumination Tray	Optional
Field of View	15 cm x 20 cm
Cabinet	◗ Door sensor to prevent accidental exposure to UV; automatically shuts off UV light when door is open ◗ Safety override, enabling band cutting on the UV transilluminator with automatic turn off after 5 minutes
Emission Filter	590 nm
3-position Filter Slider	Yes
Certifications	CE, cTUVus
Product Footprint	12" x 15" (30.48 x 38.1 cm)
Computer	◗ Tablet included: Windows 8 tablet computer enables compatibility with existing networks, as well as easy setup ◗ Bluetooth and wireless compatible, or USB to LAN compatible ◗ 10.1" touch screen ◗ 2 GB of storage for short term data saving

Ordering Information

Corning Cat. No.	Description	Qty/Pk	Qty/Cs
GDBL-1000	Gel documentation system-BL	1	1
GDBL-WLCS	Gel documentation system white light conversion screen for GDBL-1000	1	1
GDBL-GCT	Gel carrying tray for GDBL-1000	1	1
GD-PRT	Thermal printer	1	1
GD-PAPER	Thermal printer paper	1	1
GD-1D	1 user license of Total Lab 1D (also available in more user licenses upon request)	1	1
GD-1DN	1 user Network license of Total Lab 1D (also available in more user licenses upon request)	1	1
GDBL-BLUE	Optional blue filter (497 nm)	1	1
GDBL-GREEN	Optional green filter (572 nm)	1	1
GDBL-RED	Optional red filter (676 nm)	1	1
GD-GCS	UV transmitting tray that protects UV transilluminator when cutting out bands	1	1
GD-OG	Orange glasses ideal for reducing background when cutting out bands with blue light	1	1
GD-USBS	USB hub	1	1
GD-USBMK	USB mouse and keyboard	1	1

The Axygen® Gel Documentation System-BL has Ultraviolet and Blue Light Capabilities for Use with Ethidium Bromide and Alternative Safe Dyes

Application Note

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Introduction

The Axygen Gel Documentation System-BL (Corning Cat. No. GDBL-1000) is an easy-to-use system for gel image capture that produces high quality 16 bit TIFF images using 302 nm wavelength ultraviolet (UV) light (UV 302), 365 nm wavelength UV light (UV 365), 470 nm blue light, or Epi White light. The blue light source enables the use of ethidium bromide replacement dyes, avoiding both UV light exposure and the potentially mutagenic effects of ethidium bromide.

Here, we compared the features of this system in a limit of detection study using blue light in the Axygen Gel Documentation System-BL with ethidium bromide replacement stains SYBR® Safe and GelGreen, as well as using UV 302 light with ethidium bromide. A serial dilution of two DNA fragments (~6107 bp and ~1746 bp) were assessed for each combination of gel stain and light exposure, and the lowest concentration measured from gel images using the gel analysis software, TotalLab 1D, was determined. Using the SYBR Safe and GelGreen stains in combination with blue light resulted in DNA detection limits that were comparable to the limits found using ethidium bromide stain and UV 302 light exposure, demonstrating the versatility of the instrument. Additionally, transformation efficiency of DNA exposed to either blue light or UV 302 light was compared.

Materials/Methods

DNA Sample Preparation

The plasmid DNA pCMV-SPORT-Bgal (Thermo Fisher Cat. No. 10586-014) was cut using a restriction enzyme double digest at HindIII (693) and ScaI (6800) sites to generate two fragments of approximately 6107 bp and 1746 bp in length. Briefly, the enzymes HindIII-HF® (New England Biolabs (NEB) Cat. No. R3104) and ScaI-HF® (NEB Cat. No. R3122) were mixed with plasmid DNA at a ratio of 1.0 µL enzyme per 1.0 µg DNA in 10X CutSmart® buffer (NEB Cat. No. B7204S) that was diluted ten-fold in Corning molecular biology grade water (Corning Cat. No. 46-000-CM). The double digest was incubated at 37°C for 20 minutes, followed by heat inactivation at 80°C for 20 minutes. Digested DNA was stored at -20°C.

Gel Electrophoresis

Agarose gels (1 %) were prepared by melting 2.25 g agarose LE (Corning Cat. No. AGR-LE-100) in 225 mL 1X TBE buffer, which was prepared by diluting 10X TBE buffer (Corning Cat. No. 46-011-CM) ten-fold in Corning molecular biology grade water. Just before pouring gels into a 15 x 15 cm tray with two 20-well combs, gel stain was added and mixed using either 11.25 µL of ethidium bromide (Sigma-Aldrich Cat. No. E1510-10ML), 22.5 µL of SYBR Safe DNA gel stain (Thermo Fisher Cat. No. S33102), or 22.5 µL of GelGreen Nucleic Acid gel stain (Biotium Cat. No. 41005). Solidified gels were transferred into the main tank of an Axygen® horizontal gel box (Corning Cat. No. HGB-15), which was filled to the maximum fill line with 1X TBE buffer. Axygen 1 Kb DNA ladder (Corning Cat. No. M-DNA-1kb) was added to the wells of lanes 1, 20, 21, and 40 in both rows at 6 µL/well. Digested DNA was serial diluted 1:2 for 18 samples, mixed with 6X DNA gel loading dye (Thermo Fisher Cat. No. R0611), and loaded at 12 µL/well into lanes 2 to 19 and 22 to 39, with the total amount of DNA loaded ranging from 200.00 ng in lanes 2 and 22, down to 1.50 pg in lanes 19 and 39. Gels were run at 110 volts constant for 80 minutes. For each gel stain, DNA samples were run two independent times for a total of four lanes per DNA quantity per gel stain.

Gel Imaging and Analysis

Immediately following gel electrophoresis, each gel was imaged using the Axygen Gel Documentation System-BL. For ethidium bromide-stained gels, UV 302 light was used to illuminate the gels. For gels stained with SYBR Safe and GelGreen, blue light was used to illuminate the gels. For all gel images, light exposure time was automatically selected based on the region of interest (ROI) using the ladders in lanes 1 and 21. The gel images were analyzed using the TotalLab 1D gel analysis software (version 14.0), and DNA fragment size and concentration were determined based on calibrations using the 1 Kb DNA ladder. The quantity of DNA of the lowest sample that could be detected as having a quantifiable amount of DNA (> 0.00 ng) was determined to be the limit of detection for each gel stain.

Transformation Efficiency

The effects of UV 302 and blue light exposure on the quality of DNA were determined through a transformation efficiency study. The plasmid DNA pCMV-SPORT-Bgal was diluted in molecular biology grade water to 2.5 ng/µL and aliquoted into 10 µL volumes in 1.7 mL microcentrifuge tubes (Corning Cat. No. 3207). For each study, each tube was exposed to either blue light or UV 302 light in the Axygen Gel Documentation System-BL for 1, 2, 4, 7, or 10 min. Stock DNA that was not exposed to either blue light or UV 302 light was used as a positive control. MAX Efficiency® DH5α™ Competent Cells (Thermo Fisher Cat. No. 18258-012) were transformed with DNA samples. Briefly, cells were thawed on ice and 100 µL aliquoted with 1 µL of DNA per chilled 17 x 100 mm polypropylene tube. Cells were incubated on ice for

30 minutes, heat shocked at 42°C for 45 seconds, and returned to ice for 2 minutes. Cells were diluted 1:10 with 0.9 mL S.O.C. medium (Corning Cat. No. 46-003-CR) and incubated for 1 hour at 37°C with shaking at 225 rpm. Cultures were diluted 1:100 using S.O.C. medium, and 100 µL of the dilution spread onto LB agar plates with 100 µg/mL ampicillin, 60 µg/mL X-gal, and 0.1 mM IPTG (Teknova Cat. No. L1902) for overnight culture. The number of colony forming units (CFU) was counted to determine transformation efficiencies.

Results/Discussion

Immediately following gel electrophoresis, each gel was imaged using the Axygen® Gel Documentation System-BL. The gels stained with ethidium bromide were illuminated with UV 302 light, while the gels stained with SYBR® Safe and GelGreen were illuminated with blue light. As can be seen in the representative SYBR Safe gel image, lanes 1, 20, 21, and 40 contained 1 Kb DNA ladder with DNA bands ranging in size between 300 to 10,000 bp (Figure 1). The thickest and brightest bands representing approximately ~6107 bp and ~1746 bp DNA fragments can be observed in lanes 2 and 22, which received 200.00 ng total DNA. As the amount of DNA was diluted across the gel from left to right, the thickness and brightness of the sample DNA bands also decreased.

By using the TotalLab 1D gel analysis software and calibrating the sample DNA bands to known DNA band sizes and quantities loaded in the 1 Kb ladder, the amount of DNA detected in each lane was calculated. Regardless of gel stain or light source, the amount of DNA detected in each lane decreased across the gel in direct relation to the amount of DNA loaded (Figure 2). The lowest quantity of DNA that could be detected and calculated, based on the calibration to the 1 Kb DNA ladder, was determined and compared using each combination of nucleic acid gel stain and light source type. The detection limits are listed in Table 1, as a range of the lowest quantity of DNA detected from 4 independent experiments. Using ethidium bromide with UV 302 light, the larger DNA fragment (~6107 bp) demonstrated detection limits as low as 6.25 ng, whereas the smaller DNA fragment (~1746) showed detection limits as low as 50.00 ng. Using SYBR Safe DNA gel stain with blue light resulted in detection limits that were comparable to the ethidium bromide/UV 302 limits for both DNA fragments. However, using GelGreen nucleic acid gel stain with blue light resulted in detection limits as low as 3.13 ng for the ~6107 bp fragment and 12.5 ng for the ~1746 bp fragment. For the GelGreen nucleic acid gel stain, the detection limits showed a greater range in variation between the 4 independent studies when compared to ethidium bromide or SYBR Safe limits of detection. When incorporating the range of the detection limits, using SYBR Safe or GelGreen dyes with blue light demonstrated detection limits that were at least comparable to using ethidium bromide with UV 302 light.

The effects of UV 302 light and blue light exposure on DNA quality were evaluated by performing transformation efficiency studies of MAX Efficiency DH5α Competent cells with DNA that had been exposed to either UV 302 or blue light for time ranging from 1 to 10 minutes. DNA exposed to UV 302 displayed

Table 1. Range of Lowest DNA Quantity Detected (ng)

Stain/Light Source	EtBr/UV 302	SYBR Safe/BL	GelGreen/BL
~6107 bp band	6.25-12.50	6.25-12.50	3.13-6.25
~1746 bp band	50.00-100.00	50.00	12.50-25.00

N = 4 bands were used for each measurement. EtBr = Ethidium Bromide; UV 302 = ultraviolet light at 302 nm wavelength; BL = blue light.

Figure 1. Representative gel image. A 1% agarose gel was cast using 1X SYBR Safe nucleic acid stain. A 1:1 dilution series of plasmid DNA pCMV-SPORT-Bgal cut into two fragments (6107 bp and 1746 bp) was added to lanes 2 to 19 and 22 to 39 with the highest quantity (200.00 ng) in lanes 2 and 22 and the lowest quantity (1.50 pg) in lanes 19 and 39. Axygen 1 Kb ladder DNA marker (6 µL) was added to lanes 1, 20, 21, and 40. Post-electrophoresis, the agarose gel was illuminated with blue light using the Axygen Gel Documentation System-BL for image capture.

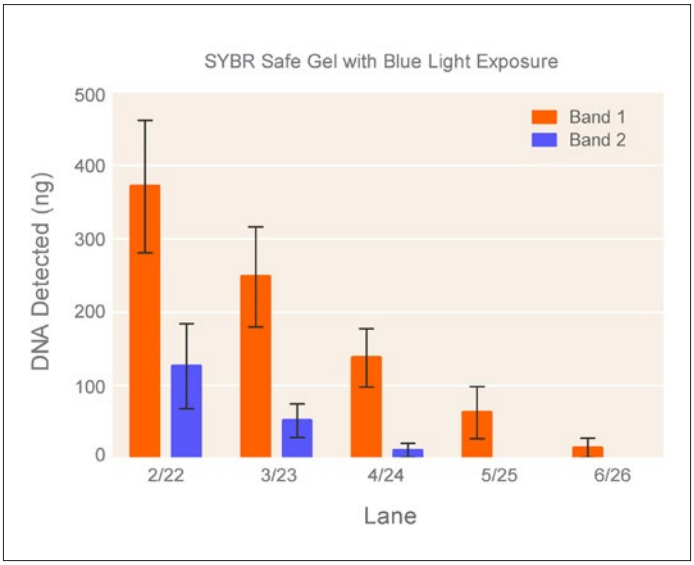

Figure 2. DNA quantification detection limit. The amount of total DNA detected, as determined from calibrating samples to the Axygen 1 Kb DNA ladder, decreased across the gel in direct relationship to the decreasing amount of DNA loaded. Representative data from a SYBR Safe stained-gel illuminated with blue light is shown. Band 1 ~6107 bp, Band 2 ~1746 bp.

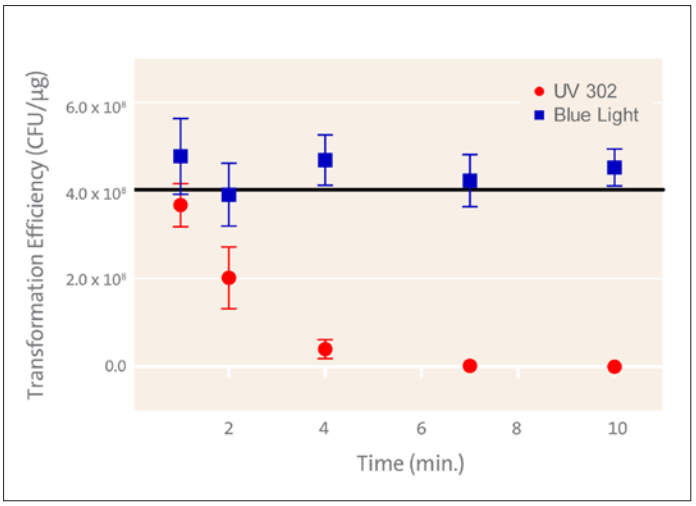

Figure 3. Transformation efficiency of DNA exposed to light. Aliquots of DNA were directly exposed to UV 302 or blue light for up to 10 minutes. The transformation efficiency of exposed DNA was determined through the use of MAX Efficiency DH5α Competent cells using the DNA after light exposure. The transformation efficiency of DNA exposed to UV 302 significantly decreased to 0 over the course of 10 minutes of exposure, whereas the transformation efficiency of DNA exposed to blue light did not significantly change compared to positive control (no light exposure). N = 3 independent studies. Black line = average of no light positive control.

transformation efficiencies that were half of the positive control (no light exposure) after 2 minutes of UV 302 exposure and transformation efficiencies of 0 (i.e., no colonies formed) within 10 minutes of UV 302 exposure (Figure 3). DNA exposed to blue light, however, did not display a time-dependent decrease in transformation efficiency, maintaining CFU levels comparable to the positive control over the course of 10 minutes of blue light exposure.

Conclusions

- The Axygen® Gel Documentation System-BL is compatible with commonly used nucleic acid gel stains, including ethidium bromide, SYBR® Safe, and GelGreen.
- Comparable low limits of detection were observed for two different DNA band sizes with each gel stain using the various features of the Axygen Gel Documentation System-BL.
- The Axygen Gel Documentation System-BL has blue light capabilities for use with ethidium bromide alternative dyes that lead to comparable sensitivity for limit of detection studies.
- The blue light feature of the Axygen Gel Documentation System-BL does not negatively affect the quality of DNA, as measured by transformation efficiency after direct DNA exposure to light for up to 10 minutes.

Related Products

Axygen® Gel Cutting Pipet Tips

Corning Cat. No.	Description	Qty/Pk	Qty/Cs
TGL-1165-R	1.1 mm x 6.5 mm gel cutting pipet tips	480	2,400
TGL-1165	1.1 mm x 6.5 mm gel cutting pipet tips	250	2,500
TGL-1140-R	1.1 mm x 4 mm gel cutting pipet tips	480	2,400
TGL-1140	1.1 mm x 4 mm gel cutting pipet tips	250	2,500
Axygen Gel Loading Pipet Tips			
TGL-10FT-17-R	0.17 mm, 10 µL racked flat gel loading pipet tip	400	400
TGL-200FT-37-R-S	0.37 mm, 200 µL racked flat gel loading pipet tip, sterile	400	400
TGL-200FT-37-R	0.37 mm, 200 µL racked flat gel loading pipet tip	400	400
TGL-200RD-57-R-S	0.57 mm, 200 µL racked round gel loading tip, sterile	400	400
TGL-200RD-57-R	0.57 mm, 200 µL racked round gel loading tip	400	400
Axygen DNA Markers			
M-DNA-100BP	100 bp DNA ladder	500 µL	500 µL
M-DNA-1KB	1 kb DNA ladder	500 µL	500 µL
Axygen Agarose			
AGR-LE-100	Agarose LE, low EEO, molecular biology grade, 100 g	1	1
AGR-LE-1001	Agarose LE, low EEO, molecular biology grade, 100 g	10	10
AGR-LE-500	Agarose LE, low EEO, molecular biology grade, 500 g	1	1
AGR-LE-5001	Agarose LE, low EEO, molecular biology grade, 500 g	10	10
AGR-LM-50	Agarose LM, low melting, molecular biology grade, 50 g	1	1
AGR-LM-501	Agarose LM, low melting, molecular biology grade, 50 g	10	10
AGR-LM-100	Agarose LM, low melting, molecular biology grade, 100 g	1	1
AGR-LM-1001	Agarose LM, low melting, molecular biology grade, 100 g	10	10
AGR-MS-50	Agarose MS, PCR screening, molecular biology grade, 50 g	1	1
AGR-MS-501	Agarose MS, PCR screening, molecular biology grade, 50 g	10	10
AGR-MS-100	Agarose MS, PCR screening, molecular biology grade, 100 g	1	1
AGR-MS-1001	Agarose MS, PCR screening, molecular biology grade, 100 g	10	10
Corning® Buffers			
46-011-CM	10X TBE Buffer, liquid	6 x 1L	6 x 1L
46-010-CM	10X TAE Buffer, liquid	6 x 1L	6 x 1L

Warranty/Disclaimer: Unless otherwise specified, all products are for research use only. Not intended for use in diagnostic or therapeutic procedures. Corning Life Sciences makes no claims regarding the performance of these products for clinical or diagnostic applications.

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