



## «Quick Cut» Validated\* Restriction Enzymes

Aat II	Hap II (Hpa II, Msp I)
Acc I	Hap II (High Concentration) (Hpa II, Msp I)
Afa I (Rsa I)	Hha I
Alu I	Hinf I
Apa I	Hinf I (High Concentration)
Apa I (High Concentration)	Hpa I
BamH I	Mbo II
BamH I (High Concentration)	Nae I
Ban II (Hgi II)	Nco I
BciT130 I (EcoR II, Mva I)	Nco I (High Concentration)
Bgl I	Not I
Bgl II	Not I (High Concentration)
Bgl II (High Concentration)	Nru I
Bln I (Avr II)	PshA I
BmeT110 I (Ava I)	PshB I (Vsp I)
BmgT120 I (Cfr13 I, Asu I)	Pst I
Bsp1286 I (Sdu I)	Pst I (High Concentration)
BspT104 I (Asu II, Nsp V)	Pvu II
BssH II (BseP I)	Pvu II (High Concentration)
Bst P I (BstE II, EcoO65 I)	Sac II
Bst X I	Sau3A I (Mbo I)
Cla I	Sau3A I (High Concentration) (Mbo I)
Cla I (High Concentration)	Sca I
Cpo I (Rsr II)	Sfi I
Dra I (Aha III)	Sma I
Dra I (High Concentration) (Aha III)	Sma I (High Concentration)
Eae I (Cfr I)	SnaB I
EcoO65 I (Bst E II, Bst P I)	Spe I
EcoR I	Sph I
EcoR I (High Concentration)	Sse8387 I
EcoR V	Sse8387 I (High Concentration)
EcoR V (High Concentration)	Stu I
EcoT22 I (Ava III)	VpaK11B I (Ava II)
Fok I	Xba I
Hae III	Xba I (High Concentration)
Hae III (High Concentration)	Xsp I (Bfa I, Mae I)

\* Takara Bio showed that 1 µl (10 - 15 U) of the enzymes validated «Quick Cut» can completely digest 1 µg of plasmid DNA in 5 minutes in recommended buffer

## Composition of Takara Universal Restriction Enzyme Buffers

<b>10X L</b>	100 mM Tris-HCl (pH 7.5)
	100 mM MgCl <sub>2</sub>
	10 mM Dithiothreitol
<b>10X M</b>	100 mM Tris-HCl (pH 7.5)
	100 mM MgCl <sub>2</sub>
	10 mM Dithiothreitol
	500 mM NaCl
<b>10X H</b>	500 mM Tris-HCl (pH 7.5)
	100 mM MgCl <sub>2</sub>
	10 mM Dithiothreitol
	1,000 mM NaCl
<b>10X K</b>	200 mM Tris-HCl (pH 8.5)
	100 mM MgCl <sub>2</sub>
	10 mM Dithiothreitol
	1,000 mM KCl
<b>10X T*</b>	330 mM Tris-acetate (pH 7.9)
	100 mM Magnesium acetate
	5 mM Dithiothreitol
	660 mM Potassium acetate
<b>10X Loading Buffer</b>	1% SDS
	0.05% Bromophenol blue
	50% Glycerol

\*BSA should be added to a final concentration of 0.01% to obtain 100% activity.

All Takara's restriction enzymes are supplied with 10X Loading Buffer (1 mL)

## Restriction Enzyme Activity in Takara Buffers

Takara Bio's restriction enzymes are supplied with either the standard Takara Buffers (L, M, H, K, or T) or the customized Basal Buffers, whose composition varies with the enzyme. Fourteen of Takara's restriction enzymes (Acc III, Bal I, Bcn I, Bgl I, Bpu1102 I, Cfr10 I, Eam1105 I, Eco52 I, Nru I, PshB I, SnaB I, Ssp I, Taq I and VpaK11B I) are supplied with the Basal Buffers. The table below displays the activity of Takara's restriction enzymes in each of the buffer. Buffers shaded in   are the supplied buffers, and buffers shaded in   are compatible for use with the specific enzymes. When performing a double digestion, the selected buffer should be as close to optimal for both enzymes. Some enzymes may show star activity in certain buffers (indicated by parentheses), and those buffers should be avoided.

  : supplied buffer  
  : compatible (but not supplied) buffer(s)

Restriction enzyme	Relative activities (%)					
	L	M	H	K	T+BSA	Basal
Aat II	<20	<20	<20	<20	100	—
Acc I	20	100	<20	<20	160	—
Acc II	(260)	100	<20	20	200	—
Acc III	<20	<20	20	(80)	<20	100
Afa I	60	60	40	60	100	—
Afl II	20	80*	<20	<20	140	—
Alu I	100	100	<20	40	200	—
Aor13H I	<20	20	<20	80*	80	—
Aor51H I	80	100	<20	20	120	—
Apa I	100	<20	<20	<20	<20	—
ApaI I	100	20	<20	<20	120	—
Bal I	20	20	<20	<20	40	100
BamH I	<20	<20	40	100	<20	—
Ban II	(120)	(120)	100	80	(100)	—
BciT130 I	<20	(20)	80	100	(20)	—
Bcn I	<20	20	40	60	60	100
Bgl I	<20	<20	20	40	<20	100
Bgl II	<20	20	100	(100)	(60)	—
Bln I	<20	20	40	100	20	—
BmeT110 I	<20	<20	20	100	<20	—
BmgT120 I	<20	<20	100	40	<20	—
Bpu1102 I	<20	<20	<20	40	60	100
BspT104 I	100	60	<20	<20	100	—
BspT107 I	<20	20	80	100	20	—
Bsp1286 I	100	20	<20	<20	60	—
Bsp1407 I	20	60	20	20	100	—
BssH II	100	100	60	20	140	—
BstP I	<20	(60)	100	(100)	(100)	—
BstX I	<20	40	100	<20	<20	—
Bst1107 I	<20	60	100	100	40	—
Cfr10 I	<20	<20	<20	40	(20)	100
Cla I	40	100	120	100	60	—
Cpo I	<20	<20	80	100	<20	—
Dpn I	60	60	120	140	100	—
Dra I	100	100	60	100	80	—
Eae I	60	100	<20	<20	120	—
Eam1105 I	<20	(40)	20	40	(40)	100
EcoO65 I	(20)	(60)	60*	40	40	—
EcoO109 I	100	60	<20	<20	100	—
EcoR I	(20)	(100)	100	(120)	(80)	—
EcoR V	<20	(40)	100	(120)	(40)	—
EcoT14 I	<20	(40)	100	120	(60)	—
EcoT22 I	<20	20	100	(140)	(20)	—
Eco52 I	<20	<20	<20	<20	<20	100
Eco81 I	<20	100	<20	<20	100	—
Fba I	<20	<20	(80)	100	(20)	—
Fok I	(20)	(60)*	<20	<20	(200)	—
Hae II	80	100	<20	80	140	—
Hae III	60	100	100	60	100	—
Hap II	100	60	<20	<20	100	—
Hha I	80	100	100	120	120	—
Hinc II	20	100	20	40	100	—
Hind III	(60)	100	<20	200	(100)	—
Hinf I	80	100	100	160	60	—
Hin1 I	40	80*	<20	20	60	—
Hpa I	<20	(40)	20	100	(80)	—
Kpn I	100	60	<20	<20	(100)	—
Mbo I	20	40	60	100	40	—
Mbo II	100	60	<20	<20	60	—
Mfi I	100	80	<20	<20	80	—
Mlu I	60	60	100	(100)	60	—
Msp I	80	80	<20	100	100	—
Mun I	(200)	100*	<20	<20	160	—
Nae I	100	<20	<20	<20	100	—
Nco I	(40)	(60)	20	60*	(60)	—
Nde I	<20	40	100	100	80	—
Nhe I	(120)	100	<20	<20	(160)	—
Not I	<20	<20	20**	<20	<20	—
Nru I	0	<20	20	20	<20	100
Nsb I	40	20	<20	60	100	—
PmaC I	100	80	<20	<20	100	—
PshA I	20	40	<20	100	60	—
PshB I	(20)	(40)	20	40	40	100
Psp1406 I	20	60	<20	<20	100	—
Pst I	<20	(60)	100	80	(20)	—
Pvu I	<20	(20)	(40)	80*	(40)	—
Pvu II	(80)	100	40	<20	(40)	—
Sac I	100	60	<20	<20	80	—
Sac II	40	20	<20	<20	100	—
Sal I	<20	<20	100	(20)	<20	—
Sau3A I	(60)	80	100	<20	(80)	—
Sca I	<20	<20	100	(60)	<20	—
Sfi I	(40)	100	<20	<20	100	—
Sma I	<20	<20	<20	<20	100	—
Smi I	<10	<20	100	40	<10	—
SnaB I	(20)	(40)	<20	<20	(40)	100
Spe I	(80)	100	80	100	(80)	—
Sph I	(20)	(40)	100	120	(20)	—
Sse8387 I	(120)	60*	<20	<20	(60)	—
Ssp I	<20	(60)	40	(100)	(80)	100
Stu I	60	100	60	80	140	—
Taq I	40	80	60	60	80	100
Tth111 I	(20)	80	40	100	(80)	—
Var91 I	<20	(20)	60	100	(60)	—
VpaK11B I	<20	<20	60	(40)	<20	100
Xba I	<20	80*	20	<20	120	—
Xho I	<20	60	100	160	60	—
Xsp I	<20	60	<20	100	160	—

\* BSA should be added to a final concentration of 0.01% to obtain 100% activity.

\*\* BSA and Triton® X-100 should be added to a final concentration of 0.01% each to obtain 100% activity.

## Recommended Buffers for Double Digestion

In the cloning process, it is sometimes necessary to perform a digestion with more than one restriction enzymes either simultaneously or sequentially. This table shows the optimal buffer for the combination of enzymes or the "double digest" application. Please note: some enzymes will work optimally at buffer concentrations other than 1X.

Enzyme	Acc I	BamH I	Bgl II	Cla I	EcoR I	EcoR V	Hinc II	Hind III	Kpn I	Nco I	Nde I	Not I	Pst I	Pvu I	Sac I	Sal I	Sma I	Spe I	Sph I	Xba I	Xho I
Supplied Buffer	10X M	10X K	10X H	10X M	10X H	10X H	10X M	10X M	10X L	10X K +BSA	10X H	10X H +BSA +Triton	10X H	10X K +BSA	10X L	10X H	10X T +BSA	10X M	10X H	10X M +BSA	10X H
Acc I	—	0.5X K	1X T	1X M	1X M	0.5X K	1X M	1X M	1X M	1X M +BSA	1X T	0.5X K +BSA	1X M	0.5X K	1X M	1.5X T	1X T +BSA	1X M	0.5X K	1X M	1X M
BamH I	0.5X K	—	1X K	1X K	1X K	1X K	0.5X K	1X K	0.5X K	1X K +BSA	1X K	0.5X K +BSA	1X K	1X K	0.5X K	1.5X T	0.5X T +BSA	1X K	1X K	0.5X K	1X K
Bgl II	1X T	1X K	—	1X H	1X H	1X H	2X K	1X K	1X T	1X K +BSA	1X H	1X H +BSA	1X H	1X K	0.5X K	1X H	1X T +BSA	1X H	1X H	2X T	1X H
Cla I	1X M	1X K	1X H	—	1X H	1X H	1X M	1X M	1X M	1X K +BSA	1X H	1X H +BSA	1X H	1X K	1X M	1X H	1X T +BSA	1X M	1X H	1X M	1X H
EcoR I	1X M	1X K	1X H	1X H	—	1X H	1X M	1X M	1X M	1X K +BSA	1X H	1X H +BSA	1X H	1X K	1X M	1X H	1X T +BSA	1X H	1X H	1X M	1X H
EcoR V	0.5X K	1X K	1X H	1X H	1X H	—	2X T	1X K	0.5X K	1X K +BSA	1X H	1X H +BSA	1X H	1X K	0.5X K	1X H	0.5X K +BSA	1X H	1X H	2X T	1X H
Hinc II	1X M	0.5X K	2X K	1X M	1X M	2X T	—	1X M	1X M	1X M +BSA	1X T	0.5X K +BSA	1X M	0.5X K	1X M	1.5X K	1X T +BSA	1X M	2X T	1X M	1X M
Hind III	1X M	1X K	1X K	1X M	1X M	1X K	1X M	—	1X M	1X K +BSA	1X K	0.5X K +BSA	1X M	1X K	1X M	1.5X K	1X T +BSA	1X M	1X K	1X M	1X M
Kpn I	1X M	0.5X K	1X T	1X M	1X M	0.5X K	1X M	1X M	—	0.5X K +BSA	1X T	0.5X K +BSA	1X M	0.5X K	1X L	1.5X T +BSA	1X T +BSA	1X M	0.5X K	1X M	1X M
Nco I	1X M +BSA	1X K +BSA	1X K +BSA	1X K +BSA	1X K +BSA	1X K +BSA	1X M +BSA	1X K +BSA	0.5X K +BSA	—	1X K +BSA	0.5X K +BSA	1X K +BSA	1X K +BSA	0.5X K +BSA	1.5X T +BSA	1X T +BSA	1X K +BSA	1X K +BSA	1X M +BSA	1X K +BSA
Nde I	1X T	1X K	1X H	1X H	1X H	1X H	1X T	1X K	1X T	1X K +BSA	—	1X H +BSA	1X H	1X K	1X T	1X H	1X T +BSA	1X H	1X H	1X T	1X H
Not I	0.5X K +BSA	0.5X K +BSA	1X H +BSA	1X H +BSA	1X H +BSA	1X H +BSA	0.5X K +BSA	0.5X K +BSA	0.5X K +BSA	0.5X K +BSA	—	1X H +BSA	1X H +BSA	2X K +BSA	0.5X K +BSA	1X H +BSA	0.5X T +BSA	1X H +BSA	1X H +BSA	0.5X K +BSA	1X H +BSA
Pst I	1X M	1X K	1X H	1X H	1X H	1X H	1X M	1X M	1X M	1X K +BSA	1X H	1X H +BSA	—	1X K	1X M	1X H	0.5X T +BSA	1X H	1X H	1X M	1X H
Pvu I	0.5X K	1X K	1X K	1X K	1X K	1X K	0.5X K	1X K	0.5X K	1X K +BSA	1X K	2X K +BSA	1X K	—	0.5X K	1.5X K +BSA	1X K +BSA	1X K	1X K	0.5X K	1X K
Sac I	1X M	0.5X K	0.5X K	1X M	1X M	0.5X K	1X M	1X M	1X L	0.5X K +BSA	1X T	0.5X K +BSA	1X M	0.5X K	—	1.5X T +BSA	1X T +BSA	1X M	0.5X K	1X M	1X M
Sal I	1.5X T	1.5X T	1X H	1X H	1X H	1X H	1.5X K	1.5X K	1.5X T +BSA	1.5X T +BSA	1X H	1X H +BSA	1X H	1.5X K +BSA	1.5X T +BSA	—	1.5X T +BSA	1X H	1X H	1.5X T	1