

IBA

BioTAGnology

www.stargate-cloning.com

Newsletter

Issue 5

StarGate® Special

StarGate®

The new dimension
of combinatorial
cloning



IBA Product of the Year

Transfer any gene of interest systematically into *E. coli*, yeast, mammalian (etc.) background with high speed and convenience to screen for the optimal host/tag combination

StarGate® - Combinatorial Cloning in one Tube

Introduction

Efficient procedures to generate functional recombinant proteins or protein complexes are of key importance in state-of-the-art life sciences. Many tools like **various expression hosts** (bacteria, yeast, insect and mammalian cells), **promoters**, **affinity or fluorescent tags** are currently available to express, purify, detect or immobilize recombinant proteins. Due to the diverse nature of proteins, however, it is impossible to predict which combination of these tools will perform best. Therefore, many have to be tried to identify the optimal solution.

To systemize and accelerate this initial search which is crucial for successful subsequent proteomic research, we have developed the **StarGate Cloning System**. StarGate offers **rapid and highly efficient subcloning** of an arbitrary gene – initially cloned into a Donor Vector - to simultaneously fuse it with many different genetic surroundings via transfer into Acceptor Vectors to generate Destination Vectors. The latter enable the efficient expression of your protein with various features (e.g. different tags and different promoters) in different hosts.

Key Advantages of StarGate® are

- Minimal modification of the gene of interest due to **short combinatorial sites (4 bases only)**
- **Easy-to-handle** subcloning procedure
- Systematic screening of different elements (e.g. tags/promoters) in a **variety of hosts**
- Inherent **high level cloning efficiency** due to a directed reaction (no equilibrium)
- Availability of a **multitude of combinatorial sites** for combinatorial cloning

The TAGnology

StarGate is a technology that allows the systematic combination of promoters (i.e. hosts), purification tag sequences or other genetic elements with any gene of interest (GOI) in a convenient cloning system. The core element of this new technology is the site-specific combinatorial enzyme **StarCombinase™**, that makes **cloning versatile, fast, easy and safe**.

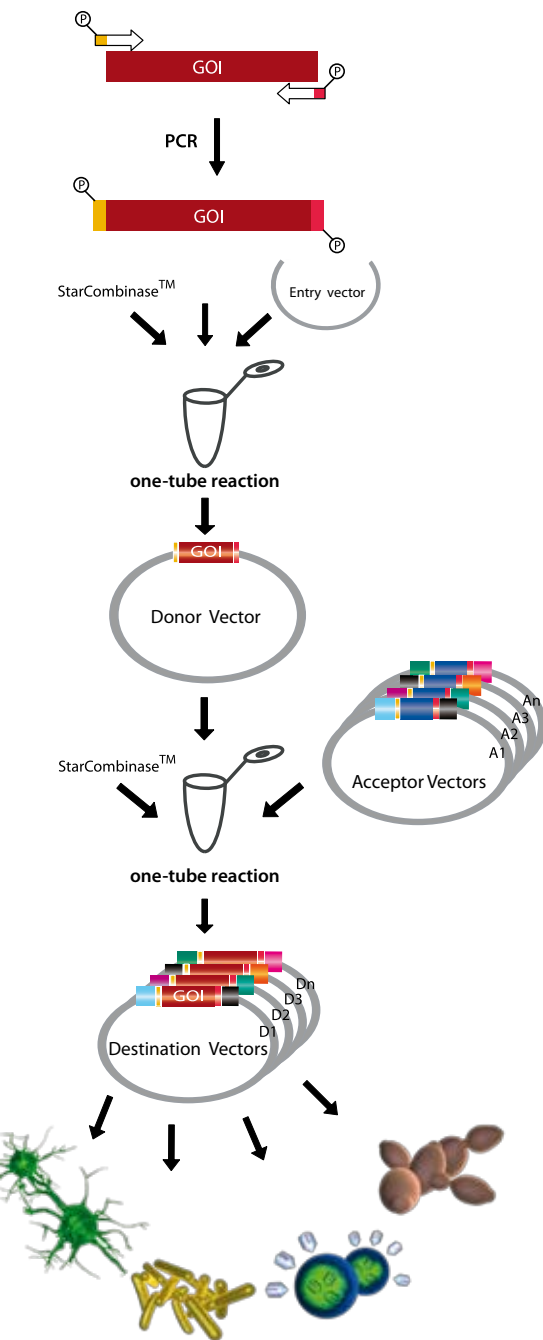
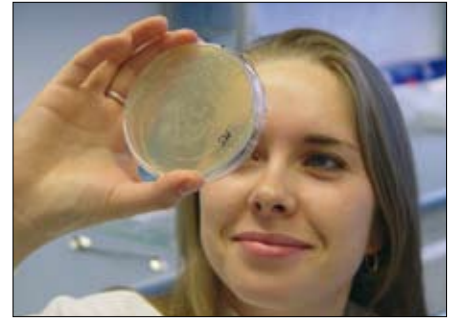
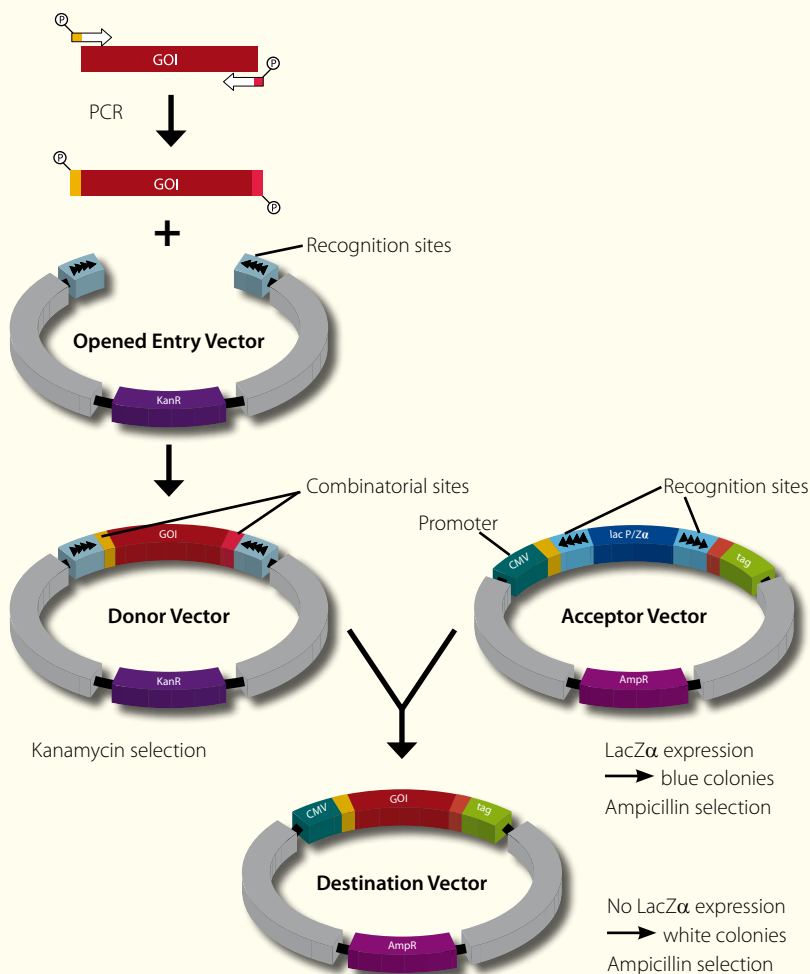


Fig. 1: In a first step, the gene of interest (GOI) is equipped at both ends with combinatorial sites (4 bases) by PCR and is inserted into an Entry Vector by a simple one-tube reaction. After sequence confirmation, the resulting Donor Vector is the origin for the highly parallel subcloning of GOI into a multitude of Acceptor Vectors, each providing a different genetic surrounding like host specific promoters and different purification tags by a second simple one-tube reaction. The resulting Destination Vectors are then transformed into the corresponding host cells for further experiments.

The StarGate® Top Benefits

- **One-tube** subcloning procedure (1 hour)
- Cutting bands out of gels becomes superfluous
- Extremely short combinatorial sites have **minimal effect on the gene of interest***
- Improved screening of **different host/tag combinations**
- Acceptor Vectors for different hosts with correlating features always yield **exactly the same protein sequence**
- **Highest level cloning efficiency** due to a directed reaction (no equilibrium)
- Once Donor Vector is sequenced no further verification is required
- **Polycistronic** gene expression readily accessible
- Easy generation of **fusion proteins**
- Versatile **mutagenesis** system with StarPrimerD'Signer software
- **Cost-effective** StarGate products and services
- **Royalty-free License Policy** ("OpenGate®", see page 11)

StarGate® Destination Vector Generation in Detail



* therefore, the protein is not significantly modified by unwanted extra amino acids and its expression is not hampered by ribosomal frameshifting like in other systems (Belfield, NAR 2007)

Fig. 2: The Entry Vector is provided in opened, dephosphorylated form to prevent religation. It reacts with a phosphorylated blunt end PCR product comprising GOI with flanking combinatorial sites.

In a second step, the GOI may be transferred from the Donor Vector into various Acceptor Vectors providing the desired genetic surrounding (i.e. tag, promoter, signal sequence etc.) by means of Star-Combinase to create corresponding Destination Vectors. The desired *E. coli* clones carrying a Destination Vector can easily be identified through blue/white selection (cf. Figure 9). The Destination Vector of this example places the GOI under control of the CMV promoter allowing GOI expression in mammalian cells. In addition, a tag is fused to the C-terminal end of the GOI expression product.

StarGate® Acceptor Vectors

Acceptor Vectors for four different hosts and with four different tags are presently available!

		pASG-IBA		pPSG-IBA		Signal sequence				N-terminal tag				CS*	Gene of Interest	CS*	C-terminal tag			
		Cat. No.	Name	Cat. No.	Name	no tag	OmpA	BM40	Strep-tag II	One-STrEP-tag	6xHistidine-tag	GST-tag** with PSC site		GOI		Strep-tag II	One-STrEP-tag	6xHistidine-tag		
E. coli	Tet (pASG-IBA) or T7 (pPSG-IBA) Promoter	Cytosolic expression		5-4000-005	pASG-IBAw1	5-4200-005	pPSG-IBAw1													
		5-4005-005	pASG-IBA5	5-4205-005	pPSG-IBA5															
		5-4105-005	pASG-IBA105	5-4305-005	pPSG-IBA105															
		5-4035-005	pASG-IBA35	5-4235-005	pPSG-IBA35															
		5-4025-005	pASG-IBA25	5-4225-005	pPSG-IBA25															
		5-4003-005	pASG-IBA3	5-4203-005	pPSG-IBA3															
		5-4103-005	pASG-IBA103	5-4303-005	pPSG-IBA103															
		5-4033-005	pASG-IBA33	5-4233-005	pPSG-IBA33															
		5-4045-005	pASG-IBA45	5-4245-005	pPSG-IBA45															
		5-4145-005	pASG-IBA145	5-4345-005	pPSG-IBA145															
		5-4043-005	pASG-IBA43	5-4243-005	pPSG-IBA43															
		5-4143-005	pASG-IBA143	5-4343-005	pPSG-IBA143															
		5-4023-005	pASG-IBA23	5-4223-005	pPSG-IBA23															
		5-4123-005	pASG-IBA123	5-4323-005	pPSG-IBA123															
		Periplasmic expression		5-4001-005	pASG-IBAw12															
		5-4004-005	pASG-IBA4																	
		5-4104-005	pASG-IBA104																	
		5-4044-005	pASG-IBA44																	
5-4144-005	pASG-IBA144																			
5-4002-005	pASG-IBA2																			
5-4102-005	pASG-IBA102																			

		pESG-IBA		Signal sequence				N-terminal tag				CS*	Gene of Interest	CS*	C-terminal tag				
		Cat. No.	Name	no tag	OmpA	BM40	Strep-tag II	One-STrEP-tag	6xHistidine-tag	GST-tag** with PSC site		GOI		Strep-tag II	One-STrEP-tag	6xHistidine-tag			
Mammalia	CMV Promoter	Cytosolic expression		5-4400-005	pESG-IBAw1														
		5-4405-005	pESG-IBA5																
		5-4505-005	pESG-IBA105																
		5-4435-005	pESG-IBA35																
		5-4403-005	pESG-IBA3																
		5-4503-005	pESG-IBA103																
		5-4433-005	pESG-IBA33																
		5-4445-005	pESG-IBA45																
		5-4545-005	pESG-IBA145																
		5-4443-005	pESG-IBA43																
		5-4543-005	pESG-IBA143																
		Secretion		5-4401-005	pESG-IBAw12														
		5-4504-005	pESG-IBA104																
		5-4502-005	pESG-IBA102																
5-4544-005	pESG-IBA144																		
5-4542-005	pESG-IBA142																		

		pYSG-IBA		Signal sequence				N-terminal tag				CS*	Gene of Interest	CS*	C-terminal tag			
		Cat. No.	Name	no tag	OmpA	BM40	Strep-tag II	One-STrEP-tag	6xHistidine-tag	GST-tag** with PSC site		GOI		Strep-tag II	One-STrEP-tag	6xHistidine-tag		
Yeast	CUP1 Promoter	Cytosolic expression		5-4600-005	pYSG-IBAw1													
		5-4605-005	pYSG-IBA5															
		5-4705-005	pYSG-IBA105															
		5-4635-005	pYSG-IBA35															
		5-4625-005	pYSG-IBA25															
		5-4603-005	pYSG-IBA3															
		5-4703-005	pYSG-IBA103															
		5-4633-005	pYSG-IBA33															
		5-4645-005	pYSG-IBA45															
		5-4745-005	pYSG-IBA145															
		5-4643-005	pYSG-IBA43															
		5-4743-005	pYSG-IBA143															
		5-4623-005	pYSG-IBA23															
		5-4723-005	pYSG-IBA123															

		pLSG-IBA		Signal sequence				N-terminal tag				CS*	Gene of Interest	CS*	C-terminal tag				
		Cat. No.	Name	no tag	OmpA	BM40	Strep-tag II	One-STrEP-tag	6xHistidine-tag	GST-tag** with PSC site		GOI		Strep-tag II	One-STrEP-tag	6xHistidine-tag			
Baculovirus	Polyhedrin Promoter	Cytosolic expression		5-4800-005	pLSG-IBAw1														
		5-4805-005	pLSG-IBA5																
		5-4905-005	pLSG-IBA105																
		5-4835-005	pLSG-IBA35																
		5-4825-005	pLSG-IBA25																
		5-4803-005	pLSG-IBA3																
		5-4903-005	pLSG-IBA103																
		5-4833-005	pLSG-IBA33																
		5-4845-005	pLSG-IBA45																
		5-4945-005	pLSG-IBA145																
		5-4843-005	pLSG-IBA43																
		5-4943-005	pLSG-IBA143																
		5-4823-005	pLSG-IBA23																
		5-4923-005	pLSG-IBA123																
		Secretion		5-4801-005	pLSG-IBAw12														
		5-4904-005	pLSG-IBA104																
		5-4902-005	pLSG-IBA102																
		5-4944-005	pLSG-IBA144																
5-4942-005	pLSG-IBA142																		

Further tailor-made Acceptor Vectors are available on request. Vector list to be expanded. Latest version see www.stargate-cloning.com. *CS signifies "combinatorial site". **GST-tags always include a PreScission™ (PSC) protease cleavage site. For all other tag cleavage sites please refer to the IBA custom service, page 8.

StarGate® Acceptor Vector Backbone Descriptions

pASG-IBA vectors

- High-level expression in *E. coli*, also for toxic proteins
- Tightly regulated expression due to anhydrotetracycline (AHT) inducible tetA promoter/operator
- Option for periplasmic expression due to ompA signal sequence
- No catabolite repression - no influence of medium components
- Not influenced by the genetic background – wide choice of *E. coli* expression strains
- Inexpensive induction with AHT.

pPSG-IBA vectors

- High-level expression in *E. coli* by bacteriophage T7 promoter
- High-level transcription by T7 RNA polymerase in BL21 strains
- High-level expression of non-toxic proteins
- Induction by IPTG
- Suitable for *in vitro* transcription/translation

pESG-IBA vectors

- High-level constitutive expression in **mammalian cells** by the CMV promoter
- Neomycin resistance for generation of stable cell lines
- ColEI ori and ampicillin resistance gene support propagation in *E. coli*
- BM40 option for secretion of protein into the medium

pYSG-IBA vectors

- High-level expression in **yeast**
- Tightly regulated expression due to Cu⁺⁺-inducible CUP1 promoter
- Ampicillin resistance gene and markers leu2-d and URA3
- High copy number under selection of leu2-d marker for maximum expression level

pLSG-IBA vectors

- Cloning and expression of recombinant proteins in **insect cells**
- Polyhedrin promoter drives high-level expression of the insert
- pUC ori and ampicillin resistance gene support propagation in *E. coli*

Destination Vector expression cassettes see www.stargate-cloning.com.

Tailor-made backbones on request, see page 8.

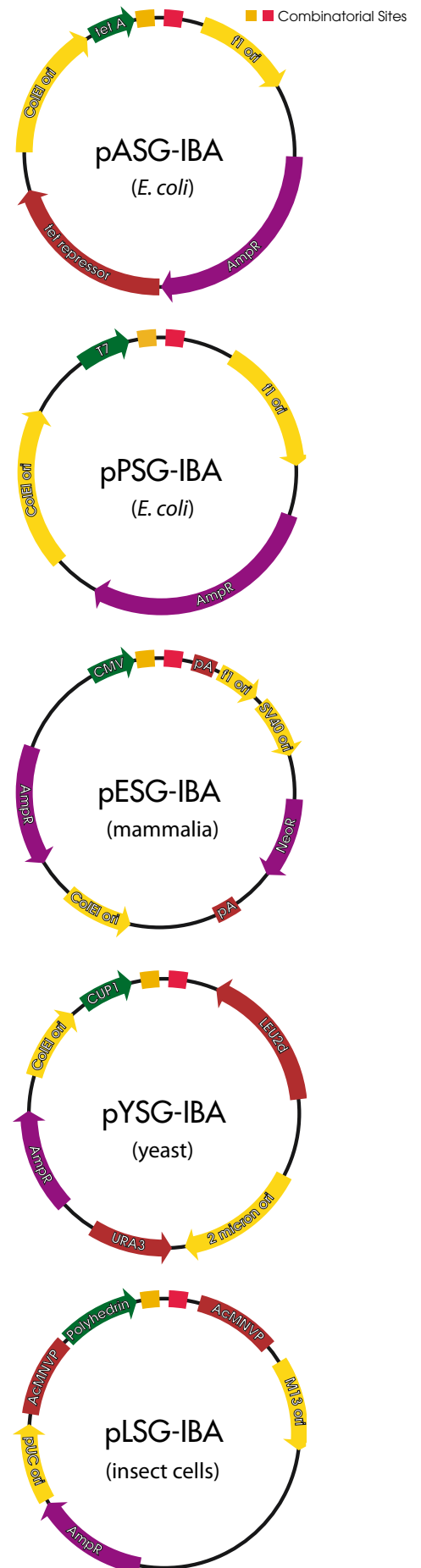


Fig. 3: StarGate® Acceptor Vectors.

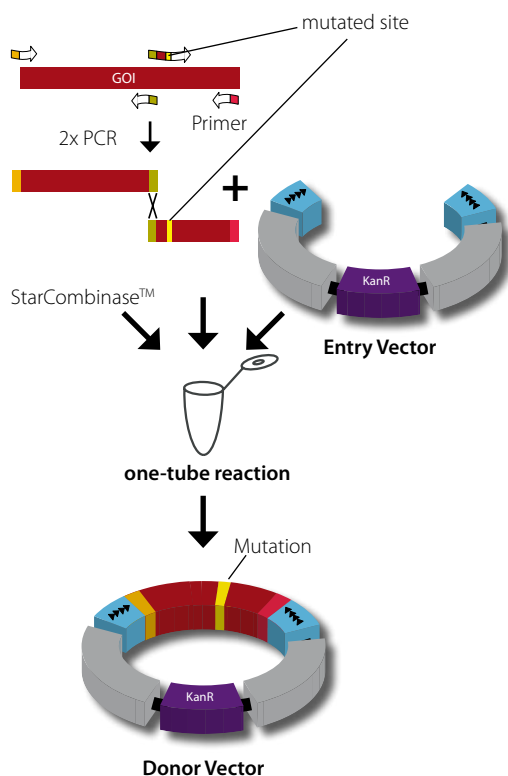


Fig. 4: Construction of Donor Vector with mutated GOI.



Fig. 5: StarPrimer D'Signer Software start page.



Fig. 6: Oligonucleotide synthesis at IBA.

StarGate® Mutagenesis Technology ("StarChange")

The StarGate Mutagenesis Entry Cloning Set is a convenient tool for site-specific modification of the gene of interest - within a sequence stretch of up to 80 bases in length - during generation of the Donor Vector. The only difference to the standard procedure described on pages 2 and 3 is that two PCRs have to be performed instead of a single PCR whereby the gene internal PCR primers introduce the desired nucleic acid sequence changes. The design of the essential primers is performed using IBA's easy-to-use software "StarPrimer D'Signer" coming with the set (see below). To design the primers the sequence of the gene of interest (GOI) as present in the template as well as the desired mutated gene sequence simply have to be pasted into the respective StarPrimer D'Signer sequence windows. The software displays the sequence of the desired primers, which can then be ordered at the IBA Gene TAGnology division. Once PCR has been performed using the StarPrimer D'Signer developed primers, both PCR products are mixed with pENTRY-IBA and StarCombinase and are incubated for one hour. After transformation, *E. coli* clones harbouring the desired Donor clone with the mutated GOI can be easily detected using blue/white selection.

StarPrimer D'Signer Software 2.0

Innovative tool for StarGate® Mutagenesis System

As described above, the StarPrimer D'Signer is an easy-to-use software to facilitate the design of primers for introducing mutations into a gene of interest (GOI), which is then transferred into a StarGate Entry Vector to create a Donor Vector.

In addition, the software can also be used for primers designed for Standard StarGate Entry Cloning.

The Microsoft Windows software comes free of charge with the system and is also available for download at <http://www.iba-go.com/download.html> (<1 MB).

PTO Protected Primers

We recommend the use of 3' phosphorothioate (PTO) protected oligonucleotides which are protected against the exonuclease activity of Proof Reading Polymerases. These Primers can be directly ordered at IBA's Gene TAGnology division, which offers excellent custom service for synthesis of a wide range of high quality nucleic acid specialties at competitive prices.

Place oligo orders at
oligo@iba-go.com
or use our brand-new online shop at
www.iba-bioTAGnology.com
 (see also back side).

Order Information

To perform the complete StarGate® Cloning procedure, you require one of the **Entry Cloning Sets** (Standard or Mutagenesis) and the products listed under "Transfer reaction".

Cat. no.	StarGate® products
Entry reaction	
5-1601-000	StarGate® Standard Entry Cloning Set consisting of - StarGate® Entry Reagent Set (Entry Vector pENTRY-IBA10 (20 rxns), StarSolution E (20 rxns), For/Rev Sequencing Primer, DNA Ruler) - Competent <i>E. coli</i> Top10 cells (20 rxns)
5-1602-000	StarGate® Mutagenesis Entry Cloning Set consisting of - StarGate® Mutagenesis Reagent Set (Entry Vector pENTRY-IBA20 (5 rxns), StarSolution M1 (5 rxns), M2 (5 rxns), M3 (5 rxns), For/Rev Sequencing Primer, DNA Ruler) - Competent <i>E. coli</i> Top10 cells (5 rxns)
Transfer reaction	
5-1603-001	StarGate® Transfer Reagent Set consisting of StarSolutions A1, A2, A3 (20 rxns)
5-1600-020	Competent <i>E. coli</i> TOP10 cells (20 rxns)
Choose catalog number from "Acceptor Vector Overview Table" on page 4	Acceptor Vectors The more vectors you select, the higher the discount (5 rxns each).

Note: See price list for Acceptor Vector sequencing primers.

StarGate® Newcomer Set: 50% Discount!

For StarGate® newcomers! Please enjoy a 50% discount for the StarGate® Newcomer Set which provides all products required to perform the entire StarGate® procedure. Please choose number and type of Acceptor Vectors according to your needs and order them separately.

Cat. no.	StarGate® product required to get started	Discount
5-1600-998	StarGate® Newcomer Set consisting of - StarGate® Entry Reagent Set - StarGate® Transfer Reagent Set - Competent <i>E. coli</i> Top10 cells (20 rxns) - Control for Entry and Transfer reaction	50% compared to individual set prices
Choose catalog number from "Acceptor Vector Overview Table" on page 4	Acceptor Vectors The more vectors you select, the higher the discount (5 rxns each).	up to 50%

High quality, HPLC purified and PTO protected
custom cloning primers
for StarGate®
can be obtained at the IBA Gene TAGnologies department;
refer to
www.iba-bioTAGnology.com.

StarGate® Components

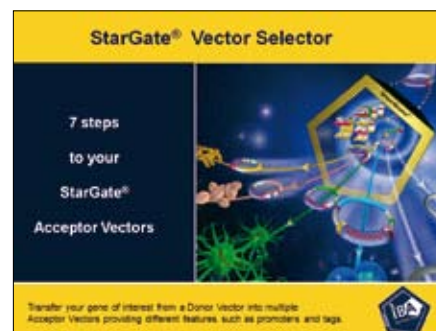
Components supplied by IBA:

- Entry Vector pENTRY-IBA
- Forward and reverse sequencing primers
- Competent *E. coli* Top10 cells
- Individual custom primer synthesis for amplification of your GOI
- Acceptor Vectors:
pASG (*E. coli*, Tet promoter),
pPSG (*E. coli*, T7 promoter),
pESG (Mammalia, CMV promoter),
pYSG (Yeast, CUP1 promoter),
pLSG (Insect cells, Polyhedrin promoter)
- StarSolutions
- StarPrimer D´Signer Software
- StarGate® Vector Selector Software
- DNA Ruler

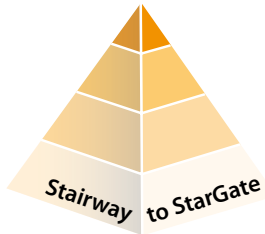
Additionally required:

- Pfu DNA polymerase and reagents
- LB agar plates with Kanamycin (Ampicillin) and X-Gal

Select your Acceptor Vectors conveniently with the new StarGate® Vector Selector Software



To select the vectors suited best for your application use our new online tool "StarGate® Vector Selector" helping you to choose your required vectors easily. See www.stargate-cloning.com.



Custom StarGate® Services

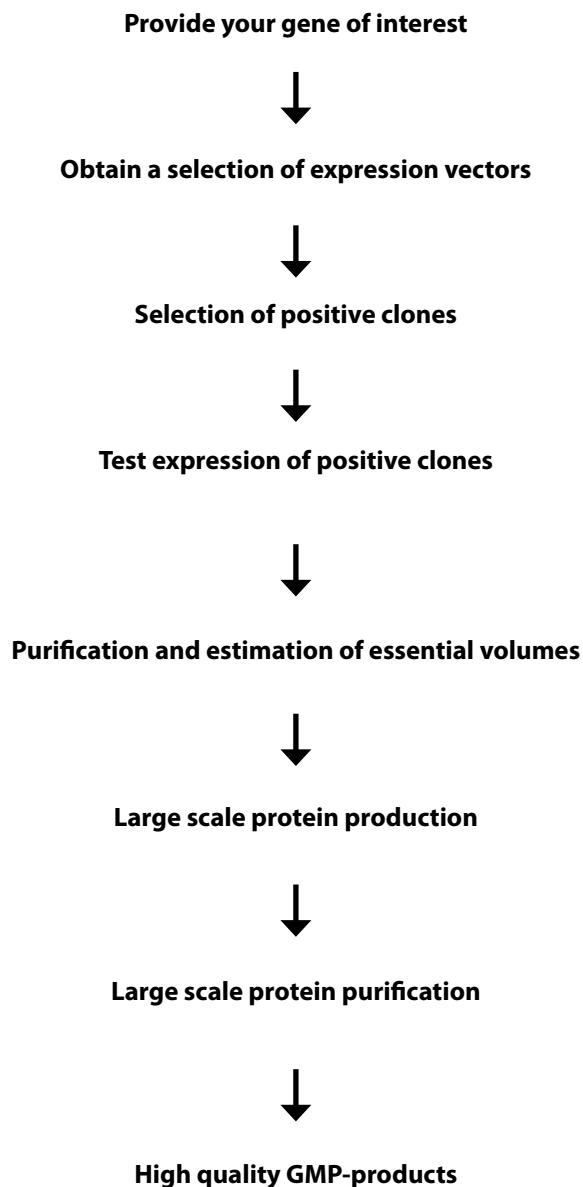
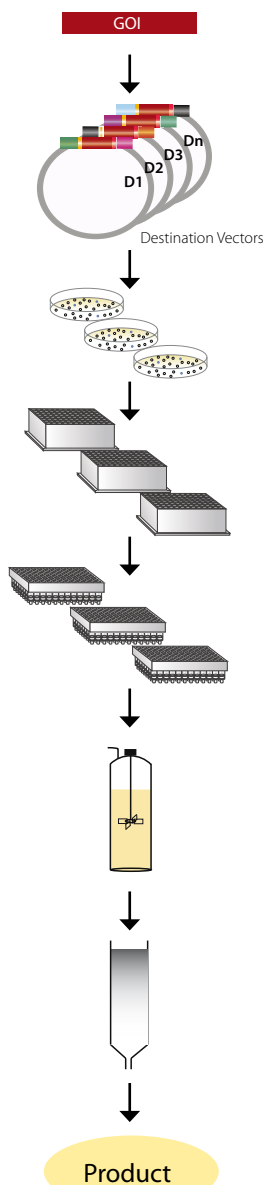
Tailor-made Acceptor Vectors, Cloning, Protein Expression and Purification

Using our expertise and access to innovative technologies, IBA/IBA Biologics is able to offer a comprehensive service from gene to protein. Contact our experts at service@iba-go.com for your specific quote.

Our strengths

- Expertise in cloning and large scale expression
- Access to innovative StarGate technology
- Variety of available vector elements offers high flexibility to customer needs
- High output within short time periods
- Low cost

Custom Service Work Flow



StarGate® in the Context of IBA Products

Request the complete IBA Portfolio Folder free of charge at www.iba-go.com/lit.html

IBA Product

Advantages



- Rapid uncomplicated cloning
- Variety of Acceptor Vectors with different elements e.g. tags/promoters
- Parallel screening for optimal protein expression
- Inherent cloning efficiency
- StarPrimerD'Signer software supported with high quality custom DNA oligonucleotide synthesis
- Convenient lysate preparation optimized for *Strep*-tag applications
- The perfect solution for automated high-throughput purification of *Strep*-tag proteins
- Strong expertise in large scale protein production, also under GMP
- Approved one-step protein purification; highly pure protein
- Magnet Assisted Transfection: highly efficient and easy-to-handle transfection technology



StarGate®

IBA-lyse

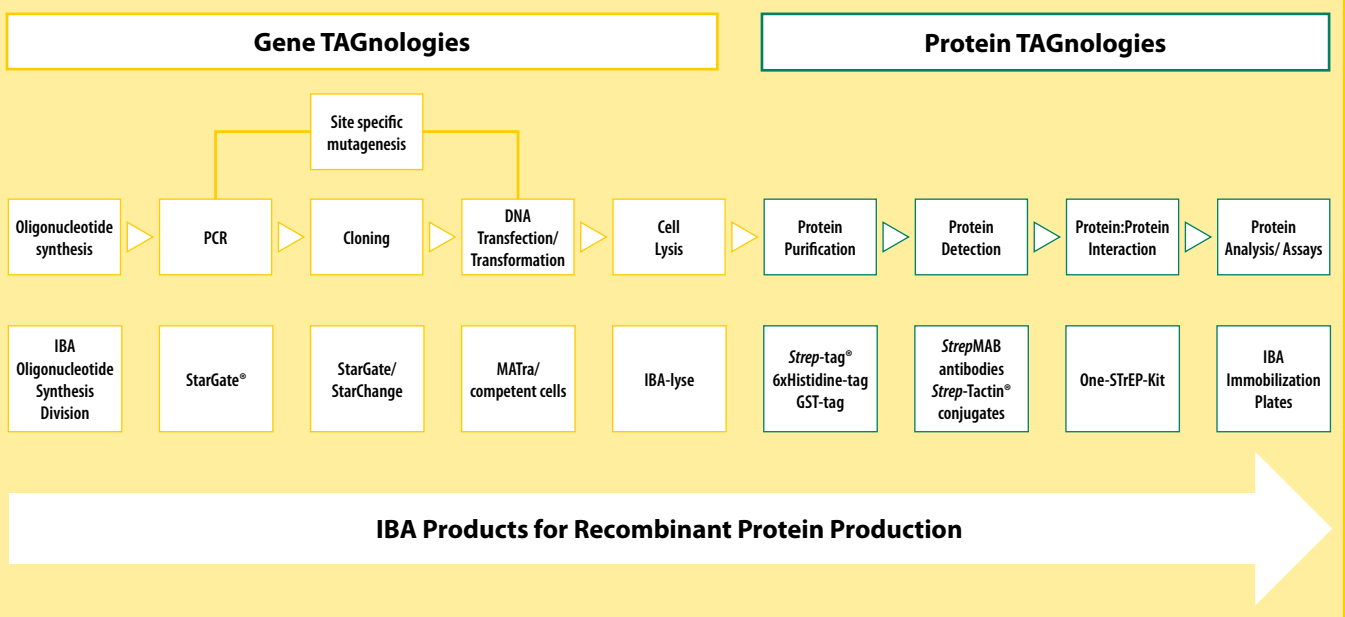
StrepWell

IBA Biologics

Strep-tag®

MATra

IBA Process Map of Recombinant Proteins



StarGate® Data

Efficient Subcloning using the StarGate System

Fig. 8:

Using StarCombinase™ the gene for GFP was transferred from a Donor Vector into a pPSG-IBA Acceptor Vector. After an 1 hour incubation, *E. coli* was transformed with the reaction mixture. All resulting clones exhibited green fluorescence by GFP expression. This provides evidence that the StarGate subcloning reaction had performed accurately and reliably to put the GFP gene under control of the T7 promoter.

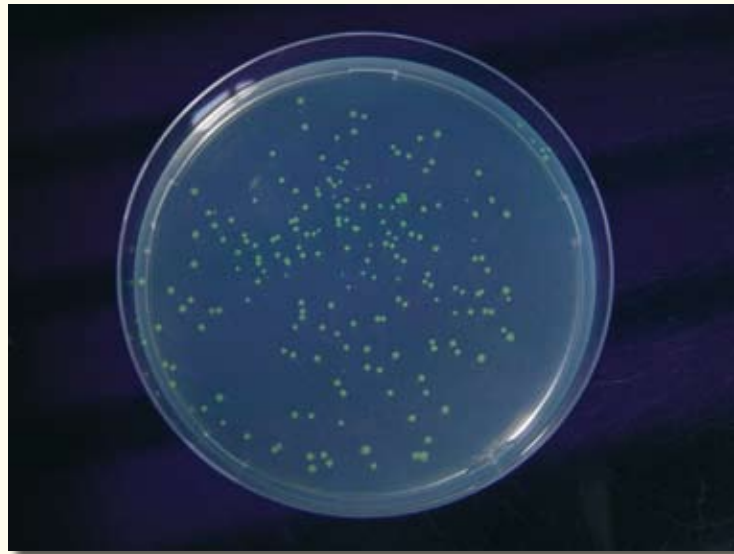


Fig. 8: See text on the left.

Reaction Efficiency >99%

Fig. 9:

Transformation of *E. coli* with a StarGate transfer reaction mixture typically leads to more than thousand white colonies harbouring the desired Destination Vector. The presence of a few blue colonies only indicates a reaction efficiency far beyond 99%.

Transfer Efficiency is Independent of Gene Size

Fig. 10 and 11:

The green fluorescent protein (GFP, 700 bp), bacterial alkaline phosphatase (BAP, 1400 bp) and T7 RNA polymerase (T7RNAP, 2650 bp) were transferred from the respective Donor Vector into all available Acceptor Vectors (cf. Table, page 4). The result provides evidence that the StarGate subcloning procedure is almost not influenced by the length of the transferred gene and that even large genes can be transferred efficiently.

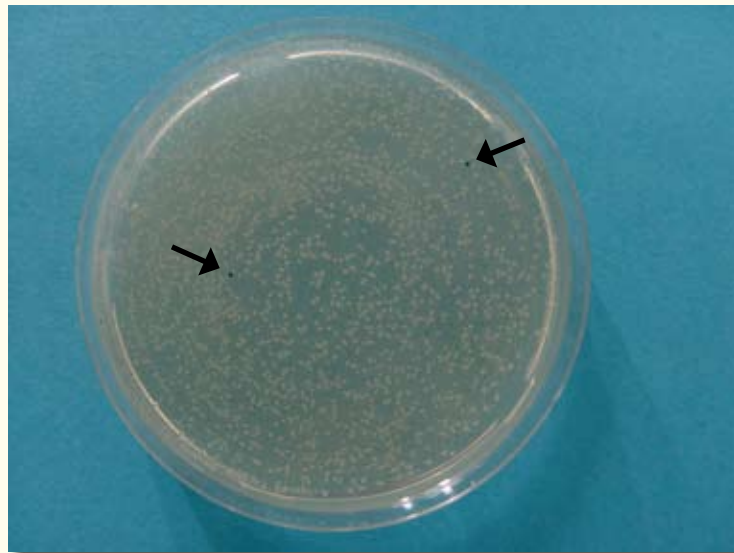


Fig. 9: See text on the left.

Transfer efficiency and fragment size

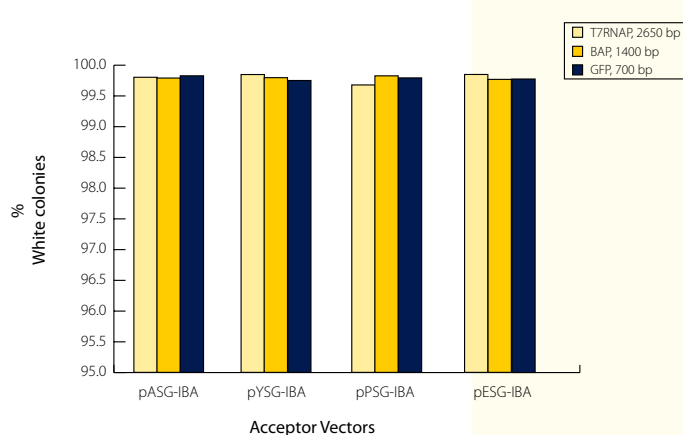


Fig. 10: See text above.

Colony numbers and fragment size

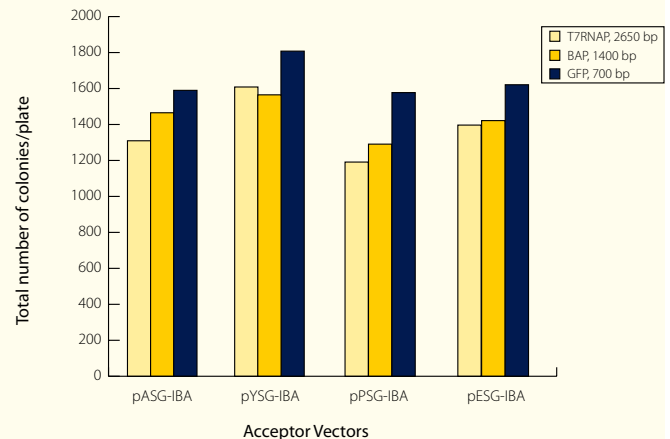


Fig. 11: See text above.

Patents and Licensing

OpenGate® Licensing Policy

StarGate® subcloning technology is protected by world-wide patent applications exclusively licensed to IBA. Purchase of reagents related to this technology from IBA provides a license for non-profit and in-house research use only. Any application of above mentioned technology for commercial purpose requires a separate license from IBA. A license may be granted by IBA on a case-by-case basis, and is entirely at IBA's discretion. Please contact IBA (IBA GmbH, Rudolf-Wissell-Str. 28, 37079 Göttingen, Germany) for further information on licenses for commercial use.

No commercial use licenses are required for key customers (e.g. if a supply agreement for StarGate products is emplaced - **OpenGate**).

Other IBA patents, licensing and trademarks

Strep-tag® technology for recombinant protein purification, detection and assay is covered by worldwide patents (US5506121; DE4237113; JP3865792; UK2272698; FR9313066) The tetracycline promoter based prokaryotic expression system is covered by US5849576 and EP759997 (BE, DE, FR, UK) and *Strep-Tactin*® is covered by US patent 6,103,493. All patents are exclusively licensed to IBA. Further patent applications are pending world-wide. StarGate® is protected by world-wide patent applications. Purchase of reagents related to these technologies from IBA provides a license for non-profit and in-house research use only. Expression or purification or other applications of above mentioned technologies for commercial use require a separate license from IBA. A license may be granted by IBA on a case-by-case basis, and is entirely at IBA's discretion. Please contact IBA for further information on licenses for commercial use.

Strep-tag®, *Strep-Tactin*®, *Streptamer*®, *StarGate*®, *OpenGate*® and *StarCombinase*™ are registered trademarks of IBA GmbH.

Other patents

The Ni-NTA resin is manufactured by QIAGEN. Hoffmann-La Roche owns patents and patent applications pertaining to the application of Ni-NTA resin USP 4.877.830, USP 5.047.513, EP 253 303 B1) and to the method of purifying 6xHistidine-tagged proteins using 6xHistidine-tag coding vectors (USP 5.284.933, USP 5.130.663, EP 282 042 B1). All purification of 6xHistidine-tagged proteins by metal affinity chromatography for commercial purposes, and the commercial use of proteins so purified, require a license from Hoffmann-La Roche. Further information about licenses for commercial use is available from QIAGEN GmbH, QIAGEN Strasse 1, D-40724 Hilden, Germany.

Intellectual property rights for the GST-tag and for PreScission protease are owned by GE Healthcare.

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are not to be considered unprotected by law.

Products are for research use only.

References

Belfield, EJ, Hughes RK, Tsesmetzis, N, Naldrett, MJ, Casey, R (2007). The gateway pDEST17 expression vector encodes a -1 ribosomal frameshifting sequence. *NAR* 35 (4), 1322-1332.

Boshart, M, Weber, F, Jahn, G, Dorsch-Häsler, K, Fleckenstein, B, and Schaffner, W (1985). A Very Strong Enhancer is Located Upstream of an Immediate Early Gene of Human Cytomegalovirus. *Cell* 41, 521-530.

Gietz, RD, Sugino, A (1988). New yeast-*Escherichia coli* shuttle vectors constructed with in vitro mutagenized yeast genes lacking six-base pair restriction sites. *Gene* 74, 527-34.

Macreadie, IG, Horaitis, O, Verkuylen, AJ, Savin, KW (1991). Improved shuttle vectors for cloning and high-level Cu²⁺-mediated expression of foreign genes in yeast. *Gene* 104, 107-11.

Nelson, JA, Reynolds-Kohler, C, and Smith, BA (1987). Negative and Positive Regulation by a Short Segment in the 5'-Flanking Region of the Human Cytomegalovirus Major Immediate-Early Gene. *Mol. Cell. Biol.* 7, 4125-4129.

Skerra, A. (1994). Use of the tetracycline promoter for the tightly regulated production of a murine antibody fragment in *Escherichia coli*. *Gene* 151, 131-135.

Studier, FW, Rosenberg, AH, Dunn, JJ, Dubendorff, JW (1990). Use of the T7 RNA polymerase to direct expression of cloned genes. *Meth. Enzymol.* 185, 60-89.



Typical StarGate® Exits

High Expression Level

- T7, CMV, CUP1

Tight Regulation

- Tet, CUP1

Protein:Protein Interaction

- One-STrEP-tag (kit)
- Yeast two-hybrid
- Pull-down assays (GST-tag)



Functional Mammalian Proteins

- Short tags: *Strep*-tag/
6xHistidine-tag
- Baculo-/ Mammalian
Expression systems
- MATra transfection

Crystallization

- *Strep*-tag®
- *E. coli*

Assays/Immobilization

- *Strep*-tag; N-/ C-terminal presentation
- *Strep*-Tactin® coated plates
- *Strep*MAB-Immo coated plates