



Advanced Recombinase Polymerase Amplification (RPA) Products

for Molecular Diagnostics and Rapid Assay Development

Intact Genomics, Inc.



intactgenomics.com

Recombinase Polymerase Amplification (RPA) Products

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1. Introduction to RPA

1.1. RPA Basics

Recombinase Polymerase Amplification (RPA) is an innovative, isothermal DNA and RNA amplification technology that enables rapid, sensitive, and specific nucleic acid detection. Unlike conventional Polymerase Chain Reaction (PCR), which requires precise thermal cycling equipment, Intact Genomics' RPA products operate at a constant low temperature range (25–42°C) and achieve exponential amplification in 5 to 30 minutes. These unique features make RPA an attractive platform for point-of-care diagnostics, field-based applications, and rapid molecular testing across healthcare, agriculture, food safety, and environmental monitoring, etc.

RPA reactions use a set of protein enzymes and reagents that work in coordination with a polymerase to make a copy of a DNA template using a set of forward and reverse primers (**Figure 1**).

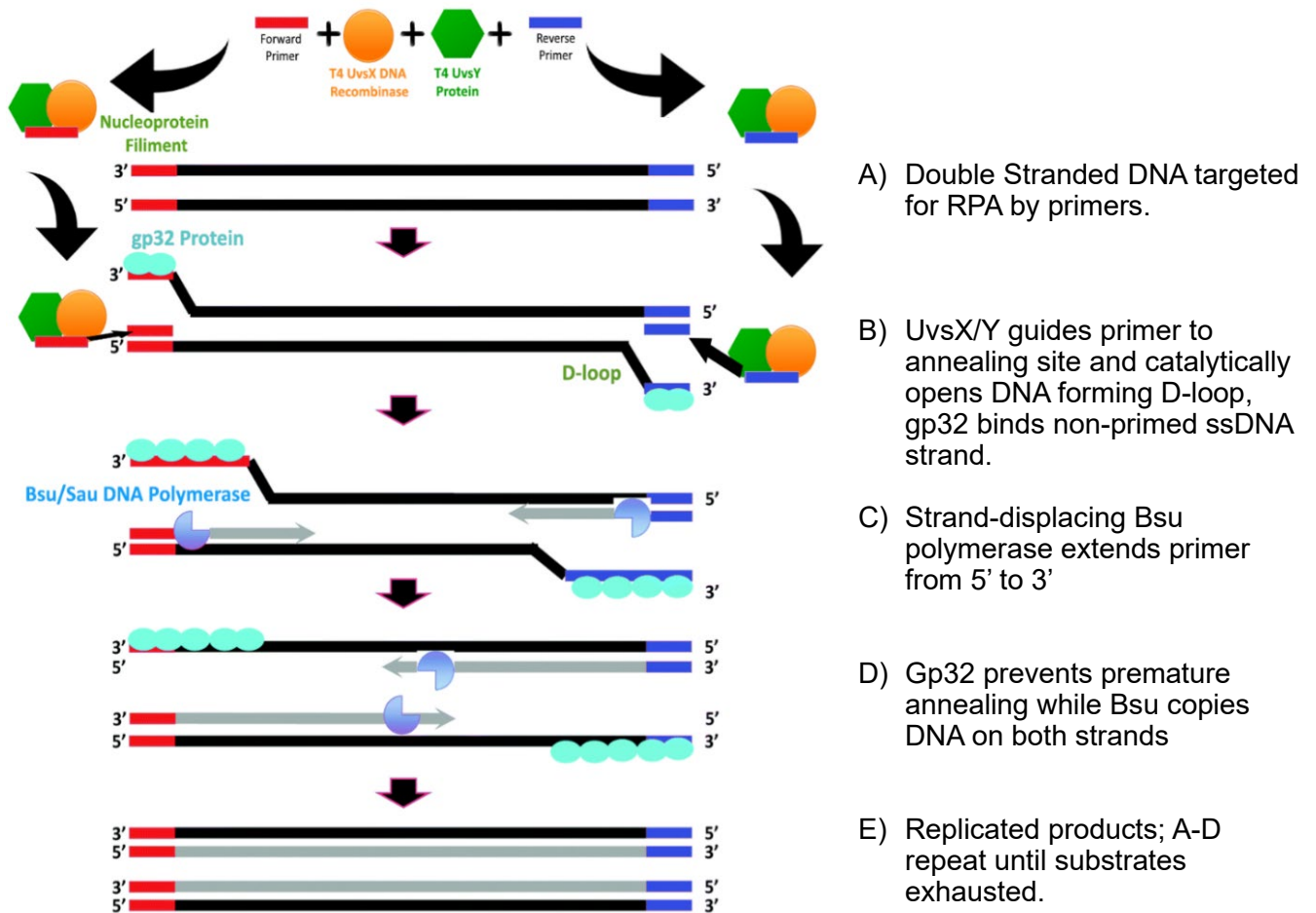


Figure 1: RPA uses a set of enzymes derived from T4 phage that replicates DNA.

- **Recombinase enzymes (T4 UvsX and UvsY)** form complexes with oligonucleotide primers, enabling them to invade homologous DNA duplexes.
- **Single-stranded DNA binding proteins (T4 gp32)** stabilize displaced DNA strands.
- **Strand-displacing DNA polymerase (Bsu/Sau)** initiates synthesis at the primer site, leading to exponential amplification.

For RNA targets, a reverse transcriptase is incorporated, enabling **RT-RPA** (reverse transcription RPA).

1.2. Benefits of RPA

- **Portability.** This isothermal reaction employing T4 UvsX DNA Recombinase does not require pretreatment of DNA, nor does it require any strand denaturation, making it suitable for field tests or performing tests with minimal equipment and supplies. Operates at 25–42°C, eliminating the need for thermocyclers. Requires minimal equipment, suitable for rapid point-of-care or field diagnostics.
- **High Sensitivity.** Can detect as few as 1–10 copies of target DNA.
- **Fast Reaction.** Detects nucleic acids in 5–30 minutes.
- **Flexible and broadly applicable.** Works with DNA and RNA, compatible with various detection formats (fluorescence, lateral flow, microfluidics).
- **Lyophilization-ready Enzymes also Available** Increased assay durability and longevity
- **Customizable.** Our team can adapt product volumes and packaging requirements to meet our clients' needs.

1.3. Applications

1. Healthcare and Infectious Disease Diagnostics

- Rapid detection of pathogens such as SARS-CoV-2, HIV, influenza, and tuberculosis.
- Decentralized testing in clinics, emergency settings, and resource-limited areas.

2. Food Safety

- On-site detection of foodborne pathogens (e.g., *Salmonella*, *E. coli*).
- Verification of allergen contamination and quality control.

3. Agriculture

- Early detection of plant pathogens and crop diseases.
- Monitoring livestock infections.

4. Environmental Monitoring

- Detection of microbial contamination in water supplies.
- Biosurveillance of emerging pathogens in ecosystems.

5. Biodefense and Security

Rapid field-deployable assays for detection of biothreat agents.

2. IG[®] RPA Products

Intact Genomics (IG[®], ig[®]) is an ISO 13485:2016 certified biotech company based in St. Louis, Missouri, providing high-quality life science products and advanced services to researchers and organizations worldwide. We are committed to advancing biotechnology through the development of cutting-edge technologies and innovative solutions for isothermal DNA/RNA amplification, simplified DNA cloning, transformation and protein expression, gene-editing, artificial chromosomes and direct capture of large DNA fragments.

As the leading global provider of Recombinase Polymerase Amplification (RPA) optimization tools, Intact Genomics is the first company to supply all individual RPA enzymes—including T4 UvsX DNA Recombinase, T4 UvsY Protein, T4 gp32, and Bsu DNA Polymerase, Large Fragment and RPA Master Mix—to the market.

Since 2016, Intact Genomics has pioneered the development and manufacturing of RPA-related kits and enzymes, enabling customers to build advanced diagnostic and molecular testing tools. Today, our RPA product portfolio includes comprehensive RPA kits, individual RPA enzymes and FastAmp[®] Viral and Cell Lysis Solutions. Through innovation, quality, and reliability, Intact Genomics empowers scientists and industry leaders to accelerate discovery and create next-generation molecular diagnostics.

2.1. RPA Related Kits

Product Name	Cat #	Pkg Size
<u>IG[®] RPA Master Mix</u>	3545	25 rxns
	3547	100 rxns
	3549	500 rxns
<u>IG[®] RPA Kit v2</u>	3533	25 rxns
	3534	100 rxns
	3536	500 rxns
<u>IG[®] RPA Kit v1</u>	3526	25 rxns
	3530	100 rxns
<u>FastAmp[®] qRPA SYBR kit</u>	3611	25 rxns
	3615	100 rxns
	3517	500 rxns
<u>FastAmp[®] Plant Direct RPA kit</u>	3621	25 rxns
	3623	100 rxns
	3625	500 rxns

[IG[®] RPA Master Mix](#): The new, ready-to-use premix that contains everything except for the user's own DNA template and primer. The IG[®] RPA Master Mix contains T4 UvsX, UvsY, gp32, Bsu DNA

polymerase, and stabilizers with an optimized reaction solution that simplifies and quickens the setup for your RPA reaction. This patent pending, proprietary IG[®] RPA Master Mix offers two key advantages over other RPA products: 1) More robust amplification at shorter times and 2) Lower background amplification of off-target products meaning IG[®] RPA Master Mix has more specific amplification of the primary target.

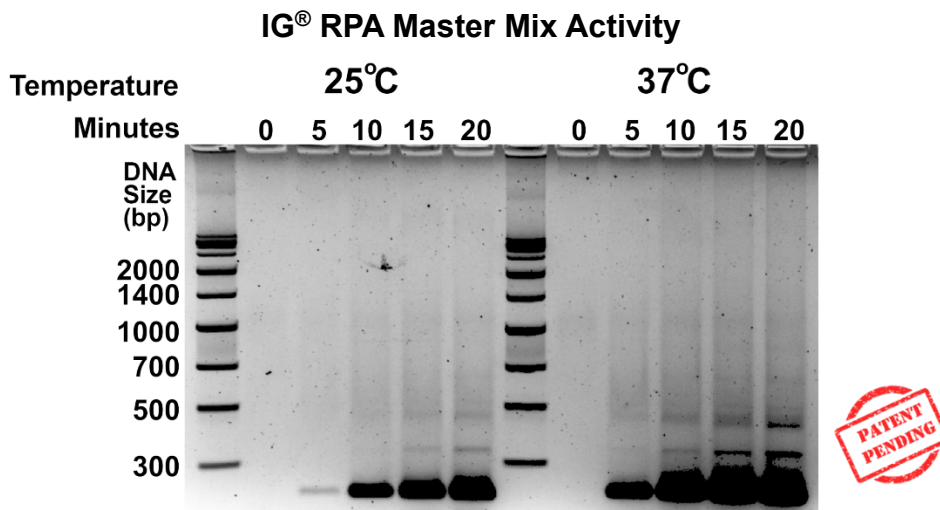


Figure 2: IG RPA Master Mix amplified DNA in 10 minutes at 25°C, in 5 minutes at 37°C.

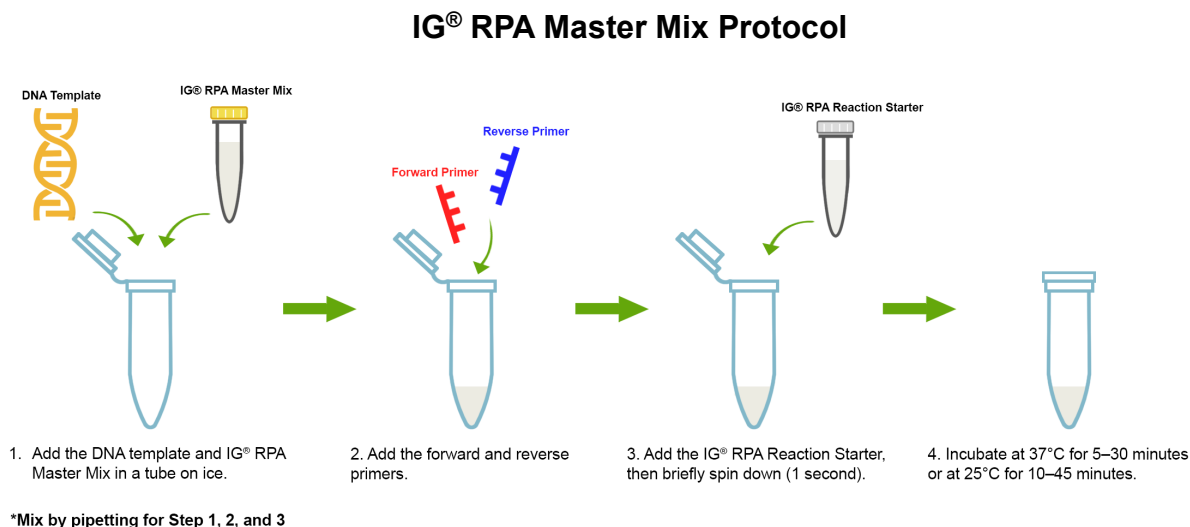


Figure 3: IG[®] RPA Master Mix delivers powerful, reliable isothermal DNA amplification to accelerate molecular diagnostics and rapid assay development.

IG[®] Recombinase Polymerase Amplification (RPA) Kit v2: The IG[®] Recombinase Polymerase Amplification Version 2 Kit (IG[®] RPA v2) helps researchers who seek the advantages of isothermal DNA amplification to achieve faster, more discernible results over v1 (Figure 4).

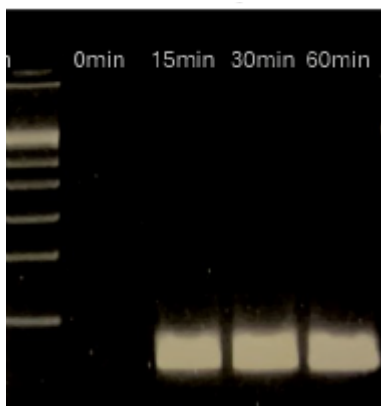


Figure 4: IG® RPA Kit v2 showed robust and specific amplification after 37°C incubation.

IG® Recombinase Polymerase Amplification (RPA) Kit v1: This introductory kit gives the user a faster, more streamlined Recombinase Polymerase Amplification experience by providing the necessary reagents and enzymes to amplify user-provided DNA template.

FastAmp® qRPA SYBR kit: FastAmp® qRPA SYBR Kit is a powerful tool to screen primer conditions for the lowest possible non-template control (NTC) background.

FastAmp® Plant Direct RPA kit: FastAmp® Plant Direct RPA kit offers a fast, robust method for amplifying DNA fragments from plant tissues at a single and constant temperature (37°C) using RPA technology.

2.2. RPA Enzymes and Proteins

Product Name	Cat #	Pkg Size	Conc.
<u>T4 UvsX DNA Recombinase</u>	3562	100 µg	5µg/µl
	3565	500 µg	
	3567	1000 µg	
<u>T4 UvsY Protein</u>	3572	100 µg	2µg/µl
	3575	500 µg	
	3577	1000 µg	
<u>T4 gp32 Protein</u>	3511	100 units	5µg/µl
	3512	200 units	
	3515	500 units	
	3516	500 units	10 µg/µl
<u>Bsu DNA Polymerase, Large Fragment</u>	3582	200 units	5units/µl
	3585	1000 units	
	3587	2000 units	
<u>Sau DNA Polymerase, Large Fragment</u>	3592	200 units	5units/µl
	3595	1000 units	

T4 UvsX DNA Recombinase: Catalyzes strand invasion and homology-directed recombination during RPA, working in concert with its helper proteins UvsY and gp32.

T4 UvsY Protein: Acts as a mediator protein, assisting UvsX in initiating strand invasion and recombination, and functions together with gp32 to enhance efficiency.

T4 Gene 32 Protein: A single-stranded DNA (ssDNA) binding protein essential for bacteriophage T4 DNA replication and repair. In RPA, gp32 stabilizes ssDNA intermediates during amplification.

Bsu DNA Polymerase, Large Fragment: A primer-extending polymerase widely used in RPA. It retains the 5' → 3' polymerase activity of *Bacillus subtilis* DNA Polymerase but lacks the 5' → 3' exonuclease domain and naturally lacks 3' → 5' exonuclease activity, making it ideal for isothermal amplification.

Sau DNA Polymerase, Large Fragment: Functions as a primer-extending enzyme in RPA, offering an alternative to Bsu polymerase for amplification workflows.

2.3. Glycerol-Free & Lyophilized RPA Enzymes, Proteins and Kits

Intact Genomics has developed a range of **glycerol-free** and **lyophilized** RPA enzymes designed to meet the evolving needs of modern molecular diagnostics and high-throughput applications.

Why glycerol-free?

Glycerol is commonly used as a cryoprotectant to stabilize enzymes during frozen storage by preventing ice crystal formation. However, it poses challenges by complicating lyophilization (freeze-drying) processes, increasing solution viscosity, slowing pipetting and liquid handling, and limiting precision and reliability in automated workflows.

Benefits of glycerol-free RPA enzymes and kits:

- Reduced solution viscosity for faster, more accurate pipetting
- Improved compatibility with automated, high-throughput systems
- Enhanced consistency and reliability in diagnostic applications

Why lyophilized?

Lyophilized formulations can be kept at room temperature for up to 1 week, eliminating the need for cold-chain shipping and deep cold storage. This is particularly beneficial for point-of-care or field diagnostics, especially in regions with limited access to cold-chain logistics.

Developing glycerol-free enzymes requires careful reformulation, and concentrations and conditions must be fine-tuned to ensure the glycerol-free version performs as effectively as standard formulations.

Intact Genomics' team made necessary adjustments to the manufacturing process to accommodate the new formulation, ensuring consistent quality, even at larger production scales.

Product Name	Cat #	Pkg Size	Conc.
<u>Glycerol-Free T4 UvsX DNA Recombinase</u>	3562GF	100 µg	5µg/µl
	3565GF	500 µg	
	3567GF	1000 µg	
<u>Lyophilized T4 UvsX DNA Recombinase</u>	3562Lyo	100 µg	
	3565Lyo	500 µg	
	3567Lyo	1000 µg	
<u>Glycerol-Free T4 UvsY Protein</u>	3572GF	100 µg	2µg/µl
	3575GF	500 µg	
	3577GF	1000 µg	
<u>Lyophilized T4 UvsY Protein</u>	3572Lyo	100 µg	
	3575Lyo	500 µg	
	3577Lyo	1000 µg	
<u>Glycerol-Free T4 gp32 Protein</u>	3513GF	250 µg	10µg/µl
	3516GF	500 µg	
	3519GF	1000 µg	
<u>Lyophilized T4 gp32 Protein</u>	3513Lyo	250 µg	
	3516Lyo	500 µg	
	3519Lyo	1000 µg	
<u>Glycerol-Free Bsu DNA Polymerase</u>	3582GF	200 units	5 units/µl
	3585GF	1000 units	
<u>Lyophilized Bsu DNA Polymerase</u>	3582Lyo	200 units	
	3585Lyo	1000 units	
<u>Lyophilized IG RPA Master Mix</u>	3545Lyo	25 rxns	
	3547Lyo	100 rxns	
	3549Lyo	500 rxns	

2.4. FastAmp® Viral and Cell Lysis Solution (1x, 5x)

Product Name	Cat #	Pkg Size
<u>FastAmp® Viral and Cell Lysis Solution</u>	4630	12.5 ml, 25 rxns
	4631	50 ml, 100 rxns
	4633	250 ml, 500 rxns
	4636	10 ml, 5x, 100 rxns

Intact Genomics' proprietary **FastAmp® Viral and Cell Lysis Solution** (former name: **FastAmp® DNA, RNA and Cell Solution for Covid 19 Testing**) can be utilized for saliva/swab samples resulting in viral/cell lysis and significantly simplifying this process. This solution streamlines specimen collection and DNA or RNA preparation processes including sample collection, transport, maintenance, viral/cell lysis, and viral RNA stabilization. After using the solution, the lysed DNA or RNA may be directly used in PCR, RT-qPCR, RT-isothermal DNA amplification, without the need for an RNA extraction step.

RNase Inactivated in Saliva by IG FastAmp® Lysis Solution

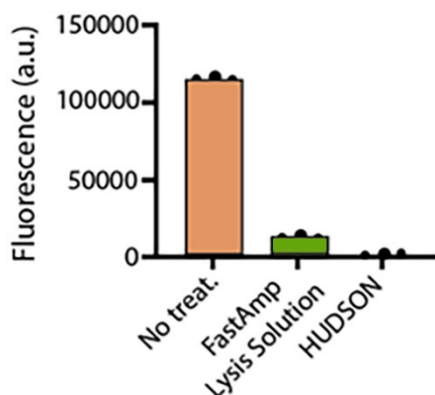


Figure 5: Simplified Cas13-based assays for the fast identification of SARS-CoV-2 and its variants. Nat Biomed Eng. 2022 August ; 6(8): 932–943. doi:10.1038/s41551-022-00889-z.

Intact Genomics **FastAmp® Viral and Cell Lysis Solution** can be used with various samples and cell types stabilizing and prepping DNA or RNA for subsequent PCR or cDNA synthesis, saving your team significant time and resources.

Benefits:

- No DNA or RNA extraction is needed
- Safe for viral sample transport and maintenance
- Compatible with various types of tissues including plants
- Compatible with different detection technologies
- Increased efficiency, specificity, and sensitivity

- Low toxicity to humans/environment
- Results approved and published by top scientists

3. Why Intact Genomics is the top choice for RPA needs?

Intact Genomics provides powerful tools for RPA optimization, offering high-quality enzymes in convenient formats (Regular, Glycerol-Free, or Lyophilized), along with FastAmp® cell and viral lysis solutions and kits. These products give customers the confidence to independently develop unique amplification assays for rapid testing across diverse applications in human health, agriculture, next-generation sequencing, and beyond.

Customers worldwide chose Intact Genomics as the top choice for RPA needs because we deliver:

3.1. ISO 13485:2016 Certified

Since 2016, Intact Genomics has developed and manufactured high-quality RPA enzymes for customers worldwide. All enzymes and kits are thoroughly tested for activity, purity and concentration under an ISO 13485:2016 certified quality management system.

We use an orthogonal, three-part approach to determine enzyme concentration, ensuring consistent and reliable RPA enzymes and kits. Protein is quantified by three measurements: (1) densitometry following polyacrylamide gel electrophoresis (PAGE), (2) UV absorbance spectra of the pure protein, and (3) a protein standard assay such as the bicinchoninic acid (BCA) assay, using bovine serum albumin (BSA) as the reference standard.

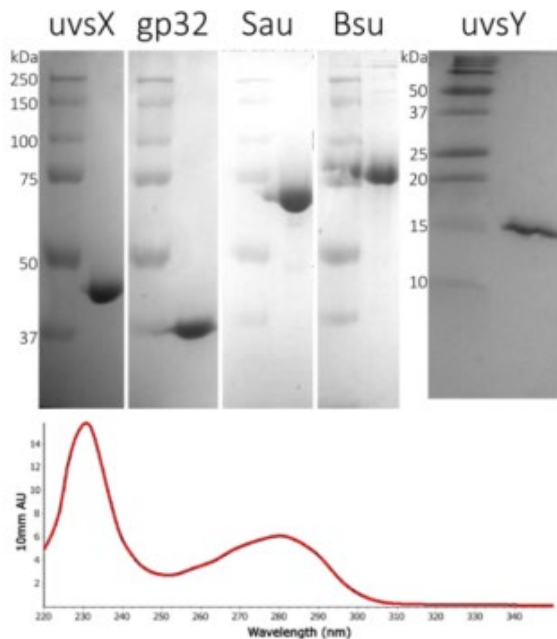


Figure 6: SDS-PAGE images (Top panel) of IG's enzymes show enzyme purity. 2 µg enzyme were loaded in each lane. Bottom panel shows a typical UV-absorbance spectrum of one of our enzymes. UV spectra are used for enzyme quantification.

3.2. Customization, OEM and Bulk Pricing

Our RPA products are available in a range of concentrations and formats to support diverse applications, and we offer customization of enzymes and reagent mixes to meet specific customer requirements.

Our capabilities include:

- Customized product formulation assays
- Fit our clients' applications
- Bulk fills or aliquoting into tubes or plates
- Tailored labeling and packaging
- Glycerol-free, lyophilized, or buffer formulations of your choice

We also offer competitive bulk order pricing to help reduce customer costs. Please contact us at sales@intactgenomics.com for a free, no obligation quote.

3.3. Expert Support

Intact Genomics' R&D and production teams are comprised of experts in isothermal DNA/RNA amplification and large DNA fragment cloning technologies. Our team provides technical support and consultation to help customers validate and optimize protocols, ensuring successful implementation of our products in your applications.

Intact Genomics (IG[®]) is committed to customer satisfaction and product quality. Every production lot undergoes rigorous testing to ensure it meets our high-quality standards and delivers reliable performance. Our quality management system is certified to ISO 13485 standards.

Please follow product instructions and contact us if additional technical assistance is needed. We value your business and welcome your feedback regarding product performance in your applications.

Our hours are Monday - Friday, 8:30AM to 5PM, U.S. central standard time.

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4. References

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5. Trademarks

Intact Genomics owns the following registered trademarks granted by the United States Patent and Trademark Office (USPTO): *Intact Genomics*[®], *IG*[®], *ig*[®], *FastAmp*[®], *i7*[®], *DirectPlate*[®].