

Isoschizomers

Isoschizomers. The enzymes in boldface type are available from Promega.

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|---------------------|--|-----------------------|
| AatI | StuI , Eco147I, Pme55I, SseBI | AGG▼CCT |
| AatII | — | GACGT▼C |
| AccI | FblI, XmiI | GT▼(A/C)(G/T)AC |
| AccIII | BspEI, MroI | T▼CCGGA |
| Acc65I | Asp718I KpnI * | G▼GTACC GGTAC▼C |
| AccB1I | BanI , BshNI, Eco64I | G▼G(C/T)(G/A)CC |
| AccB7I | PfiMI, Van91I | CCAN,▼NTGG |
| AclNI | SpeI | A▼CTAGT |
| AclWI | AlwI | GGATCNNNN▼ |
| Acyl | BbII, Hin1I, Hsp92I , BsaHI, Msp171I | G(A/G)▼CG(T/C)C |
| AcsI | ApoI | (G/A)▼AATT(C/T) |
| AfaI | RsaI Csp6I | GT▼AC G▼TAC |
| AfeI | Eco47III | AGC▼GCT |
| AfilI | Bst98I | C▼TTAAG |
| AgeI | PinAI | A▼CCGGT |
| AhalI | DraI | TTT▼AAA |
| AhdI | EclHKI | GACNNN▼NNGTC |
| AluI | — | AG▼CT |
| AlwI | AclWI | GGATCNNNN▼ |
| Alw26I ¹ | BsmAI | GTCTC(1/5) |
| Alw44I | ApaLI | G▼TGCAC |
| AocI | Bsu36I , CvnI | CC▼TNAGG |
| ApaI | — Bsp120I* | GGGCC▼C G▼GGCCC |
| ApaLI | Alw44I , VneI | G▼TGCAC |
| ApoI | AcsI | (G/A)▼AATT(C/T) |
| Asel | VspI , AsnI | AT▼TAAT |
| AsnI | VspI , AseI | AT▼TAAT |
| AspI | Tth111I | GACN▼NNGTC |
| AspEI | AhdI, Eam1105I, EclHKI | GACNNN/NNGTC |
| Asp700I | XmnI | GAANN▼NNTTC |
| Asp718I | Acc65I KpnI * | G▼GTACC GGTAC▼C |
| AsuI | Sau96I, Cfr13I | G▼GNCC |
| AsuII | Csp45I , BstBI | TT▼CGAA |
| AsuHPI | HphI | GGTGAN ₃ ▼ |
| AvaI | Ama87I, BcoI, BsoBI, Eco88I | C▼(C/T)CG(G/A)G |
| AvaII | SinI , Eco47I, HgiEI | G▼G(A/T)CC |
| Axyl | Bsu36I | CC▼TNAGG |
| BalI | MscI, MluNI | TGG▼CCA |
| BamHI | — | G▼GATCC |
| BanI | AccBI, BshNI, Eco64I | G▼G(T/C)(A/G)CC |
| BanII | Eco24I | G(A/G)GC(T/C)▼C |
| BbeI | — NarI * | GGCGC▼C GG▼CGCC |
| BbrPI | Eco72I, PmlI | CAC▼GTG |
| BbsI ¹ | Bsc91I, BpiI | GAAGAC(2/6) |
| BbuI | PaeI, SphI | GCATG▼C |
| BclI | BsiQI, FbaI | T▼GATCA |
| BcnI | NciI | CC▼(C/G)GG |
| Bfri | Bst98I | C▼TTAAG |
| BglI | — | GCCNNNN▼NGGC |
| BglII | — | A▼GATCT |
| BmyI | Bsp1286I | G(G/A/T)GC(C/A/T)▼C |
| Bpml | GsuI | CTGGAG(16/14) |
| BsaHI | Hsp92I | G(A/G)▼CG(T/C)C |
| BsaMI | BsmI | GAATGC(1/-1) |
| BsaOI | Bsh1285I, BsiEI | CG(A/G)(T/C)▼C |
| BseAI | AccIII | T▼CCGGA |
| BseNI | BsrSI , BsrI | ACTGGN(1/-1) |
| BsePI | BssHII , Paul | G▼CGCGC |
| Bsh1285I | BsaOI | CG(A/G)(T/C)▼CG |
| BshNI | BanI , AccB1I, Eco64I | G▼G(T/C)(A/G)CC |
| Bsh1365I | BsrBRI | GATNN▼NNATC |
| BsiEI | BsaOI | CG(A/G)(T/C)▼CG |

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| BsmI | BsaMI | GAATGCN▼ |
| BsmAI ¹ | Alw26I | GTCTC(1/5) |
| BsoBI | AvaI , Ama87I, BcoI, Eco88I | C(C/T)CG(G/A)G |
| Bsp19I | NcoI | C▼CATGG |
| Bsp68I | NruI | TCG▼CGA |
| Bsp106I | Clal , BspDI | AT▼CGAT |
| Bsp119I | Csp45I , NspV, BstBI | TT▼CGAA |
| Bsp120I | — ApaI | G▼GGCCC GGGCC▼C |
| Bsp143I | Mbol , Sau3AI , NdeI | ▼GATC |
| Bsp143II | HaeII | (A/G)GCGC▼(T/C) |
| Bsp1286I | BmyI, SduI | G(G/A/T)GC(C/A/T)▼C |
| BspCI | PvuI | CGAT▼CG |
| BspDI | Clal | AT▼CGAT |
| BspEI | AccIII | T▼CCGGA |
| BsrI ¹ | BsrSI , BseNI | ACTGGN(1/-1) |
| BsrSI | BseNI, BsrI | ACTGGN(1/-1) |
| BssHII | BsePI, Paul | G▼CGCGC |
| Bst98I | AfilI, Bfri | C▼TTAAG |
| BstBI | Csp45I , NspV, Bsp119I | TT▼CGAA |
| BstEII | BstPI, Eco91I, PspEI | G▼GTNACC |
| BstNI | BstOI , MvaI EcoRII* | CC▼(A/T)GG ▼CC(A/T)GG |
| BstOI | BstNI, MvaI EcoRII* | CC▼(A/T)GG ▼CC(A/T)GG |
| BstXI | — | CCANNNNN▼NTGG |
| BstYI | XhoI , MfiI | (A/G)▼GATC(T/C) |
| BstZI | Eco52I, EagI, XmaII, EclXI | C▼GGCCG |
| Bsu15I | Clal | AT▼CGAT |
| Bsu36I | CvnI, AocI, Eco81I | CC▼TNAGG |
| BsuRI | HaeIII , Pall | GG▼CC |
| CfoI | HhaI Hin6I, HinP1I | GCG▼C G▼CGC |
| Cfr9I | XmaI SmaI * | C▼CCGGG CCC▼GGG |
| Cfr13I | Sau96I | G▼GNCC |
| Cfr42I | SacII | CCGC▼GG |
| Clal | BanIII, Bsp106I, BspDI, Bsu15I | AT▼CGAT |
| CpoI | CspI , RsrII | CG▼G(A/T)CCG |
| CspI | CpoI, RsrII | CG▼G(A/T)CCG |
| Csp6I | — RsaI *, AfaI* | G▼TAC GT▼AC |
| Csp45I | BstBI, NspV, Bsp119I | TT▼CGAA |
| CvnI | Bsu36I | CC▼TNAGG |
| DdeI | BstDEI | C▼TNAG |
| DpnI ² | — DpnII* | G ^m A▼TC GA▼TC |
| DpnII | Mbol , Sau3AI , NdeI , DpnI * | ▼GATC GA▼TC |
| DraI | — | TTT▼AAA |
| EagI | Eco52I, BstZI , EclXI, XmaII | C▼GGCCG |
| Eam1105I | EclHKI , AhdI, AspEI | GACNNN▼NNGTC |
| Ecl136II | EcoICRI SacI * | GAG▼CTC GAGCT▼C |
| EclHKI | AhdI, Eam1105I, AspEI | GACNNN▼NNGTC |
| EclXI | BstZI , EagI, Eco52I, XmaII | C▼GGCCG |
| Eco24I | BanII , FriOI | G(A/G)GC(T/C)▼C |
| Eco32I | EcoRV | GAT▼ATC |
| Eco47I | AvaI , SinI | G▼G(A/T)CC |
| Eco47III | AfeI | AGC▼GCT |
| Eco52I | BstZI , XmaII, EagI, EclXI | C▼GGCCG |
| Eco64I | BanI , BshNI, Eco64I | G▼G(T/C)(A/G)CC |
| Eco81I | Bsu36I | CC▼TNAGG |
| Eco88I | AvaI | C▼(T/C)CG(A/G)G |
| Eco91I | BstEII | G▼GTNACC |
| Eco105I | SnaBI | TAC▼CTA |

Isoschizomers

Isoschizomers (continued). The enzymes in boldface type are available from Promega.

| Enzyme | Isoschizomer(s) | Recognition Sequence |
|--------------------------|--|----------------------|
| Eco130I | Styl | C▼C(A/T)(T/A)GG |
| Eco147I | Stul | AGG▼CCT |
| EcoCRI | Ecl136II | GAG▼CTC |
| | Sacl* , SstI* | GAGCT▼C |
| EcoRI | — | G▼AATTC |
| EcoRII | — | ▼CC(A/T)GG |
| | BstOI* , BstNI* , MvaI* | CC▼(A/T)GG |
| EcoRV | Eco32I | GAT▼ATC |
| EcoT14I | Styl | C▼C(A/T)(A/T)GG |
| EcoT22I | Nsil | ATGCA▼T |
| EheI | — | GGC▼GCC |
| | NarI* | GG▼CGCC |
| FokI ² | — | GGATG(9/13) |
| HaeII | Bsp143II | (A/G)GCGC▼(T/C) |
| HaeIII | BsuRI, Pall | GG▼CC |
| HapII | HpaII , MspI | C▼CGG |
| HgiEI | Eco47I, SinI , Avall | G▼G(A/T)CC |
| HhaI | CfoI | GCG▼C |
| | HinP1I*, Hin6I* | G▼CGC |
| Hin1I | Acyl, Hsp92I | G(A/G)▼CG(T/C)C |
| HincII | HindII | GT(T/C)▼(A/G)AC |
| HindII | HincII | GT(T/C)▼(A/G)AC |
| HindIII | — | A▼AGCTT |
| HinfI | — | G▼ANTC |
| HinP1I | — | G▼CGC |
| | HhaI* , CfoI* | GCG▼C |
| HpaI | KspAI | GTT▼AAC |
| HpaII³ | MspI , HapII | C▼CGG |
| Hsp92I | Acyl, BsaHI, Hin1I | G(A/G)▼CG(C/T)C |
| Hsp92II | NlaIII | CATG▼ |
| I-PpoI | — | CTCTCTTAA▼GGTAGC |
| KasI | — | G▼GCGCC |
| | NarI* | GG▼CGCC |
| KpnI | — | GGTAC▼C |
| | Acc65I* , Asp718I* | G▼GTACC |
| KspI | SacII | CCGC▼GG |
| MboI | Sau3AI , NdeII , DpnII | ▼GATC |
| MbolI¹ | — | GAAGA(8/7) |
| MfiI | XhoII | (A/G)▼GATC(T/C) |
| MluI | — | A▼CGCGT |
| MluNI | BalI , MscI | TGG▼CCA |
| MroI | AccIII | T▼CCGGA |
| MscI | BalI , MluNI | TGG▼CCA |
| MseI | Tru9I | T▼TAA |
| MspI³ | HpaII , HapII | C▼CGG |
| MspA1I | NspBII | C(A/C)G▼C(G/T)G |
| MstII | Bsu36I | CC▼TNAGG |
| MvaI | BstOI , BstNI | CC▼(A/T)GG |
| | EcoRII* | ▼CC(A/T)GG |
| NaeI | — | GCC▼GGC |
| | NgoMIV | G▼CCGGC |
| NarI | — | GG▼CGCC |
| | EheI* | GGC▼GCC |
| | KasI* | G▼GCGCC |
| | BbeI* | GGCGC▼C |
| NciI | BcniI | CC▼(C/G)GG |
| NcoI | Bsp19I | C▼CATGG |
| NdeI | — | CA▼TATG |
| NdeII | MbolI , Sau3AI , DpnII | ▼GATC |
| NgoMIV | — | G▼CCGGC |
| | NaeI* | GCC▼GGC |
| NheI | — | G▼CTAGC |
| NlaIII | Hsp92II | CATG▼ |
| NotI | — | GC▼GGCCG |
| NruI | Bsp68 I | TCG▼CGA |
| NsiI | EcoT22I, Mph1103I | ATGCA▼T |
| NspV | Csp45I , BstBI, Bsp119I | TT▼CGAA |

| Enzyme | Isoschizomer(s) | Recognition Sequence |
|----------------|------------------------------------|----------------------|
| NspBII | MspA1I | C(A/C)G▼C(G/T)G |
| PaeI | BbuI , SphI | GCATG▼C |
| PaeR7I | XhoI | C▼TCGAG |
| Pall | HaeIII , BsuRI | GG▼CC |
| PfIMI | AccB7I , Van91I | CCAN,▼NTGG |
| PinAI | AgeI | A▼CCGGT |
| PstI | — | CTGCA▼G |
| PvuI | BspCI | CGAT▼CG |
| PvuII | — | CAG▼CTG |
| RsaI | AfaI | GT▼AC |
| RsrII | CspI , CpoI | CG▼G(A/T)CCG |
| SacI | SstI | GAGCT▼C |
| | Ecl136II*, EcoCRI* | GAG▼CTC |
| SacII | SstII, KspI, Cfr42I | CCG▼GG |
| Sall | — | G▼TCGAC |
| Sau3AI | MboI , NdeII , DpnII | ▼GATC |
| Sau96I | Cfr13I | G▼GNCC |
| ScaI | — | AGT▼ACT |
| SduI | Bsp1286I | G(G/A/T)GC(C/A/T)▼C |
| SfiI | — | GGCCNNNN▼NGGCC |
| SfuI | Csp45I | TT▼CGAA |
| SgfiI | — | GCGAT▼CGC |
| SinI | Avall , Eco47I | G▼G(A/T)CC |
| SmaI | — | CCC▼GGG |
| | XmaI* , Cfr9I* | C▼CCGGG |
| SnaBI | Eco105I | TAC▼GTA |
| SpeI | AcNI | A▼CTAGT |
| SphI | BbuI , PaeI | GCATG▼C |
| SspI | — | AAT▼ATT |
| SstI | SacI | GAGCT▼C |
| | EcoCRI* | GAG▼CTC |
| SstII | SacII | CCG▼GG |
| StuI | AatI, Eco147I | AGG▼CCT |
| StyI | EcoT14I | C▼C(A/T)(A/T)GG |
| TaqI | TthHB8I | T▼CGA |
| Tru9I | MseI | T▼TAA |
| Tth111I | AspI | GACN▼NNGTC |
| TthHB8I | TaqI | T▼CGA |
| Van91I | AccB7I , PfIMI | CCAN,▼NTGG |
| VneI | ApaLI, Alw44I | G▼TGCAC |
| VspI | Asel, AsnI | AT▼TAAT |
| XbaI | — | T▼CTAGA |
| XhoI | PaeR7I | C▼TCGAG |
| XhoII | BstYI, MfiI | (A/G)▼GATC(T/C) |
| XmaI | Cfr9I, XmaCI, | C▼CCGGG |
| | SmaI* | CCC▼GGG |
| XmaIII | Eco52I, BstZI , EagI, EclXI | C▼GGCCG |
| XmaCI | XmaI | C▼CCGGG |
| | SmaI* | CCC▼GGG |
| Xmnl | Asp700I | GAANN▼NNTTC |

Key:

N = A, C, G or T
* = neoschizomer

Notes:

- The locations of cleavage sites falling outside the recognition site are indicated in parentheses. For example, GTCTC(1/5) indicates cleavage at:
5'...GTCTCN*...3'
3'...CAGAGNNNN*...5'
- DpnI is unique among commercially available restriction enzymes in requiring methylation of a nucleotide (adenine) in its recognition sequence in order to cut. Therefore, DpnI cannot be substituted for other enzymes recognizing the GATC sequence (e.g., MboI and Sau3AI).
- Although HpaII and MspI recognize the same nucleotide sequence, HpaII is sensitive to methylation of either cytosine in its recognition sequence, while MspI is sensitive only to methylation of the external cytosine. These enzymes may not be interchanged for all applications.

Reference

Roberts, R.J. and Macelis, D. (1991) *Nucl. Acids Res.* **19** (supp), 2077.