

TRANSFORMER SELECTION PROCESS

Determining Inrush and Voltage Requirements

Selecting a transformer for industrial control circuit applications requires knowledge of the following terms:

INRUSH VA is the product of the load voltage (V) multiplied by the current (A) that is required during start-up. It is calculated by adding the inrush VA requirements of all devices (contactors, timers, relays, pilot lights, solenoids, etc.), which will be energized together. Inrush VA requirements are best obtained from the component manufacturer.

SEALED VA also called Steady State VA, is the product of the load voltage (V) multiplied by the current (A) that is required to operate the circuit after initial start-up or under normal operating conditions. It is calculated by adding the sealed VA requirements of all electrical components of the circuit that will be energized at any given time. Sealed VA requirements are best obtained from the component manufacturer.

PRIMARY VOLTAGE is the voltage available from the electrical distribution system and its operational frequency, which is connected to the transformer supply voltage (H) terminals.

SECONDARY VOLTAGE is the voltage required for load operation, which is connected to the transformer load voltage (X) terminals.

Once the circuit variables have been determined, transformer selection is a simple 5-step process as follows:

1. Determine the Application Inrush VA by using the following industry accepted formula.

$$\text{Application Inrush VA} = \sqrt{(\text{INRUSH VA})^2 + (\text{SEALED VA})^2}$$

2. Refer to the Regulation Data Chart. If the primary voltage is basically stable and does not vary by more than 5% from nominal, the 90% secondary voltage column should be used. If the primary voltage varies between 5 and 10%, the 95% secondary voltage column should be used.
3. After determining the proper secondary voltage column, read down until a value equal to or greater than the Application Inrush VA is found. In no case should a lesser figure be used.
4. Read left to the Transformer VA Rating column to determine the proper transformer for the application. As a final check, make sure that the Transformer VA Rating is equal to or greater than the total sealed VA requirements.
5. Refer to the catalog pages to determine the proper catalog number based on the transformer VA and primary and secondary voltage requirements.

REGULATION DATA CHART

Transformer VA Rating	Inrush VA at 20% Power factor		
	NEMA / IEC 95% Sec. Voltage	NEMA / IEC 90% Sec. Voltage	NEMA / IEC 85% Sec. Voltage
25 ¹	100 / ----	130 / ---	150 / ---
50 ¹	170 / 190	200 / 220	240 / 270
75 ¹	310 / 350	410 / 460	540 / 600
100 ¹	370 / 410	540 / 600	730 / 810
150 ²	780 / 850	930 / 1030	1150 / 1270
200 ²	810 / 900	1150 / 1270	1450 / 1600
250 ²	1400 / 1540	1900 / 2090	2300 / 2530
300 ²	1900 / 2090	2700 / 2970	3850 / 4240
350 ²	3100 / 3410	3650 / 4020	4800 / 5280
500 ²	4000 / 4400	5300 / 5830	7000 / 7700
750 ²	8300 / 9130	11000 / 12100	14000 / 15400
1000 ²	15000 / 16500	21000 / 23000	27000 / 29500
1000 ³	9000 / 9900	13000 / 14300	18500 / 20300
1500 ³	10500 / 11500	15000 / 16500	20500 / 22500
2000 ³	17000 / 18900	25500 / 27300	34000 / 36400
3000 ³	24000 / 25700	36000 / 38500	47500 / 50200
5000 ³	55000 / 58800	92500 / 98900	115000 / 122000

To comply with NEMA standards, which require all magnetic devices to operate successfully at 85% of rated voltage, the 90% secondary column is most often used in selecting a transformer. No comparable requirement is available for IEC.

¹ For units with class 105° C insulation system.

² For units with class 130° C insulation system.

³ For units with class 180° C insulation system

CONTROL TRANSFORMERS

GENERAL SPECIFICATIONS:

STYLE: SERIES 2 IMPERVITRAN
 APPROVALS: UL/Cul FILE# E46323
 TEMP CLASS: 105°C/130°C
 VA SIZES: 50-1500

SUFFIX DESCRIPTION:

"R" IN SUFFIX DENOTES INSTALLED CLASS "CC" PRIMARY FUSE BLOCK
 TWO LETTER SUFFIX = TEMP CLASS 105C
 THREE LETTER SUFFIX ENDING "F" = TEMP CLASS 130C
 THREE LETTER SUFFIX ENDING "H" = TEMP CLASS 180C

STYLE: IMPERVITRAN

APPROVALS: UL LISTED FILE# E46323/ CSA APPROVED FILE# LR27533
 TEMP CLASS: 105°C/130°C/180°C
 VA SIZES: 1000-5000

CATALOG NUMBER GROUP "A"	VOLTAGE: PRI: 220x440, 230x460, 240x480 SEC: 110/115/120	
	VA	AMPS
B050BTZ13JK	50	0.43
B050BTZ13RB		
B075BTZ13JK	75	0.65
B075BTZ13RB		
B100BTZ13JK	100	0.87
B100BTZ13RB		
B150BTZ13JKF	150	1.30
B150BTZ13RBF		
B200BTZ13JKF	200	1.74
B200BTZ13RBF		
B250BTZ13JKF	250	2.17
B250BTZ13RBF		
B300BTZ13JKF	300	2.61
B300BTZ13RBF		
B350BTZ13JKF	350	3.04
B350BTZ13RBF		
B500BTZ13JKF	500	4.35
B500BTZ13RBF		
B750BTZ13JKF	750	6.52
B750BTZ13RBF		
B1K0BTZ13JKF	1000	8.70
B1K0BTZ13RBF		
B1K5BTZ13JKH	1500	13.04
B1K5BTZ13RBH		
B2K0BTZ13JKH	2000	17.39
B2K0BTZ13RBH		
B3K0BTZ13JXH	3000	26.09
B5K0BTZ13JXH	5000	43.48

CATALOG NUMBER GROUP "B"	VOLTAGE: PRI: 240x480 SEC: 24	
	VA	AMPS
B050PU7JK	50	2.08
B050PU7RB		
B075PU7JK	75	3.13
B075PU7RB		
B100PU7JK	100	4.17
B100PU7RB		
B150PU7JKF	150	6.25
B150PU7RBF		
B200PU7JKF	200	8.33
B200PU7RBF		
B250PU7JKF	250	10.42
B250PU7RBF		
B300PU7JKF	300	12.50
B300PU7RBF		
B350PU7JKF	350	14.58
B350PU7RBF		
B500PU7JKF	500	20.83
B500PU7RBF		
B750PU7JXF	750	31.25
B750PU7RCF		

CATALOG NUMBER GROUP "C"	VOLTAGE: PRI: 120x240 SEC: 24	
	VA	AMPS
B050LP7JK	50	2.08
B050LP7RB		
B075LP7JK	75	3.13
B075LP7RB		
B100LP7JK	100	4.17
B100LP7RB		
B150LP7JKF	150	6.25
B150LP7RBF		
B200LP7JKF	200	8.33
B200LP7RBF		
B250LP7JKF	250	10.42
B250LP7RBF		
B300LP7JKF	300	12.50
B300LP7RBF		
B350LP7JKF	350	14.58
B350LP7RBF		
B500LP7JKF	500	20.83
B500LP7RBF		
B750LP7JXF	750	31.25
B750LP7RCF		

CATALOG NUMBER GROUP "E"	VOLTAGE: PRI: 550/575/600 SEC: 110/115/120	
	VA	AMPS
B050WZ13XK	50	0.43
B050WZ13RK		
B075WZ13XK	75	0.65
B075WZ13RK		
B100WZ13XK	100	0.87
B100WZ13RK		
B150WZ13XKF	150	1.30
B150WZ13RKF		
B200WZ13XKF	200	1.74
B200WZ13RKF		
B250WZ13XKF	250	2.17
B250WZ13RKF		
B300WZ13XKF	300	2.61
B300WZ13RKF		
B350WZ13XKF	350	3.04
B350WZ13RKF		
B500WZ13XKF	500	4.35
B500WZ13RKF		
B750WZ13XKF	750	6.52
B750WZ13RKF		

CATALOG NUMBER GROUP "F"	VOLTAGE: PRI: 208/277 SEC: 120	
	VA	AMPS
B050MQ15XK	50	0.42
B050MQ15RK		
B075MQ15XK	75	0.63
B075MQ15RK		
B100MQ15XK	100	0.83
B100MQ15RK		
B150MQ15XKF	150	1.25
B150MQ15RKF		
B200MQ15XKF	200	1.67
B200MQ15RKF		
B250MQ15XKF	250	2.08
B250MQ15RKF		
B300MQ15XKF	300	2.50
B300MQ15RKF		
B350MQ15XKF	350	2.92
B350MQ15RKF		
B500MQ15XKF	500	4.17
B500MQ15RKF		
B750MQ15XKF	750	6.25
B750MQ15RKF		

CATALOG NUMBER GROUP "G"	VOLTAGE: PRI: 208/230/460 SEC: 115	
	VA	AMPS
B050MBT13XK	50	0.43
B050MBT13RK		
B075MBT13XK	75	0.65
B075MBT13RK		
B100MBT13XK	100	0.87
B100MBT13RK		
B150MBT13XKF	150	1.30
B150MBT13RKF		
B200MBT13XKF	200	1.74
B200MBT13RKF		
B250MBT13XKF	250	2.17
B250MBT13RKF		
B300MBT13XKF	300	2.61
B300MBT13RKF		
B350MBT13XKF	350	3.04
B350MBT13RKF		
B500MBT13XKF	500	4.35
B500MBT13RKF		
B750MBT13XKF	750	6.52
B750MBT13RKF		
B1K0MBT13XKF	1000	8.70
B1K0MBT13RKF		
B1K5MBT13XKH	1500	13.04
B1K5MBT13RKH		
B2K0MBT13XKH	2000	17.39
B2K0MBT13RKH		
B3K0MBT13XKH	3000	26.09
B5K0MBT13XKH	5000	43.48

CONTROL TRANSFORMERS

STYLE: SERIES 2 IMPERVITRAN

STYLE: IMPERVITRAN

CATALOG
NUMBER
GROUP "H"

VOLTAGE:

PRI: 230/460/575

SEC: 95/115

	VA	AMPS
B050BTW37XX	50	0.53/0.44
B050BTW37RX		
B075BTW37XX	75	0.79/0.65
B075BTW37RX		
B100BTW37XX	100	1.05/0.87
B100BTW37RX		
B150BTW37XXF	150	1.58/1.30
B150BTW37RXF		
B200BTW37XXF	200	2.11/1.74
B200BTW37RXF		
B250BTW37XXF	250	2.63/2.17
B250BTW37RXF		
B300BTW37XXF	300	3.16/2.61
B300BTW37RXF		
B350BTW37XXF	350	3.68/3.04
B350BTW37RXF		
B500BTW37XXF	500	5.26/4.35
B500BTW37RXF		
B750BTW37XXF	750	7.89/6.52
B750BTW37RXF		
B1K0BTWZ37XKH	1000	10.53/8/70
B1K0BTWZ37RKH		
B1K5BTWZ37XKH	1500	15.79/13.04
B1K5BTWZ37RKH		
B2K0BTWZ37XKH	2000	21.05/17.39
B2K0BTWZ37RKH		
B3K0BTWZ37XXH	3000	31.58/26.09
B5K0BTWZ37XXH	5000	52.63/43.48

GROUP "I"

VOLTAGE:

PRI: 380/400/415

SEC: 110x220

	VA	AMPS
B050RFD34XJ	50	0.46/0.23
B050RFD34RJ		
B075RFD34XJ	75	0.68/0.34
B075RFD34RJ		
B100RFD34XJ	100	0.91/0.46
B100RFD34RJ		
B150RFD34XJF	150	1.37/0.69
B150RFD34RJF		
B200RFD34XJF	200	1.82/0.91
B200RFD34RJF		
B250RFD34XJF	250	2.28/1.14
B250RFD34RJF		
B300RFD34XJF	300	2.72/1.36
B300RFD34RJF		
B350RFD34XJF	350	3.18/1.59
B350RFD34RJF		
B500RFD34XJF	500	4.55/2.27
B500RFD34RJF		
B750RFD34XJF	750	6.82/3.41
B750RFD34RJF		

CATALOG
NUMBER
GROUP "J"

VOLTAGE:

PRI: 208/230/460

SEC: 24/115

	VA	AMPS
B050-2000-1	50	2.08/0.44
B050-2000-8		
B075-2001-1	75	3.13/0.65
B075-2001-8		
B100-2002-1	100	4.17/0.87
B100-2002-8		
B150-2003-1F	150	6.25/1.30
B150-2003-8F		
B200-2004-1F	200	8.33/1.74
B200-2004-8F		
B250-2005-1F	250	10.42/2.17
B250-2005-8F		
B300-2006-1F	300	12.50/2.61
B300-2006-8F		
B350-2007-1F	350	14.58/3.04
B350-2007-8F		
B500-2008-1F	500	20.84/4.35
B500-2008-8F		
B750-2009-1F	750	31.3/6.5
B750-2009-8F		
B1K0-2010-1F	1000	41.7/8.7
B1K0-2010-8F		

GROUP "J"

VOLTAGE:

PRI: 208/230/460

SEC: 24/115

	VA	AMPS
B050MBT713XK	50	2.08/0.44
B050MBT713RK		
B075MBT713XK	75	3.13/0.65
B075MBT713RK		
B100MBT713XK	100	4.17/0.87
B100MBT713RK		
B150MBT713XKF	150	6.25/1.30
B150MBT713RKF		
B200MBT713XKF	200	8.33/1.74
B200MBT713RKF		
B250MBT713XKF	250	10.42/2.17
B250MBT713RKF		
B300MBT713XKF	300	12.50/2.61
B300MBT713RKF		
B350MBT713XKF	350	14.58/3.04
B350MBT713RKF		
B500MBT713XKF	500	20.84/4.35
B500MBT713RKF		

CATALOG
NUMBER
GROUP "K"

VOLTAGE:

PRI: 240x480

SEC: 120x240

	VA	AMPS
B050PU1519JJ	50	0.42/0.21
B050PU1519RR		
B075PU1519JJ	75	0.63/0.31
B075PU1519RR		
B100PU1519JJ	100	0.83/0.42
B100PU1519RR		
B150PU1519JJF	150	1.25/0.63
B150PU1519RRF		
B200PU1519JJF	200	1.67/0.83
B200PU1519RRF		
B250PU1519JJF	250	2.08/1.04
B250PU1519RRF		
B300PU1519JJF	300	2.50/1.25
B300PU1519RRF		
B350PU1519JJF	350	2.92/1.46
B350PU1519RRF		
B500PU1519JJF	500	4.17/2.08
B500PU1519RRF		
B750PU1519JJF	750	6.25/3.12
B750PU1519RRF		

CONTROL TRANSFORMERS
STYLE: IMPERVITRAN

**CATALOG
NUMBER
GROUP "L"**

VOLTAGE:
 PRI: 208-600
 SEC: 85-130

	VA	AMPS
B050-0482-1	50	0.38
B050-0482-8		
B100-0483-1	100	0.77
B100-0483-8		
B150-0484-1F	150	1.15
B150-0484-8F		
B250-0485-1F	250	1.92
B250-0485-8F		
B350-0486-1F	350	2.69
B350-0486-8F		
B500-0487-1F	500	3.85
B500-0487-8F		
B750-0488-1F	750	5.77
B750-0488-8F		

GROUP "M"

VOLTAGE:
 PRI: 240x480, 230x460, 220x440
 SEC: 120x240, 115x230, 110x220

	VA	AMPS
B1K0-0500-3F	1000	8.70/4.35
B1K5-0501-3H	1500	13.04/6.52
B2K0-0502-3H	2000	17.39/8.70
B3K0-0503-3H	3000	26.09/13.04
B5K0-0504-3H	5000	43.48/21.74

GROUP "N"

VOLTAGE:
 PRI: 240, 347, 380
 SEC: 120x240

B1K0-0321-3F	1000	8.33/4.17
B1K5-0322-3H	1500	12.50/6.25
B2K0-0323-3H	2000	16.67/8.33
B3K0-0324-3H	3000	25.00/12.50
B5K0-0325-3H	5000	41.67/20.83

DIMENSIONAL DATA (KVA SIZES)

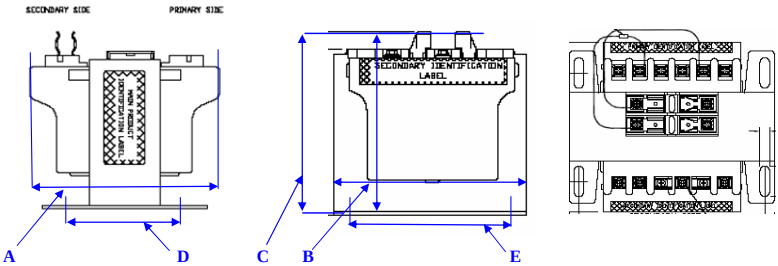
KVA SIZES CAN EITHER BE SERIES 2 OR IMPERVITRAN

DIAGRAMS DEPICT SERIES 2 DESIGN.

NOTES:
TRANSFORMERS 500VA AND LARGER ARE FITTED WITH 6-TERMINAL CONNECTION BLOCKS.

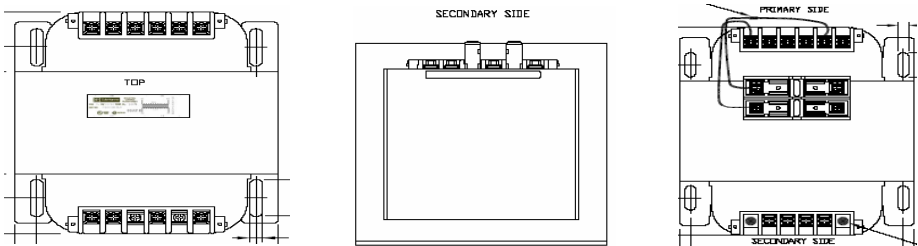
PRIMARY FUSE BLOCK ADDS 1.375" (35MM) TO "C" DIMENSION.

NO SECONDARY FUSE CLIP DEDUCTS 0.50 (12.7MM) FROM "C" DIMENSION.



CATALOG (VOLTAGE) GROUP	DIMENSIONS INCHES/MM										
	A	B		C		D		E		APPROX	
	A (BTZ13)	(MAX)			INCL. FUSE CLIP		(MAX)			WEIGHT	
VA	IN	MM	IN	MM	IN	MM	IN	MM	IN	MM	LBS
1000	6.11	155	6.75	172	6.30	160	3.91	99	6.13	156	30.50
1500	8.11	206	6.75	172	6.32	161	6.12	155	6.13	156	50.10
2000	7.75	197	6.75	172	6.28	160	4.97	126	6.13	156	46.00
3000	8.06	205	9.00	229	7.50	191	5.25	133	7.50	191	55.90
5000	10.38	264	9.00	229	7.50	191	7.56	192	7.50	191	84.40
G (MBT13)											
1000	7.44	189	6.38	162	5.42	138	5.09	129	5.31	135	37.00
1500	8.50	216	6.75	172	5.73	146	6.09	155	6.13	156	53.90
2000	8.13	207	6.75	172	5.75	146	5.25	133	6.13	156	42.00
3000	8.56	217	9.00	229	7.50	191	5.75	146	7.50	191	64.50
5000	10.00	254	9.00	229	7.50	191	7.19	183	7.50	191	97.00
H (BTWZ37)											
1000	7.00	178	6.38	162	5.42	138	5.06	129	5.31	135	31.80
1500	7.45	189	6.75	172	6.29	160	5.25	133	6.13	156	44.20
2000	7.56	192	9.00	229	7.80	198	4.81	122	7.50	191	57.70
3000	8.75	222	9.00	229	7.50	191	5.94	151	7.50	191	76.20
5000	11.00	279	9.00	229	7.50	191	8.19	208	7.50	191	127.40
M											
240/480 X 120/240											
1000	7.00	178	5.25	133	4.25	108	5.38	137	4.38	111	26.30
1500	7.00	178	6.75	172	5.75	146	4.25	108	6.13	156	31.00
2000	7.75	197	6.75	172	5.73	146	4.97	126	6.13	156	46.00
3000	8.06	205	9.00	229	7.50	191	5.25	133	7.50	191	56.00
5000	10.00	254	9.00	229	7.50	191	7.19	183	7.50	191	85.40
N											
240,347,380 X 120/240											
1000	7.38	187	6.38	162	5.44	138	5.06	129	5.31	135	29.00
1500	8.13	207	6.38	162	5.44	138	5.06	129	5.31	135	33.30
2000	8.88	226	6.75	172	5.75	146	6.13	156	6.13	156	50.00
3000	8.50	216	9.00	229	7.50	191	5.69	146	7.50	191	74.00
5000	10.38	264	9.00	229	7.50	191	7.56	192	7.50	191	110.00

DIAGRAMS DEPICT IMPERVITRAN DESIGN.

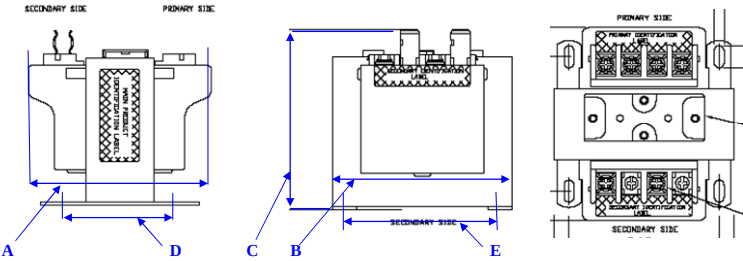


DIMENSIONAL DATA

NOTES: SERIES 2 TRANSFORMERS 500VA AND LARGER ARE FITTED WITH 6-TERMINAL CONNECTION BLOCKS.

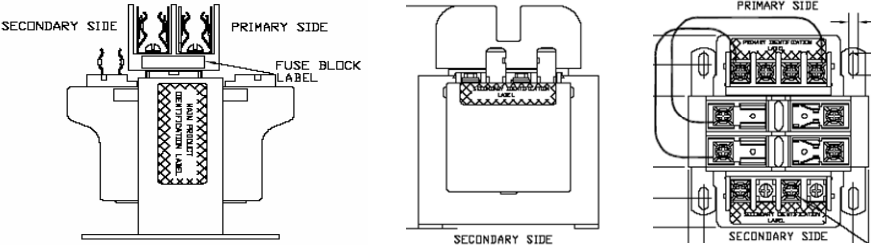
PRIMARY FUSE BLOCK ADDS 1.375" (35MM) TO "C" DIMENSION.

NO SECONDARY FUSE CLIP DEDUCTS 0.50 (12.7MM) FROM "C" DIMENSION.



CATALOG (VOLTAGE) GROUP	DIMENSIONS INCHES/MM											
	A		B		C		D		E		APPROX WEIGHT	
	SERIES 2 (MAX)	ALL VERSIONS	INCL. FUSE CLIP (MAX)	ALL VERSIONS	ALL VERSIONS	ALL VERSIONS	ALL VERSIONS	ALL VERSIONS				
J	P/N	IN	MM	IN	MM	IN	MM	IN	MM	IN	LBS	
	B050MBT713XK	3.50	89	3.00	76	3.14	79	2.25	57	2.50	64	3.40
	B075MBT713XK	3.50	89	3.38	86	3.44	87	2.44	62	2.82	71	4.80
	B100MBT713XK	3.63	92	3.75	95	3.78	96	2.44	62	3.13	79	5.90
	B150MBT713XKF	4.00	102	3.75	95	3.78	96	3.19	81	3.13	79	8.00
	B200MBT713XKF	4.38	111	4.50	114	4.40	112	3.00	76	3.75	95	9.80
	B250MBT713XKF	4.38	111	4.50	114	4.40	112	3.75	95	3.75	95	12.00
	B300MBT713XKF	5.19	132	5.25	133	5.14	131	3.88	99	4.38	111	14.00
	B350MBT713XKF	5.00	127	5.25	133	5.14	131	3.88	99	4.38	111	15.00
	B500MBT713XKF	5.50	140	5.25	133	5.14	131	5.38	137	4.38	111	18.00
	J											
	B050-2000-1	4.53	115	3.00	76	3.14	79	2.82	71	2.50	64	3.40
	B075-2001-1	4.53	115	3.75	95	3.78	96	2.82	71	3.13	79	4.80
	B100-2002-1	4.53	115	3.75	95	3.78	96	3.00	76	3.13	79	5.90
	B150-2003-1F	5.03	128	3.75	95	3.78	96	3.19	81	3.13	79	8.00
	B200-2004-1F	4.38	111	4.50	114	4.40	112	3.00	76	3.75	95	9.80
	B250-2005-1F	4.75	121	4.50	114	4.40	112	3.75	95	3.75	95	12.00
	B300-2006-1F	6.11	155	5.25	133	5.14	131	3.88	99	4.38	111	14.00
	B350-2007-1F	6.11	155	5.25	133	5.14	131	3.88	99	4.38	111	15.00
	B500-2008-1F	7.11	181	5.25	133	5.14	131	5.38	137	4.38	111	18.00
	L											
	B050-0482-1	3.44	87	3.88	99	3.38	86	2.41	61	2.81	71	4.00
	B100-0483-1	4.00	102	3.75	95	3.50	89	3.00	76	3.13	79	6.60
	B150-0484-1F	4.00	102	4.50	114	4.50	114	2.82	71	3.75	95	8.70
	B250-0485-1F	5.75	146	4.50	114	4.50	114	4.38	111	3.75	95	11.40
	B350-0486-1F	5.14	131	5.25	133	4.75	121	4.38	111	4.38	111	13.60
	B500-0487-1F	7.19	183	5.14	131	4.75	121	5.88	149	4.38	111	17.40
	B750-0488-1F	6.50	165	6.75	172	6.00	152	4.25	108	6.13	156	27.50

DIAGRAMS BELOW DEPICT INSTALLED PRIMARY FUSING OPTION.



DIAGRAMS DEPICT UNITS 500VA AND UP.

