NIPPON Genetics EUROPE

Restriction Enzymes Buffer Activity Chart

Enzyme	Cat. #	Sequence 5‘ → 3‘	Enzyme Properties	Activity in FastGene Buffer [%]			
				I	II	III	IV
Aat II	FG-AatII	GACGT↓C	37° 65° IV CpG FastCut	0	25	25	100
Acc I	FG-AccI	GT↓MKAC	37° 80° IV CpG FastCut	75	100	100	100
Acc III*	FG-AccIII	T↓CCGGA	65° No AccIII Dam	0	25	100	0
Acu I	FG-AcuI	CTGAAGN$_{15}$↓	37° 65° IV FastCut	50	50	75	100
Afl II	FG-AflII	C↓TTAAG	37° 65° IV FastCut	75	100	75	100
Age I	FG-AgeI	A↓CCGGT	37° 65° IV CpG FastCut	100	50	0	100
Alw I	FG-AlwI	GGATCNNNN↓N	37° 65° IV Dam FastCut	50	50	10	100
Alw26 I	FG-Alw26I	GTCTCN↓NNNN	37° 65° IV CpG FastCut	75	100	50	100
Apa I	FG-ApaI	GGGCC↓C	37° 65° IV CpG Dcm FastCut	100	25	0	100
ApaL I	FG-ApaLI	G↓TGCAC	37° No IV CpG FastCut	50	100	50	100
Apo I	FG-ApoI	R↓AATTY	50° 80° III FastCut	10	75	100	75
Asc I	FG-AscI	GG↓CGCGCC	37° 80° IV CpG FastCut	0	0	0	100
Ava I	FG-AvaI	C↓YCGRG	37° 80° IV CpG FastCut	25	100	100	100
Ava II	FG-AvaII	G↓GWCC	37° 80° IV CpG Dcm FastCut	100	100	50	100
Avr II	FG-AvrII	C↓CTAGG	37° 80° IV FastCut	100	50	50	100
Bal I*	FG-BalI	TGG↓CCA	37° 65° Bal I Dcm	0	75	25	75
BamH I*	FG-BamHI	G↓GATCC	37° No BamHI FastCut	75	100	100	100
Bcl I	FG-BclI	T↓GATCA	50° No III Dam FastCut	50	100	100	75
Bgl I	FG-BglI	GCCNNNN↓NGGC	37° 65° III CpG FastCut	75	75	100	50
Bgl II	FG-BglII	A↓GATCT	37° 65° III FastCut	10	75	100	10
Bsa I	FG-BsaI	GGTCTCN↓NNNN	37° 65° IV CpG Dcm FastCut	50	100	100	100
BsaW I	FG-BsaWI	W↓CCGGW	60° 80° IV FastCut	50	100	100	100
BsiW I	FG-BsiWI	C↓GTACG	55° 80° III CpG FastCut	50	75	100	50
BsmB I	FG-BsmBI	CGTCTCN↓NNNN	55° 80° III CpG FastCut	10	50	100	25
BsoB I	FG-BsoBI	C↓YCGRG	37° 80° IV FastCut	10	100	100	100
BspE I	FG-BspEI	T↓CCGGA	37° 80° III CpG Dam FastCut	10	10	100	10
BsrF I	FG-BsrFI	R↓CCGGY	37° No IV CpG FastCut	75	100	100	100
BstY I	FG-BstYI	R↓GATCY	60° 80° II FastCut	50	100	75	100
BtsC I	FG-BtsCI	GGATGNN↓	50° 80° IV FastCut	75	100	100	100
Cfr10 I*	FG-Cfr10I	R↓CCGGY	37° No Cfr10I CpG FastCut	10	10	10	25
Cfr42 I	FG-Cfr42I	CCGC↓GG	37° 65° I CpG FastCut	100	50	25	75
Cfr9 I	FG-Cfr9I	C↓CCGGG	37° 65° III CpG	0	0	100	0
Cla I	FG-ClaI	AT↓CGAT	37° 65° IV CpG Dcm FastCut	50	75	75	100
CviA I	FG-CviAI	↓GATC	37° 65° IV Dam FastCut	10	50	10	100
Dde I	FG-DdeI	C↓TNAG	37° 65° III CpG	25	50	100	50
Dpn I	FG-DpnI	GA↓TC	37° 80° IV FastCut	75	100	100	100
Dpn II*	FG-DpnII	↓GATC	37° 65° DpnII Dam FastCut	25	75	100	75
Dra I	FG-DraI	TTT↓AAA	37° 65° IV FastCut	75	100	50	100
Eag I	FG-EagI	C↓GGCCG	37° 65° III CpG FastCut	10	25	100	10
Eco47 I	FG-Eco47I	G↓GWCC	37° 65° III CpG Dcm FastCut	100	100	100	100
EcoN I	FG-EcoNI	CCTNN↓NNNAGG	37° 65° IV FastCut	50	100	75	100
EcoO109 I	FG-EcoO109I	RG↓GNCCY	37° 65° IV Dcm FastCut	50	75	100	100
EcoR I*	FG-EcoRI	G↓AATTC	37° 65° EcoRI CpG FastCut	50	100	75	100
EcoR V	FG-EcoRV	GAT↓ATC	37° 65° III CpG FastCut	0	100	100	50
EcoT38 I	FG-EcoT38I	GRGCY↓C	37° 65° IV FastCut	75	100	0	100
Esp3 I	FG-Esp3I	CGTCTCN↓NNNN	37° 65° IV CpG FastCut	25	50	10	100
Fok I	FG-FokI	GGATGN$_{12}$	37° 65° IV CpG Dcm FastCut	100	100	10	100
Fsp I	FG-FspI	TGC↓GCA	37° 65° IV CpG FastCut	75	100	50	100
Hae II	FG-HaeII	RGCGC↓Y	37° 80° IV CpG FastCut	10	100	100	100
Hae III	FG-HaeIII	GG↓CC	37° 80° IV FastCut	50	100	75	100
Hga I	FG-HgaI	GACGCN$_4$↓N$_4$	37° 65° I CpG FastCut	100	75	10	100
Hinc II	FG-HincII	GTY↓RAC	37° 65° IV CpG FastCut	75	50	50	100
Hind II	FG-HindII	GTY↓RAC	37° 65° II CpG FastCut	100	100	50	100
Hind III	FG-HindIII	A↓AGCTT	37° 80° II FastCut	25	100	75	100
Hinf I	FG-HinfI	G↓ANTC	37° 80° IV CpG FastCut	50	100	100	100
HinP1 I	FG-HinP1I	G↓CGC	37° 65° II CpG FastCut	50	100	100	75
Hpa I	FG-HpaI	GTT↓AAC	37° No IV CpG FastCut	0	50	25	100

*Supplied with Unique Buffer

Enzyme	Cat. #	Sequence 5‘ → 3‘	Enzyme Properties	Activity in FastGene Buffer [%]			
				I	II	III	IV
Hpa II	FG-HpaII	C↓CGG	37° 80° IV CpG FastCut	100	75	50	100
Hph I	FG-HphI	GGTGAN7↓	37° 65° IV Dam FastCut	100	75	10	100
Hpy188 I	FG-Hpy188I	TCN↓GA	37° 65° IV Dam FastCut	50	75	50	100
Hpy99 I	FG-Hpy99I	CGWCG↓	37° 65° IV CpG FastCut	100	25	10	100
HpyCH4 V	FG-HpyCH4V	TG↓CA	37° 65° IV FastCut	75	100	25	100
Kpn I	FG-KpnI	GGTAC↓C	37° No I FastCut	100	50	0	100
Kpn2 I	FG-Kpn2I	T↓CCGGA	55° 80° I CpG FastCut	100	25	75	50
Lsp1109 I	FG-Lsp1109I	GCAGCN7↓N3	37° 65° III FastCut	25	75	100	100
Mbo I	FG-MboI	↓GATC	37° 65° III CpG Dam FastCut	75	100	100	100
Mbo II	FG-MboII	GAAGAN7↓	37° 65° II Dam FastCut	100	100	50	100
Mlu I	FG-MluI	A↓CGCGT	37° 65° III CpG FastCut	25	75	100	50
Mnl I	FG-MnlI	CCTCN6↓	37° 65° II FastCut	75	100	75	100
Mse I	FG-MseI	T↓TAA	37° 65° IV FastCut	75	100	100	100
Msp I	FG-MspI	C↓CGG	37° No IV FastCut	75	100	75	100
MspA1 I	FG-MspA1I	CMG↓CKG	37° 65° IV CpG FastCut	0	100	75	100
Mun I	FG-MunI	C↓AATTG	37° 65° II FastCut	100	100	10	100
Nae I	FG-NaeI	GCC↓GGC	37° 65° I CpG FastCut	100	100	25	100
Nco I	FG-NcoI	C↓CATGG	37° 65° III FastCut	50	100	100	75
Nde I	FG-NdeI	CA↓TATG	37° 65° IV FastCut	75	100	100	100
NgoM IV	FG-NgoMIV	G↓CCGGC	37° 80° IV CpG FastCut	25	75	0	100
Nhe I	FG-NheI	G↓CTAGC	37° 65° II CpG FastCut	100	100	10	100
Nla IV	FG-NlaIV	GGN↓NCC	37° 65° IV CpG Dcm FastCut	0	10	10	100
Not I	FG-NotI	GC↓GGCCGC	37° 65° III CpG FastCut	0	50	100	0
Nru I	FG-NruI	TCG↓CGA	37° 65° III CpG Dam FastCut	0	50	100	75
Nt.BstNB I	FG-NtBstNBI	GAGTCNNNN↓	55° 80° III FastCut	0	10	100	0
PaeR7 I	FG-PaeR7I	C↓TCGAG	37° No IV CpG FastCut	25	100	10	100
PflM I	FG-PflMI	CCANNNN↓NTGG	37° 65° III Dcm FastCut	0	100	100	50
Ple I	FG-PleI	GAGTCNNNN↓N	37° No IV CpG FastCut	75	75	50	100
PluT I	FG-PluTI	GGCGC↓C	37° No IV CpG FastCut	75	25	10	100
PspG I	FG-PspGI	↓CCWGG	37° No IV Dcm	25	100	75	100
Pst I	FG-PstI	CTGCA↓G	37° 80° III FastCut	100	100	100	75
Pvu I	FG-PvuI	CGAT↓CG	37° No III CpG FastCut	25	75	100	50
Pvu II	FG-PvuII	CAG↓CTG	37° No II FastCut	75	100	25	10
Rsa I	FG-RsaI	GT↓AC	37° No IV CpG FastCut	100	100	75	100
Sac I	FG-SacI	GAGCT↓C	37° 65° I FastCut	100	75	25	75
Sac II	FG-SacII	CCGC↓GG	37° 65° IV CpG FastCut	50	100	50	100
Sal I	FG-SalI	GTCGAC	37° 65° III CpG FastCut	0	0	100	0
Sau96 I	FG-Sau96I	G↓GNCC	37° 80° IV CpG Dcm FastCut	50	100	100	100
Sbf I	FG-SbfI	CCTGCA↓GG	37° 80° IV FastCut	50	25	10	100
Sca I	FG-ScaI	AGT↓ACT	37° 80° III FastCut	0	0	100	0
Sda I	FG-SdaI	CCTGCA↓GG	37° 80° IV FastCut	75	75	0	100
Sfi I	FG-SfiI	GGCCN3↓NGGCC	50° No II CpG Dcm FastCut	25	100	25	100
SgrA I	FG-SgrAI	CR↓CCGGYG	37° 65° IV CpG FastCut	100	100	0	100
Sma I	FG-SmaI	CCC↓GGG	25° 65° IV CpG FastCut	0	0	0	100
SnaB I	FG-SnaBI	TAC↓GTA	37° 80° IV CpG FastCut	100	75	25	100
Spe I	FG-SpeI	A↓CTAGT	37° 80° IV FastCut	50	100	75	100
Sph I	FG-SphI	GCATG↓C	37° 65° II FastCut	50	100	50	75
Sse9 I	FG-Sse9I	↓AATT	55° 65° I FastCut	100	50	50	75
Ssp I	FG-SspI	AAT↓ATT	37° 65° IV FastCut	50	100	25	100
Stu I	FG-StuI	AGG↓CCT	37° 65° IV Dcm FastCut	75	100	75	100
StyD4 I	FG-StyD4I	↓CCNGG	37° 65° IV CpG Dcm FastCut	10	100	100	100
Swa I	FG-SwaI	ATTT↓AAAT	25° 65° III FastCut	75	75	100	25
Taq I	FG-TaqI	T↓CGA	65° 80° III Dam FastCut	50	100	100	100
TspM I	FG-TspMI	C↓CCGGG	75° No IV CpG FastCut	50	75	50	100
Tth111 I	FG-Tth111I	GACN↓NNGTC	65° No IV FastCut	25	100	100	100
Xba I	FG-XbaI	T↓CTAGA	37° 65° IV Dam FastCut	0	100	100	100
Xho I	FG-XhoI	C↓TCGAG	37° 80° IV CpG FastCut	50	100	100	100
Xma I	FG-XmaI	C↓CCGGG	37° 65° IV CpG FastCut	50	75	25	100

Activity of Unique Buffer

Some restriction endonucleases require unique buffer for maximal activity.

Enzyme
Acc III
Bal I
BamH I
Cfr10 I
Dpn II
EcoR I

For the selection of double digestion buffer if a restriction enzyme requires unique buffer, please refer to the table „Activity Chart of common restriction enzymes in the five Unique Buffers“

Get here the table

Ligases

The FastGene® T4 DNA Ligase catalyzes the formation of a covalent bond between the 5′-phosphate and 3′-OH in nicked duplex DNA or at two DNA ends.

Cat. #	Ligase
FG-T4	T4 DNA Ligase (20,000 U)
FG-T4HC	T4 DNA Ligase (100,000 U, 2000 units/µl)
FG-T4BP	T4 DNA Ligase (100,000 U, 400 units/µl)
FG-LK30	Kickspeed DNA Ligation kit (30 rxns)
FG-LK60	Kickspeed DNA Ligation kit (60 rxns)
FG-LM50	Kickspeed 2x DNA Ligation Mix (50 rxns)

Chart Legend

- 25° 37° 50° 55° — Optimal reaction temperature
- I II III IV — Supplied buffer
- CpG Dcm Dam — Cleavage blocked or impaired by CpG, Dam or Dcm methylation
- 65° 80° — Thermal inactivation condition
- No — Not heat inactivatable
- FastCut protocol available
- Bal I BamHI DpnII EcoRI — Supplied with unique buffer

Buffer Compositions (1x)

Buffer I
10 mM Bis Tris propane HCl (pH 7.0 @ 25°C), 10 mM $MgCl_2$, 100 µg/ml BSA

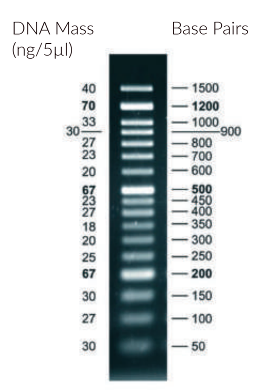
Buffer II
10 mM Tris-HCl (pH 7.9 @ 25°C), 50 mM $NaCl_2$, 10 mM $MgCl_2$, 100 µg/ml BSA

Buffer III
50 mM Tris-HCl (pH 7.9 @ 25°C), 100 mM $NaCl_2$, 10 mM $MgCl_2$, 100 µg/ml BSA

Buffer IV
20 mM Tris-acetate (pH 7.9 @ 25°C), 50 mM potassium acetate, 10 mM magnesium acetate, 100 µg/ml BSA

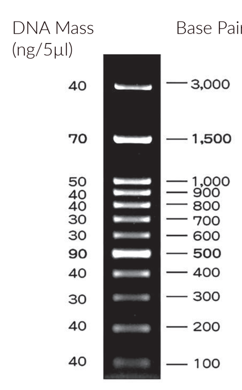
Nippon Genetics DNA Ladder

DNA Ladder
#MWD50



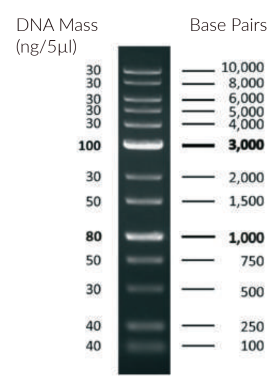
2 % TAE agarose gel

DNA Ladder
#MWD100



1.5 % TAE agarose gel

DNA Ladder
#MWD1P



1 % TAE agarose gel

For each application the right ladder

FastGene DNA Ladder

Setting up a Double Digestion

1. Double Digestion using Color-Coded Buffers I II III IV

- If possible, use the buffer in which both enzymes have 100% activity.

[Example]
For performing a double digestion reaction using Not I and Pst I, simply select Buffer III, because both enzymes are 100% active on Buffer III.

- Is there no optimal buffer for both enzymes, use a non-optimal Buffer and adjust the number of units or incubation time for the slower rate of cleavage

[Example]
For performing a double digestion reaction using Not I and Pvu II, we recommend to select a Buffer II and use double unit of Not I than Pvu II because, Not I exhibits only 50% of activity on Buffer II.

2. Double Digestion the FastCut Buffer

Most restriction enzymes are 100% active in FastCut Buffer, making double digestion simple. The FastCut digestion enables a restriction in 5-15 min.

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