Tools for DNA cloning

A range of products from restriction enzymes to custom gene synthesis

We’ve provided superior tools for DNA cloning for 30 years, continually improving existing technologies and developing new ones.

Invitrogen™ GeneArt™ Gene Synthesis Service offers a comprehensive portfolio of tools and resources— from restriction enzymes to fully cloned genes— to help you save time and money while obtaining high-quality DNA to facilitate your next discovery.
Methods used for DNA cloning

**Thermo Scientific™ FastDigest™ restriction enzymes**
- Convenient single-buffer system of 176 restriction enzymes and 8 modifying enzymes
- Excellent for subcloning
- Single or multiple digestion in 5–15 min and no star activity
- Direct loading of reaction mixture on gels

**Invitrogen™ TOPO™ cloning technology**
- Excellent choice for subcloning and sequencing of PCR or other DNA fragments
- 95% efficiency and fast 5 min reactions
- Expression and Gateway entry formats also available
- Vectors come bound with DNA topoisomerase I, which functions as a ligase

**Invitrogen™ Gateway™ cloning technology**
- Flexible system for shuttling between various protein expression systems, such as mammalian and bacterial
- No need to reclone or resequence DNA
- Uses site-specific recombination technology

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thermofisher.com/fastdigest
thermofisher.com/fastdigesttypeiis
thermofisher.com/topo
thermofisher.com/gateway
**Invitrogen™ GeneArt™ Gibson Assembly® technology**

- Homologous overlap design to clone anywhere from 1 to 15 fragments without scars
- Choice of Invitrogen™ GeneArt™ Gibson Assembly® Cloning HiFi or EX Kits for simple to highly complex cloning
- Available as full cloning kits with chemically and electrocompetent cells or master mix formats for maximum flexibility
- Can be used to build entire genomes de novo

**Invitrogen™ GeneArt™ Strings™ DNA fragments**

- Synthetic DNA fragments, ready to clone
- Specify ends to facilitate cloning method of choice
- No starting DNA required
- Free optimization of gene with Invitrogen™ GeneOptimizer™ software for maximum protein expression
- Libraries with full IUPAC code of mixed, randomized DNA nucleotide options also available

**Invitrogen™ GeneArt™ Type IIs Assembly Kits**

- Directionally clone up to 8 fragments at one time
- Great for cloning repetitive or small inserts
- Uses simultaneous cleavage and ligation; not based on recombination

**GeneArt Gene Synthesis**

- Synthetic gene, ready to transfet
- Select from several vectors (custom options available)
- 100% sequence-verified and ready for downstream applications
- No starting DNA required
- Free optimization of gene with GeneOptimizer software for maximum protein expression

thermofisher.com/gibsonassembly

thermofisher.com/strings

thermofisher.com/genesynthesis
<table>
<thead>
<tr>
<th>Needs DNA source material (plasmid with gene, library, etc.)</th>
<th>Fast Digest restriction enzymes</th>
<th>TOPO technology/TA cloning kits</th>
<th>Gateway cloning system</th>
<th>GeneArt Gibson Assembly cloning and type IIs assembly kits</th>
<th>GeneArt Strings DNA fragments and gene synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Requires knowledge of sequence</td>
<td>Some</td>
<td>Some</td>
<td>Some</td>
<td>Some</td>
<td>Yes</td>
</tr>
<tr>
<td>Sequence optimization and easy mutagenesis</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Strings DNA Fragments: Yes, Gene Synthesis: No</td>
</tr>
<tr>
<td>Requires vector</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Strings DNA Fragments: Yes, Gene Synthesis: No</td>
</tr>
<tr>
<td>Online tools available</td>
<td>Vector selection tool</td>
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<td>Vector selection tool</td>
<td>Invitrogen® GeneArt® Primer and Construct Design Tool</td>
<td>Invitrogen® GeneArt® portal for design and optimization</td>
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<tr>
<td>Simplified traditional cloning</td>
<td>Best choice</td>
<td>Best choice</td>
<td>Best choice</td>
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<td>Fast and reliable PCR product or DNA fragment cloning</td>
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<td>Shuttle between a variety of host vector systems</td>
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<td>Easy assembly of multiple DNA fragments</td>
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<tr>
<td>Optimized sequence, easy mutation, and 100% sequence-verified</td>
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<tr>
<td>Recommended additional materials</td>
<td>Ligation enzymes</td>
<td>Competent cells</td>
<td>Gateway cloning kit with competent cells</td>
<td>PCR cloning kit with competent cells, GeneArt Strings DNA Fragments</td>
<td>Subcloning and plasmid prep services, Mutagenesis or gene variants, Libraries</td>
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<tr>
<td></td>
<td>Cleanup kit</td>
<td>Purification kit</td>
<td>Invitrogen™ Gateway™ BP Clonase™ and LR Clonase™ enzymes</td>
<td>Purification kit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competent cells</td>
<td>GeneArt Strings DNA Fragments</td>
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<td></td>
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<tr>
<td></td>
<td>Purification kit</td>
<td></td>
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<tr>
<td>The bottom line</td>
<td>Good for subcloning into a multiple cloning site</td>
<td>Good for cloning PCR products and GeneArt Strings DNA Fragments</td>
<td>Good for protein expression in multiple systems, such as bacterial and mammalian</td>
<td>Good for simultaneous, multi-fragment cloning</td>
<td>Get your gene of interest ready to use, Focus on your research while we take care of the cloning</td>
</tr>
</tbody>
</table>

Find out more at [thermofisher.com/cloning](http://thermofisher.com/cloning)