

SOURCETRONIC – Quality electronics for service, lab and production

User Manual

Braking Unit SBU



Dynamic Braking Unit SBU-2015/2030, SBU-4015/4030/4045/4220 User Manual

NOTE: REFER ALSO TO APPLICABLE INVERTER INSTRUCTION MANUAL

Manual Date: **March, 2011**

After reading this manual,
keep it handy for future reference.

Sourcetric GmbH

Safety Precautions

Please read through this user's manual before you use our product. Keep this manual handy for future reference.

Safety labels used in this manual:



CAUTION! – This indicates a potentially hazardous situation that, if not avoided, can result in minor to moderate injury, or serious damage to the product.



WARNING! – This indicates a potentially hazardous situation that, if not avoided, can result in serious injury or death.

I. General Information

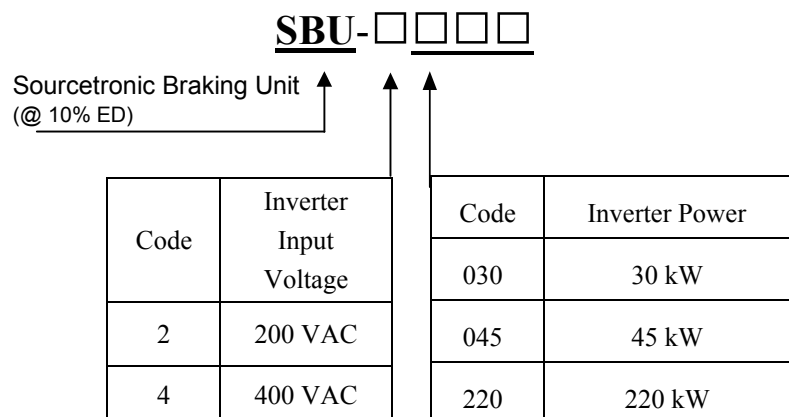
The function of the SBU braking unit is to divert into a braking resistor the regenerative energy produced in the process of decelerating the motor, converting that energy into heat. Regenerative energy flows from the motor into the inverter DC Bus, manifested as increased bus voltage. The advantage gained using the SBU is improved braking performance and shorter deceleration time of the load.

Before you use the SBU braking unit, please read through this manual and please contact your distributor if you have any questions. This manual will provide you the necessary information for installation, operation, troubleshooting and repair of the SBU braking unit.

A. Inspection

Please check that the model number is the same as what you ordered BEFORE opening the box. Then, check the contents for any sign of defect or damage during transport. If there is any problem, please contact your Sourcetricon distributor immediately.

B. Braking Unit model numbering convention



C. SBU Series Technical Specifications


200 V SERIES

Model		SBU-2015	SBU-2030
Input and output specifications	Peak current (A) *	50	90
	Continuous current (A)	15	30
	Braking Activation Voltage	380 ±10 VDC (not selectable)	
	Maximum hysteresis	10 VDC	
	Multiple units	Maximum: 10 SBUs parallel connected	
Power supply	DC Bus Voltage Range	230-380V	
Indication functions	Power ON	The red "power" LED will be on whenever the inverter DC Bus voltage is above 35VDC	
	Braking ON	The green "braking" LED will be on during braking unit conduction	
Physical data	Ambient temperature	Minus 10°C to 40°C (no frost)	
	Ambient humidity	90% RH (no dew)	
	Vibration	10-20hz: 1g, 20-50hz: 0.2g	
	Protection	IP20	
	Weight	2.3 kg/5.1 lbs	

400 V SERIES

Model		SBU-4015	SBU-4030	SBU-4045	SBU-4220
Input and output specifications	Peak current (A) *	25	50	75	250
	Continuous current (A)	8	15	25	80
	Braking Activation Voltage	630/660/690/730/760V±16V (jumper selectable) †			
	Maximum hysteresis	16V			
	Multiple units	Maximum: 10 SBUs parallel connected			
Power supply	DC Bus Voltage Range	460-800V			
Indication functions	Power ON	The red "power" LED will be on whenever the inverter DC Bus voltage is above 35VDC			
	Braking ON	The green "braking" LED will be on during braking unit conduction			
Physical data	Ambient temperature	Minus 10°C to 40°C (no frost)			
	Ambient humidity	90% RH (no dew)			
	Vibration	10-20hz: 1g, 20-50hz: 0.2g			
	Protection	IP20			
	Weight	2.3 kg/5.1 lbs			11.6 kg/ 25.5 lbs

* Peak current is defined as capacity for 10 seconds maximum, and 10% ED

 † **WARNING:** It is critical to set the jumper appropriately for the local supply voltage, or damage to the SBU, inverter and or resistors may result.

**D. Braking Resistor Selection Table for SBU braking unit
200 V SERIES 10% ED**

ED = 10%, braking activation voltage = 380 VDC

Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (10%ED) %
0.4	SBU-2015	1	70W 200Ω	1	220
0.75	SBU-2015	1	70W 200Ω	1	125
1.5	SBU-2015	1	260W 100Ω	1	125
2.2	SBU-2015	1	260W 70Ω	1	120
3.7	SBU-2015	1	390W 40Ω	1	125
5.5	SBU-2015	1	520W 30Ω	1	115
7.5	SBU-2015	1	780W 20Ω	1	125
11	SBU-2015	1	2400W 13.6Ω	1	125
15	SBU-2015	1	3000W 10Ω	1	125
18.5	SBU-2015	2	2400W 16Ω	2	125
22	SBU-2015	2	2400W 13.6Ω	2	125
30	SBU-2015	2	3000W 10Ω	2	125
37	SBU-2015	2	3000W 10Ω	2	100
45	SBU-2015	3	3000W 10Ω	3	120
55	SBU-2030	2	4800W 6.8Ω	2	100
75	SBU-2030	3	4800W 6.8Ω	3	110
90	SBU-2030	4	4800W 6.8Ω	4	120
110	SBU-2030	5	4800W 6.8Ω	5	100

200 V SERIES 20% ED

ED = 20%, braking activation voltage = 380 VDC

Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (20%ED) %
0.4	SBU-2015	1	140W 200Ω	1	220
0.75	SBU-2015	1	140W 200Ω	1	125
1.5	SBU-2015	1	520W 100Ω	1	125
2.2	SBU-2015	1	520W 70Ω	1	120
3.7	SBU-2015	1	780W 40Ω	1	125
5.5	SBU-2015	1	1KW 30Ω	1	115
7.5	SBU-2015	1	1.5KW 20Ω	1	125
11	SBU-2015	1	4.8KW 13.6Ω	1	125
15	SBU-2015	2	3KW 20Ω	2	125
18.5	SBU-2030	1	9.6KW 8Ω	1	125
22	SBU-2030	1	9.6KW 6.8Ω	1	125
30	SBU-2030	3	4KW 15Ω	3	125
37	SBU-2030	2	6KW 10Ω	2	100
45	SBU-2030	2	9.6KW 6.8Ω	2	120
55	SBU-2030	3	6.4KW 10.2Ω	3	100
75	SBU-2030	4	7.2KW 9Ω	4	110
90	SBU-2030	4	9.6KW 6.8Ω	4	120
110	SBU-2030	5	9.6KW 6.8Ω	5	100

200 V SERIES 40% ED


ED = 40%, braking activation voltage = 380 VDC

Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (40%ED) %
0.4	SBU-2015	1	240W 200Ω	1	220
0.75	SBU-2015	1	450W 200Ω	1	125
1.5	SBU-2015	1	900W 100Ω	1	125
2.2	SBU-2015	1	1.3KW 70Ω	1	120
3.7	SBU-2015	1	2.2KW 40Ω	1	125
5.5	SBU-2015	1	3.3KW 30Ω	1	115
7.5	SBU-2015	1	4.5KW 20Ω	1	125
11	SBU-2015	2	3.3KW 27.2Ω	2	125
15	SBU-2030	1	9KW 10Ω	1	125
18.5	SBU-2030	2	6KW 16Ω	2	125
22	SBU-2030	2	6.6KW 13.6Ω	2	125
30	SBU-2030	2	9KW 10Ω	2	125
37	SBU-2030	3	7.5KW 15Ω	3	100
45	SBU-2030	3	9KW 10.2Ω	3	120
55	SBU-2030	4	8.5KW 13.2Ω	4	100
75	SBU-2030	4	12KW 9Ω	4	110
90	SBU-2030	6	9KW 10.2Ω	6	120
110	SBU-2030	8	8.5KW 10.8Ω	8	100

400 V SERIES 10% ED

ED = 10%, braking activation voltage = 760 VDC[†]


Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (10%ED) %
0.4	SBU-4015	1	70W 750Ω	1	230
0.75	SBU-4015	1	70W 750Ω	1	130
1.5	SBU-4015	1	260W 400Ω	1	125
2.2	SBU-4015	1	260W 250Ω	1	135
3.7	SBU-4015	1	390W 150Ω	1	135
5.5	SBU-4015	1	520W 100Ω	1	135
7.5	SBU-4015	1	780W 75Ω	1	130
11	SBU-4015	1	1040W 50Ω	1	135
15	SBU-4015	1	1560W 40Ω	1	125
18.5	SBU-4030	1	4800W 32Ω	1	125
22	SBU-4030	1	4800W 27.2Ω	1	125
30	SBU-4030	1	6000W 20Ω	1	125
37	SBU-4045	1	9600W 16Ω	1	125
45	SBU-4045	1	9600W 13.6Ω	1	125
55	SBU-4045	2	6000W 20Ω	2	135
75	SBU-4045	2	9600W 13.6Ω	2	145
90	SBU-4045	2	9600W 13.6 Ω	2	100
110	SBU-4045	3	9600W 13.6Ω	3	100
132	SBU-4220	1	16KW 3.6Ω	1	120
160	SBU-4220	1	40KW 3Ω	1	140
220	SBU-4220	1	60KW 2.5Ω	1	110
300	SBU-4220	2	40KW 3Ω	2	110
600	SBU-4220	4	40KW 3Ω	4	110

 **† WARNING:** It is critical to set the jumper appropriately for the local supply voltage, or damage to the SBU, inverter and or resistors may result. Factory default setting may not be appropriate for your installation!

400 V SERIES 20% ED

ED = 20%, braking activation voltage = 760 VDC†


Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (20%ED) %
0.4	SBU-4015	1	140W 750Ω	1	230
0.75	SBU-4015	1	140W 750Ω	1	130
1.5	SBU-4015	1	520W 400Ω	1	125
2.2	SBU-4015	1	520W 250Ω	1	135
3.7	SBU-4015	1	780W 150Ω	1	135
5.5	SBU-4015	1	1040W 100Ω	1	135
7.5	SBU-4015	1	1560W 75Ω	1	130
11	SBU-4015	1	2KW 50Ω	1	135
15	SBU-4030	1	3KW 40Ω	1	125
18.5	SBU-4030	1	9600W 32Ω	1	125
22	SBU-4030	1	9600W 27.2Ω	1	125
30	SBU-4045	1	12KW 20Ω	1	125
37	SBU-4045	1	20KW 16Ω	1	125
45	SBU-4030	2	10KW 27.2Ω	2	125
55	SBU-4045	2	12KW 20Ω	2	135
75	SBU-4045	3	18KW 20.4Ω	3	145
90	SBU-4045	4	12KW 21.2Ω	4	120
110	SBU-4045	4	15KW 18Ω	4	100
132	SBU-4220	1	48KW 3.6Ω	1	120
160	SBU-4220	1	80KW 3Ω	1	140
220	SBU-4220	2	60KW 5Ω	2	110
300	SBU-4220	2	80KW 3Ω	2	110
600	SBU-4220	4	80KW 3Ω	4	110

 **† WARNING:** It is critical to set the jumper appropriately for the local supply voltage, or damage to the SBU, inverter and or resistors may result. Factory default setting may not be appropriate for your installation!

400 V SERIES 40% ED

ED = 40%, braking activation voltage = 760 VDC†

Power of Inverter (KW)	Model of braking unit	Quantity of braking unit	Resistors	Quantity of resistors	Braking torque (40%ED) %
0.4	SBU-4015	1	240W 750Ω	1	230
0.75	SBU-4015	1	450W 750Ω	1	130
1.5	SBU-4015	1	800W 400Ω	1	125
2.2	SBU-4015	1	1.32KW 250Ω	1	135
3.7	SBU-4015	1	2.2KW 150Ω	1	135
5.5	SBU-4015	1	3.3KW 100Ω	1	135
7.5	SBU-4015	1	4.5KW 75Ω	1	130
11	SBU-4030	1	6.6KW 50Ω	1	135
15	SBU-4030	1	9KW 40Ω	1	125
18.5	SBU-4045	1	11KW 32Ω	1	125
22	SBU-4045	1	13.2KW 27.2Ω	1	125
30	SBU-4030	2	10KW 40Ω	2	125
37	SBU-4045	2	11KW 32Ω	2	125
45	SBU-4045	2	13.5KW 27.2Ω	2	125
55	SBU-4045	3	12KW 30Ω	3	135
75	SBU-4045	4	11KW 27.2Ω	4	145
90	SBU-4220	1	54KW 5.3Ω	1	120
110	SBU-4220	1	66KW 4.4Ω	1	100
132	SBU-4220	2	40KW 10Ω	2	130
160	SBU-4220	2	48KW 6Ω	2	140
220	SBU-4220	2	66KW 5Ω	2	110
300	SBU-4220	3	60KW 4.5Ω	3	110
600	SBU-4220	6	60KW 4.5Ω	6	110

 **† WARNING:** It is critical to set the jumper appropriately for the local supply voltage, or damage to the SBU, inverter and or resistors may result. Factory default setting may not be appropriate for your installation!

II. Mounting

A. External dimensions of SBU-2015/2030/4015/4030/4045/4220

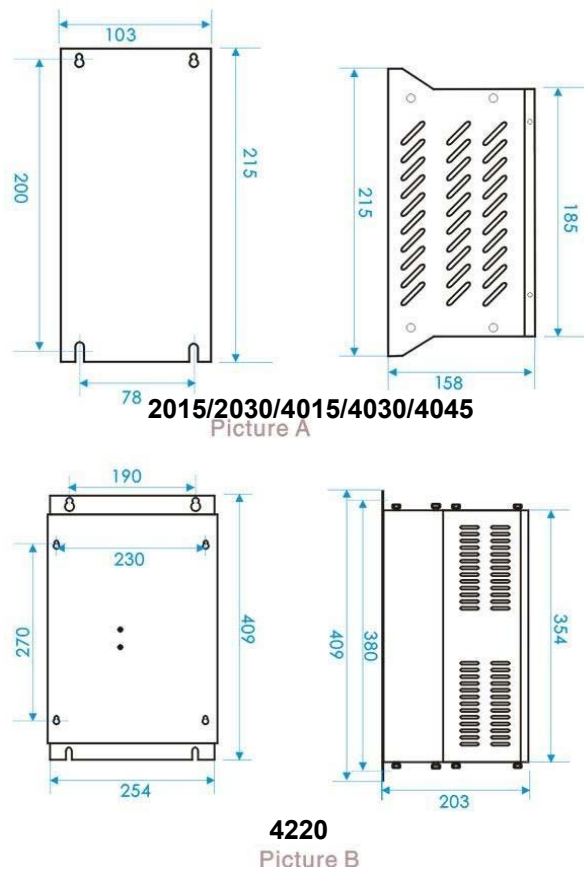


Figure 1 – External Dimensions

Model	Mounting Hole Size (mm)	Terminal Screw Size	Wire Size (mm ²)	Wire Size (AWG)
2015/2030/4015/4030/4045	6	M4	4 – 6	10 – 8
4220	8	M8	16 – 36	4 – 2

B. Braking Unit Front Panel

1. Front Cover Removal

Grasp the two sides of the front panel firmly. Remove the two attachment screws at the bottom of the cover by turning counterclockwise. Remove the cover by lifting it upward from the bottom. (Figure 2 A)

2. Front Cover Re-attachment

Insert the top tongue of the front cover under the coping. Push the front cover down until it is fully seated. Reinstall the attachment screws at the bottom of the front cover. (3-5N·M) (Figure 2B)

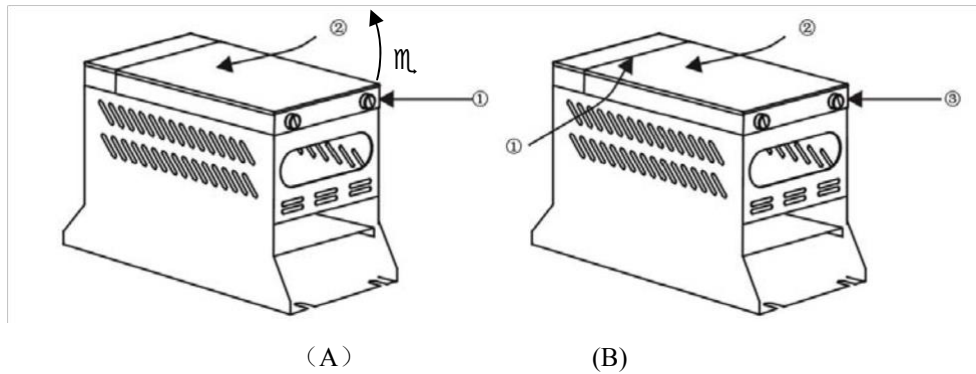


Figure 2 –
Front Cover Removal and Reinstallation of SBU Braking Unit

C. Cautions for Installation



CAUTION!

Please install the braking unit on a non-flammable wall or panel. Otherwise there is risk of fire.

If you install braking units in an enclosure, be sure to size the panel properly and provide adequate cooling/ventilation as necessary to ensure the internal temperature remains lower than +40°C.

It is normal for this braking unit to become hot during operation. Therefore be sure nothing flammable or explosive comes in contact with it while it is in use. Otherwise there is risk of fire.

1. Installation considerations:

- If installed in a cabinet, the cabinet should be adequately ventilated.
- Ambient temperature should be between -10°C and +40°C, or if NOT in a cabinet, between -10°C and +50°C (no frost)
- Humidity < 90% RH, non-condensing.
- Do not install the braking unit on wooden board or any flammable surface.
- Do not install where the unit will be exposed to direct sunlight.
- Do not install near flammable, explosive or caustic gases or liquids
- Protect from dust and strong electromagnetic fields.

2. Ambient temperature:

In order to improve the life and reliability of the braking unit, please install it in a well-ventilated area. If you install braking units in an enclosure, be sure to size the panel properly and provide adequate cooling/ventilation as necessary to ensure the internal temperature remains lower than +40°C.

3. Other precautions for installation:

Before installation, cover the ventilation grills on the braking unit with tape to keep out dust and metal fragments. After installation is completed, be sure to remove any tape or other coverings from the ventilation grills.

4. Mounting clearance:

Provide adequate top, bottom and side clearance around the SBU according to the following diagram:

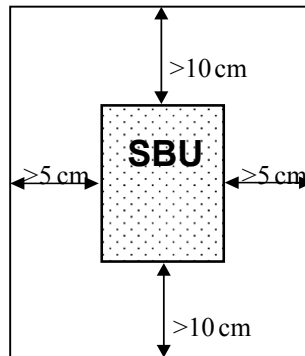





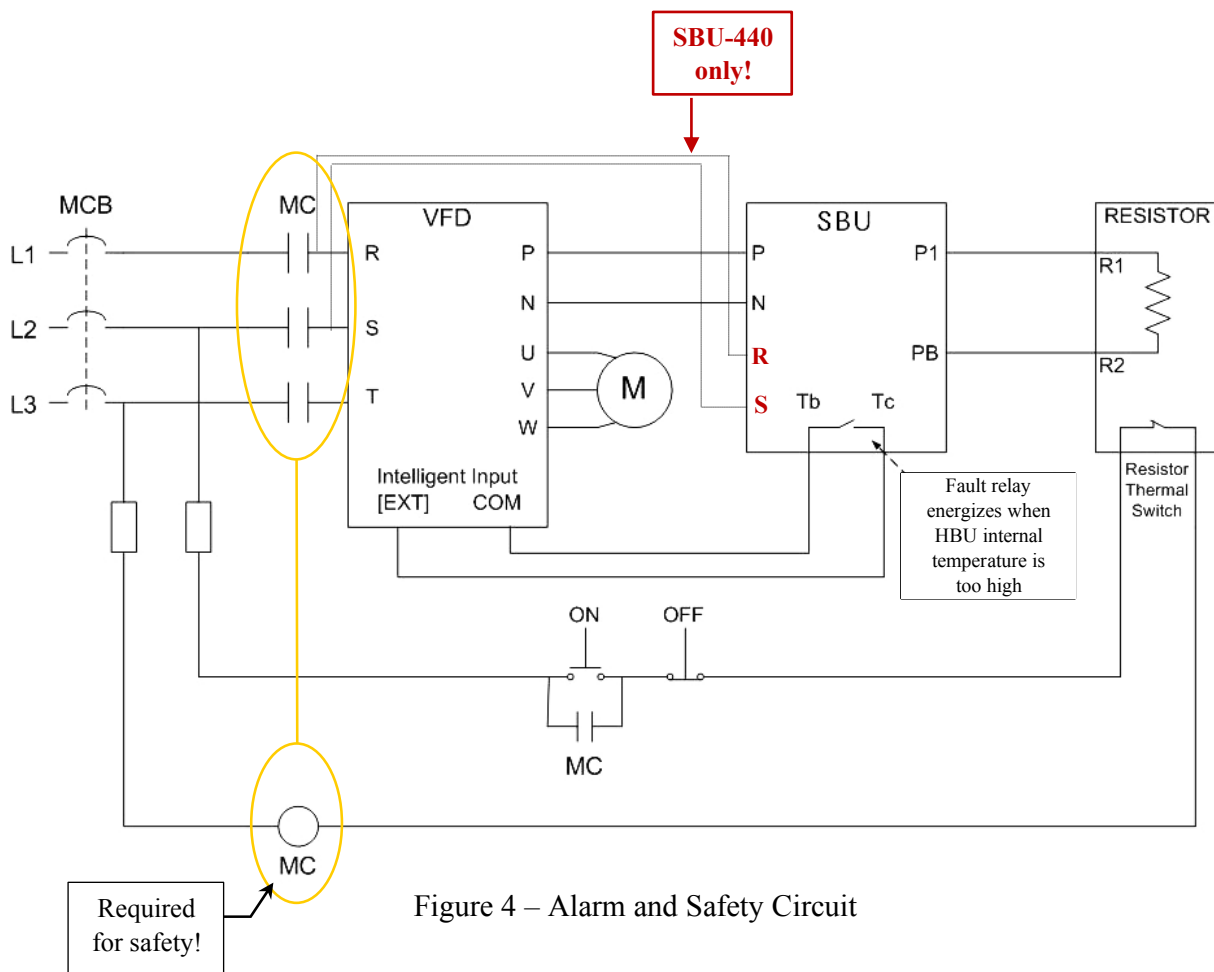
Figure 3 – Mounting Clearance Diagram

III. Installation and Operation

<p style="text-align: center;"> WARNING! </p>
<ol style="list-style-type: none"> 1. The inverter DC Bus can hold a dangerous electrical charge for some time after AC power had been removed. Make sure that the inverter input power has been turned off for at least 10 minutes before you attempt to make any wiring connections to the SBU. 2. Wiring should be done by a licensed electrician following applicable codes and generally accepted wiring practices. 3. Do not touch the terminals or internal components of the braking unit while the DC bus is charged. 4. Make sure that no wire strands contact the metal case of the SBU, or cause a short circuit between the terminals.
<p style="text-align: center;"> CAUTION!</p>
<ol style="list-style-type: none"> 1. Be sure to connect the braking resistors, braking unit and inverter according to the connection diagram. 2. Tighten the terminal screws according the specified torque.

A. General instructions

1. Use wire gauge $> 4 \text{ mm}^2$ on power supply connection and resistor connection.
2. Check that the connections are correct before you connect to the power supply. Refer to the wiring diagram in Figure 4 for the necessary connections for P and N, and recommended use of fault alarm functions. The terminal arrangement is shown in Figure 7.
3. The SBU incorporates internal fault detection which can be monitored externally through the relay alarm output terminals marked Tb and Tc. Should the SBU detect an internal fault, the relay will energize and the state of the Tb/Tc output will change. These terminals should be wired to a safety circuit as appropriate. In the factory default configuration, the Tb/Tc output will CLOSE when the SBU detects a high internal temperature, and will be OPEN otherwise. An SBU fault will cause an external trip fault in the inverter. Note: Jumper J8 will change the logic sense of the Tb/Tc output from NO to NC (Figure 5) should your system so require. However, it is recommended to use the factory default setting as described. Refer to the Inverter Instruction Manual for more specific details about how to wire and set up an external trip input.
4. The resistor(s) must incorporate an internal thermal switch (usually open-on-fault type), and this must be wired with a safety circuit that will remove power to the inverter. A typical configuration is shown in Figure 4. In this way, a resistor over-temperature condition, or a break in the alarm wiring, will cause power to be removed from the inverter.
5. **IMPORTANT NOTE:** On 400 V models only, there are five voltage settings (630V, 660V, 690V, 730V, and 760V) for unit activation. The braking voltage should be set to meet the needs of the application. Set the voltage by moving the jumper on inside the SBU to the pair of pins that correspond to the activation voltage desired. Note:
On 200 V models, the activation voltage is fixed at 380 VDC.
6. When using multiple SBU units, please refer to section III, B on page 17. The first braking unit should have its jumper set to the MASTER position, and braking units number 2 through N should have their jumpers in the SLAVE position.
7. Ensure that the case of braking unit is well grounded.
8. All units *except* the SBU-4220 are completely powered from the DC bus (P and N terminals) of the inverter. The SBU-4220 also requires single phase AC power to operate. The SBU-4220 also includes terminals marked R and S, which must be connected to the corresponding terminals on the AC input side of the inverter, as shown below.



WARNING! Be sure to utilize a power disconnection method as shown in Figure 4 above, which removes power from the inverter should the braking resistor overheat. Failure to do so may result in risk of fire, injury or death.



WARNING! On 400 V class, be certain to verify the correct jumper position for braking activation level BEFORE applying power to the system. Otherwise, if the voltage is set too low there is risk of damage to the SBU, the inverter, and/or the resistor(s).

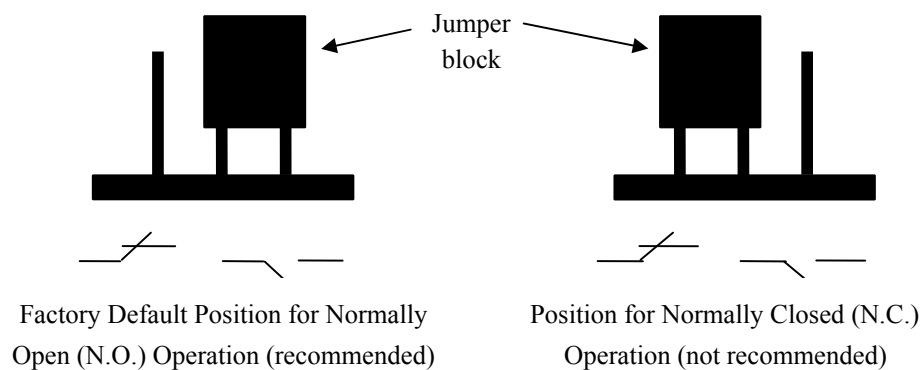


Figure 5 – Jumper J8 Setting

B. Connecting Multiple SBU Units

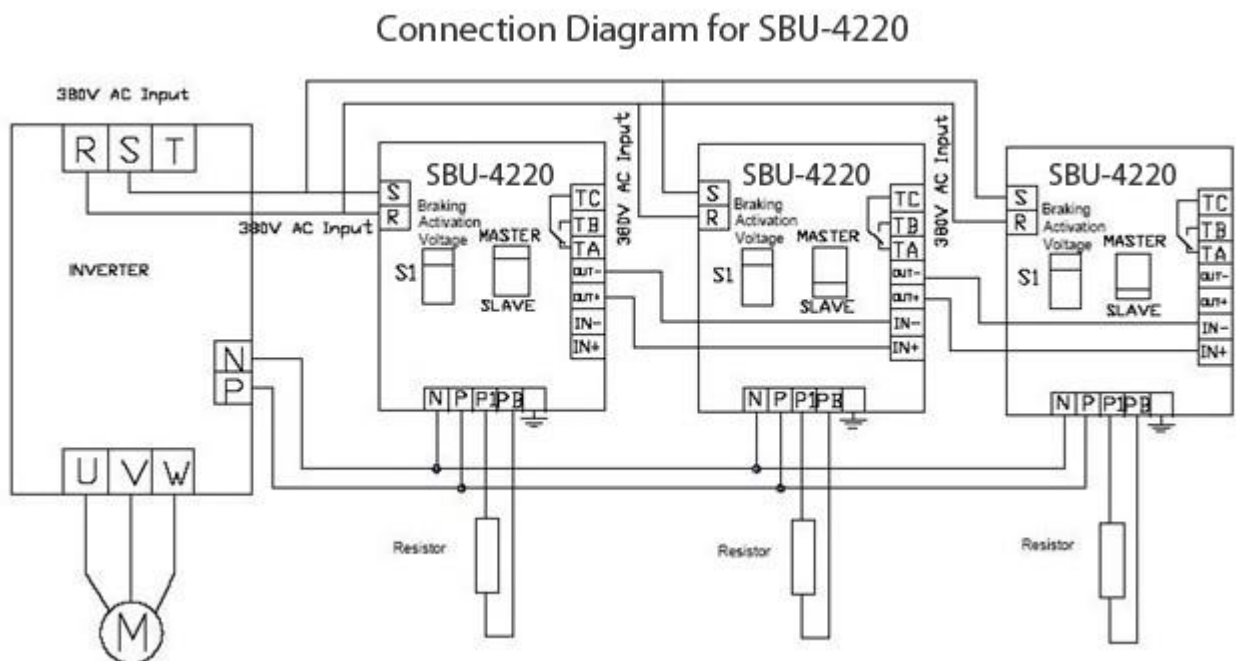
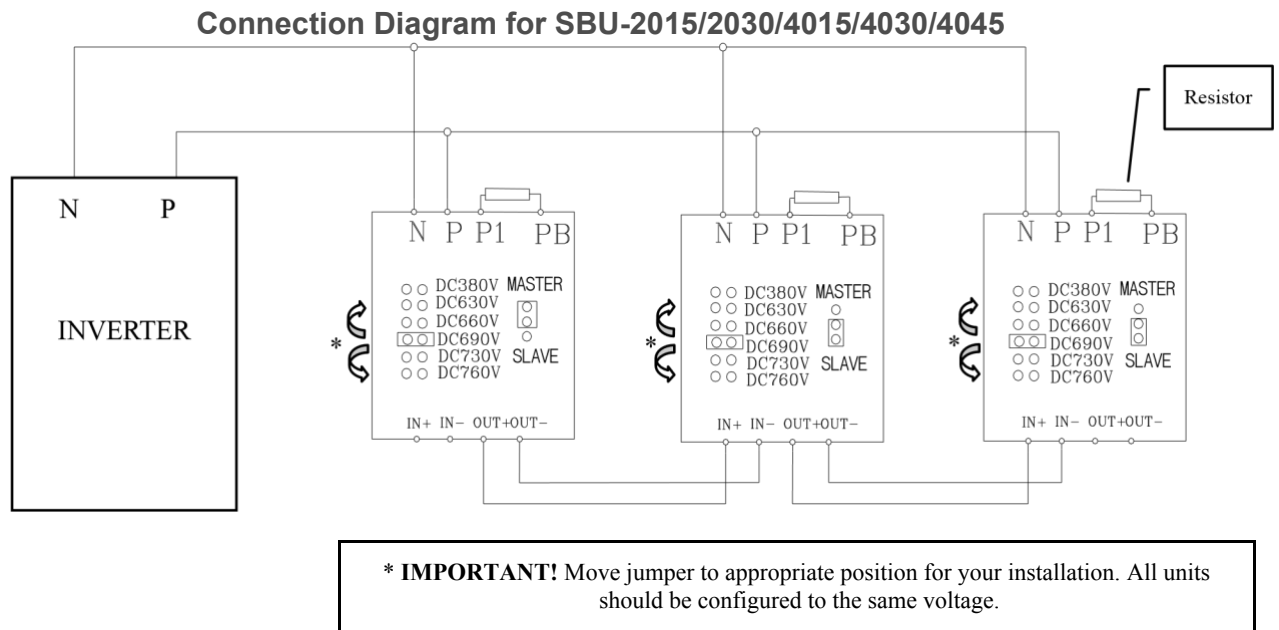


Figure 6 – Connection Diagrams

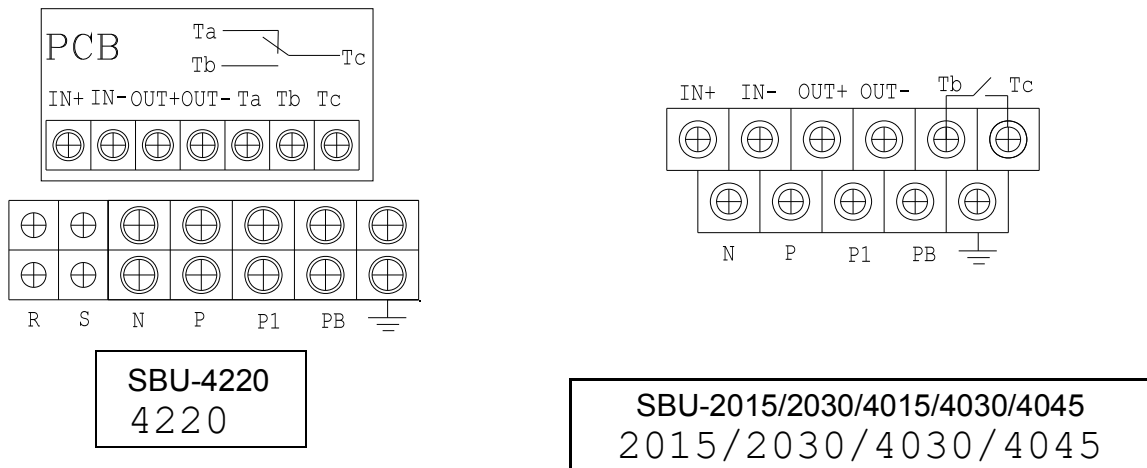


Figure 7 – Terminal Arrangement

C. Simplified circuit diagram of the braking unit

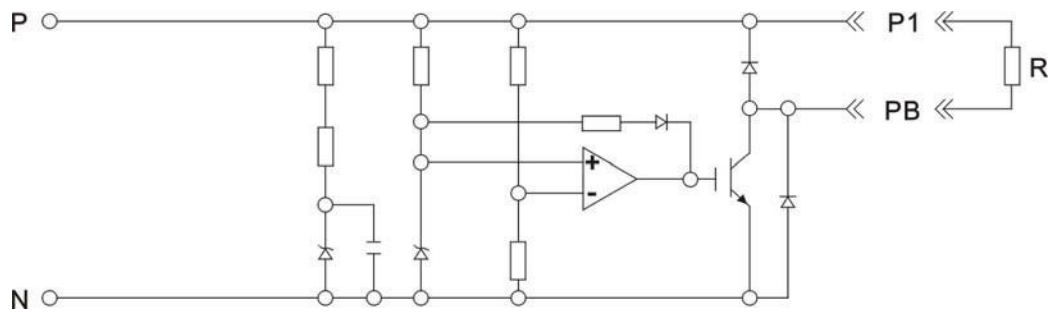
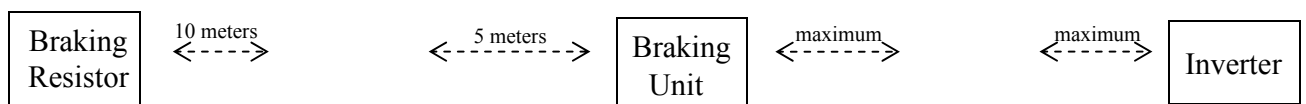


Figure 8 – Circuit Diagram

D. Wiring

1. The wiring to the SBU should be passed through the wiring hole provided on the bottom of the unit.
2. The wires from the SBU to the inverter and to the resistor carry high current with significant harmonic content. To minimize the chance for interference, lay out signal wire as far away as possible from these high current wires. While multiple SBU units are connected, signal wires from OUT+, OUT- to IN+, IN- must be shielded or twisted pair and shouldn't be in a bundle with those high current wires.
3. The wiring distance between braking unit and braking resistor and between braking unit and inverter should meet the requirements as in the following pictures.
4. For 400 V class units, 1000 V rated wire should be used. For 200 V class, 600 V rated wire is sufficient.



E. Operation

1. Recheck all wiring and connections before applying power to the inverter.
2. Operation of the SBU is automatic once installed. It will turn on when the voltage of the inverter DC 3.
3. Bus exceeds the activation voltage setting. When activated, the SBU draws current off the DC Bus and passes it to the braking resistor(s). In so doing, it will dissipate the regenerative energy from the motor load as heat.
4. Do not touch the braking resistor while the inverter is operating. The resistor may become very hot during normal operation.
5. Inside the SBU front metal cover, on the internal printed circuit board, there are two LED indicators. The red LED – “POWER” – will be ON when the voltage between the DC Bus P and N of inverter is higher than 35V; and the green LED – “BRAKING” – will be ON when the DC bus level is above the activation voltage and the braking unit is therefore passing current to the resistor(s).



WARNING!

Do not disassemble the SBU when it is connected to an inverter and power is applied!



CAUTION!

Do not touch the braking resistor while the inverter is energized. Its surface may be very hot during normal operation, and there is risk of injury.

IV. Troubleshooting

The internal protection circuit of the braking unit will cause it to shut down in the case of internal malfunction. Should this occur, it would likely result in an over voltage trip on the inverter.

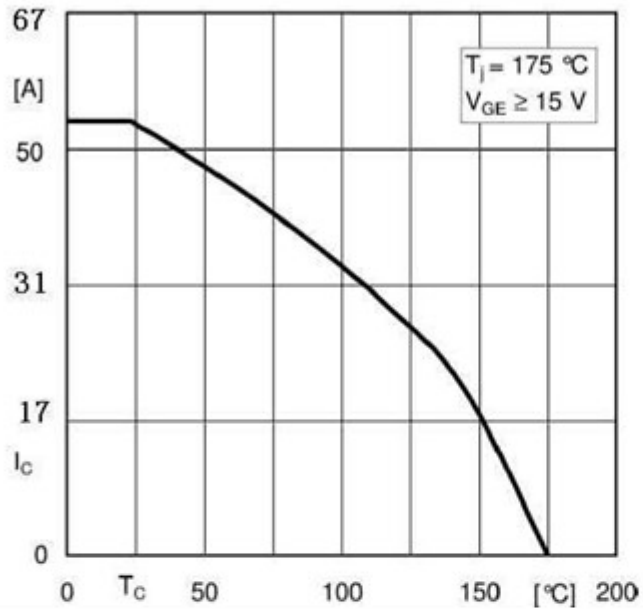
In case of difficulty, use the table below to try to find possible solutions. Should this not resolve the problem, please contact your Sourcetricon distributor for further assistance.

Item	Symptom	Possible Cause	Solution
1	The “POWER” light of the braking unit is not illuminated when the inverter is energized	Wiring error	Check the wiring – from inverter to SBU-P,N terminal
2	The “BRAKING” light is on all the time.	Short circuit on Braking unit IGBT	Change the braking unit
		Wrong connection of the braking resistor.	Examine the braking resistance and its connection.
3	“Over voltage” trip on inverter.	Wiring error	Recheck connections
		The capacity of braking unit and braking resistor is not enough.	Examine the design and recalculate it.
		The activation voltage setting of braking unit is not suited	Reset the activation voltage
4	The braking unit trips because the temperature of resistor is too high.	Braking usage rate (%ED) is too high	Examine the design and recalculate it.
		The ambient temperature is over 40°C	Reduce the ambient temperature where the SBU is installed.

SBU DYNAMIC BRAKING UNIT DERATING CURVES

SBU-2015

SBU-4015, SBU-4030



SBU-4045

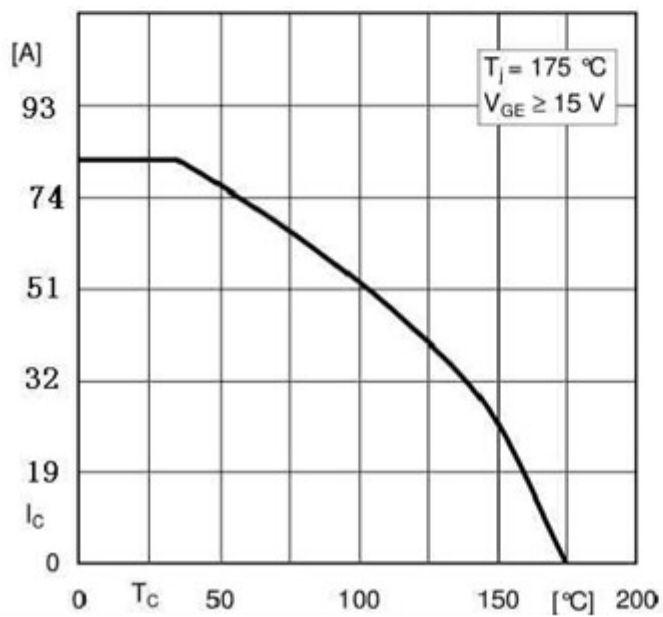


Figure 9 – Derating Curves SBU-2015/4015/4030/4545

SBU-4220

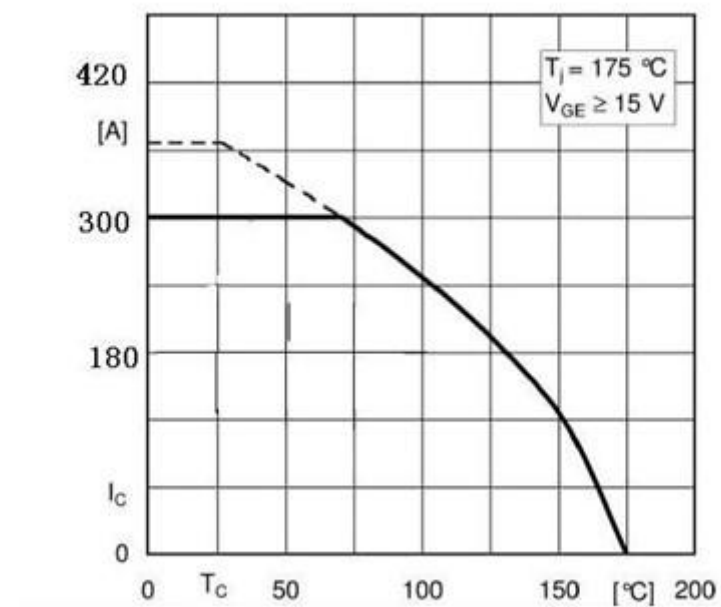


Figure 10 – Derating Curve SBU-4220

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