

6. ACCESSORIES

6.1. BRAKING RESISTORS

6.1.1. APPLICATION TABLES

From size S05 to size S30, SINUS PENTA inverters are supplied with a built-in braking module. The braking resistor is to be connected outside the inverter to terminal B and terminal + (see section 1.4 "Wiring"); properly set the parameters relating to the inverter braking (see Programming Manual). An external braking unit (BU200) is used for higher sizes. When choosing the braking resistor, consider the inverter supply voltage (voltage class), the braking resistor Ohm value and rated power. The voltage class and the Ohm value determine the instant power dissipated in the braking resistor and are relating to the motor power; the rated power determines the mean power to be dissipated in the braking resistor and is relating to the duty cycle of the equipment, i.e. to the resistor activation time with respect to the duty cycle full time (the duty cycle of the resistor is equal to the motor braking time divided by the equipment duty cycle).

It is not possible to connect resistors with a Ohm value lower than the min. value acknowledged by the inverter.

The following pages contain application tables stating the resistors to be used depending on the inverter size, the application requirements and the supply voltage. The braking resistor power is stated as an approximate value; a correct dimensioning of the braking resistor is based on the equipment duty cycle and the power regenerated during the braking stage.

For more details on the connection and features of the external braking module, refer to the braking module instruction manual.

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6.1.1.1. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 10% AND 380 - 500 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter	DUTY CYCLE 10%	
			Ω	Degree of protection IP54 or IP55 up to 25 Ω /1800 W IP20 for higher power ranges	Code
S05	0005	4T BA2X2	50	75 Ω -1100W	RE3063750
	0007	4T BA2X2	50	75 Ω -550W	RE3063750
	0009	4T BA2X2	50	50 Ω -1100W	RE3083500
	0011	4T BA2X2	50	50 Ω -1100W	RE3083500
	0014	4T BA2X2	50	50 Ω -1100W	RE3083500
S10	0016	4T BA2X2	50	50 Ω -1500W	RE3093500
	0017	4T BA2X2	50	50 Ω -1500W	RE3093500
	0020	4T BA2X2	50	50 Ω -1500W	RE3093500
	0025	4T BA2X2	20	25 Ω -1800W	RE3103250
	0030	4T BA2X2	20	25 Ω -1800W	RE3103250
	0035	4T BA2X2	20	25 Ω -1800W	RE3103250
S15	0038	4T BA2X2	15	15 Ω -4000W	RE3483150
	0040	4T BA2X2	15	15 Ω -4000W	RE3483150
	0049	4T BA2X2	10	15 Ω -4000W	RE3483150
S20	0060	4T BA2X2	10	10 Ω -8000W	RE3763100
	0067	4T BA2X2	10	10 Ω -8000W	RE3763100
	0074	4T BA2X2	8.5	10 Ω -8000W	RE3763100
	0086	4T BA2X2	8.5	10 Ω -8000W	RE3763100
S30	0113	4T BA2X2	6	6.6 Ω -12000W	RE4022660
	0129	4T BA2X2	6	6.6 Ω -12000W	RE4022660
	0150	4T BA2X2	5	6.6 Ω -12000W	RE4022660
	0162	4T BA2X2	5	6.6 Ω -12000W	RE4022660
S40	0179	4T XA2X2	2*BU200	10 Ω -10 Ω -8000W (note1)	2*RE3763100
	0200	4T XA2X2	2*BU200	6.6 Ω -6.6 Ω -12000W (note1)	2*RE4022660
	0216	4T XA2X2	2*BU200	6.6 Ω -6.6 Ω -12000W (note1)	2*RE4022660
	0250	4T XA2X2	2*BU200	6.6 Ω -6.6 Ω -12000W (note1)	2*RE4022660
S50	0312	4T XA2X0	3*BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	3*RE4022660
	0366	4T XA2X0	3*BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	3*RE4022660
	0399	4T XA2X0	3*BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	3*RE4022660
S60	0457	4T XA2X0	3*BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	3*RE4022660
	0524	4T XA2X0	4*BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	4*RE4022660
S65	0598	4T XA2X0	4*BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	4*RE4022660
	0748	4T XA2X0	5*BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	5*RE4022660
	0831	4T XA2X0	5*BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note1)	5*RE4022660

(note1) : for the connection of BU200 and braking resistors, see manual relating to braking unit BU200

**DANGER**

Braking resistors may reach temperatures higher than 200°C.

**CAUTION**

Braking resistors may dissipate approx. 10% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.

**CAUTION**

Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.1.2. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 20% AND 380 - 500 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter Ω	DUTY CYCLE 20%	
				Degree of protection IP54 or IP55 up to 25 Ω /2200W IP20 for higher power ranges	Code
S05	0005	4T BA2X2	50	50 Ω -1100W	RE3083500
	0007	4T BA2X2	50	50 Ω -1100W	RE3083500
	0009	4T BA2X2	50	50 Ω -1100W	RE3083500
	0011	4T BA2X2	50	50 Ω -1500W	RE3093500
	0014	4T BA2X2	50	50 Ω -1500W	RE3093500
S10	0016	4T BA2X2	50	50 Ω -2200W	RE3113500
	0017	4T BA2X2	50	50 Ω -2200W	RE3113500
	0020	4T BA2X2	50	50 Ω -4000W	RE3483500
	0025	4T BA2X2	20	25 Ω -4000W	RE3483250
	0030	4T BA2X2	20	25 Ω -4000W	RE3483250
	0035	4T BA2X2	20	25 Ω -4000W	RE3483250
S15	0038	4T BA2X2	15	15 Ω -4000W	RE3483150
	0040	4T BA2X2	15	15 Ω -4000W	RE3483150
	0049	4T BA2X2	10	10 Ω -8000W	RE3763100
S20	0060	4T BA2X2	10	10 Ω -8000W	RE3763100
	0067	4T BA2X2	10	10 Ω -12000W	RE4023100
	0074	4T BA2X2	8.5	10 Ω -12000W	RE4023100
	0086	4T BA2X2	8.5	10 Ω -12000W	RE4023100
S30	0113	4T BA2X2	6	3.3 Ω +3.3 Ω -8000W (note1)	2*RE3762330
	0129	4T BA2X2	6	3.3 Ω +3.3 Ω -8000W (note1)	2*RE3762330
	0150	4T BA2X2	5	10 Ω //10 Ω -12000W (note2)	2*RE4023100
	0162	4T BA2X2	5	10 Ω //10 Ω -12000W (note2)	2*RE4023100
S40	0179	4T XA2X2	2* BU200	6.6 Ω -6.6 Ω -12000W (note3)	2*RE4022660
	0200	4T XA2X2	2* BU200	6.6 Ω -6.6 Ω -12000W (note3)	2*RE4022660
	0216	4T XA2X2	3* BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note3)	3*RE4022660
	0250	4T XA2X2	3* BU200	6.6 Ω -6.6 Ω -6.6 Ω -12000W (note3)	3*RE4022660
S50	0312	4T XA2X0	4* BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note3)	4*RE4022660
	0366	4T XA2X0	4* BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note3)	4*RE4022660
	0399	4T XA2X0	4* BU200	6.6 Ω -6.6 Ω -6.6 Ω -6.6 Ω -12000W (note3)	4*RE4022660
S60	0457	4T XA2X0	5*BU200	10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -12000W (note3)	5*RE4023100
	0524	4T XA2X0	5*BU200	10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -12000W (note3)	5*RE4023100
S65	0598	4T XA2X0	6*BU200	10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -12000W (note3)	6*RE4023100
	0748	4T XA2X0	8*BU200	10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -12000W (note3)	8*RE4023100
	0831	4T XA2X0	8*BU200	10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -10 Ω -12000W (note3)	8*RE4023100

(note 1): Two series-connected resistors, 3.3 Ohm/8000 W

(note 2): 2 parallel-connected resistors, 10 Ohm/12000 W

(note 3): For the connection of BU200 and braking resistors, see manual relating to braking unit.



DANGER Braking resistors may reach temperatures higher than 200°C.



CAUTION Braking resistors may dissipate approx. 20% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.



CAUTION Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.1.3. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 50% AND 380 - 500 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter Ω	DUTY CYCLE 50%	
				Degree of protection IP23	Code
S05	0005	4T BA2X2	50	50 Ω -4000W	RE3503500
	0007	4T BA2X2	50	50 Ω -4000W	RE3503500
	0009	4T BA2X2	50	50 Ω -4000W	RE3503500
	0011	4T BA2X2	50	50 Ω -4000W	RE3503500
	0014	4T BA2X2	50	50 Ω -4000W	RE3503500
S10	0016	4T BA2X2	50	50 Ω -8000W	RE3783500
	0017	4T BA2X2	50	50 Ω -8000W	RE3783500
	0020	4T BA2X2	50	50 Ω -8000W	RE3783500
	0025	4T BA2X2	20	20 Ω -12000W	RE4053200
	0030	4T BA2X2	20	20 Ω -12000W	RE4053200
	0035	4T BA2X2	20	20 Ω -12000W	RE4053200
S15	0038	4T BA2X2	15	15 Ω -16000W	RE4163150
	0040	4T BA2X2	15	15 Ω -16000W	RE4163150
	0049	4T BA2X2	10	15 Ω -16000W	RE4163150
	0060	4T BA2X2	10	10 Ω -24000W	RE4293100
S20	0067	4T BA2X2	10	10 Ω -24000W	RE4293100
	0074	4T BA2X2	8.5	10 Ω -24000W	RE4293100
	0086	4T BA2X2	8.5	10 Ω -24000W	RE4293100
	0113	4T BA2X2	6	6 Ω -48000W	RE4452600
S30	0129	4T BA2X2	6	6 Ω -48000W	RE4452600
	0150	4T BA2X2	5	5 Ω -64000W	RE4552500
	0162	4T BA2X2	5	5 Ω -64000W	RE4552500
	0179	4T XA2X2	2 * BU200	6.6 Ω -6.6 Ω -32000W (note1)	2*RE4362660
S40	0200	4T XA2X2	2 * BU200	6.6 Ω -6.6 Ω -32000W (note1)	2*RE4362660
	0216	4T XA2X2	2 * BU200	6.6 Ω -6.6 Ω -32000W (note1)	2*RE4362660
	0250	4T XA2X2	2 * BU200	6 Ω -6 Ω -48000W (note1)	2*RE4452600
	0312	4T XA2X0	3 * BU200	6.6 Ω -6.6 Ω -6.6 Ω -32000W (note1)	3*RE4362660
S50	0366	4T XA2X0	3 * BU200	6 Ω -6 Ω -6 Ω -48000W (note1)	3*RE4452600
	0399	4T XA2X0	3 * BU200	6 Ω -6 Ω -6 Ω -48000W (note1)	3*RE4452600
	0457	4T XA2X0	3 * BU200	5 Ω -5 Ω -5 Ω -64000W (note1)	3*RE4452500
S60	0524	4T XA2X0	4 * BU200	5 Ω -5 Ω -5 Ω -64000W (note1)	4*RE4452500
	0598	4T XA2X0	4 * BU200	5 Ω -5 Ω -5 Ω -64000W (note1)	4*RE4452500
S65	0748	4T XA2X0	5 * BU200	5 Ω -5 Ω -5 Ω -64000W (note1)	5*RE4452500
	0831	4T XA2X0	5 * BU200	5 Ω -5 Ω -5 Ω -64000W (note1)	5*RE4452500

(note 1): For the connection of BU200 and braking resistors, see manual relating to braking unit BU200

**DANGER**

Braking resistors may reach temperatures higher than 200°C.

**CAUTION**

Braking resistors may dissipate approx. 50% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.

**CAUTION**

Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.1.4. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 10% AND 200 - 240 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter Ω	DUTY CYCLE 10%	
				Degree of protection IP54 or IP55 up to 15 Ω /1100 W IP20 for higher power ranges	Code
S05	0005	2T BA2X2	25.0	56 Ω -350W	RE2643560
	0007	2T BA2X2	25.0	56 Ω -350W	RE2643560
	0009	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
	0011	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
	0014	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
S10	0016	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
	0017	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
	0020	2T BA2X2	25.0	56 Ω //56 Ω -350W (note1)	2*RE2643560
	0025	2T BA2X2	10.0	15 Ω -1100W	RE3083150
	0030	2T BA2X2	10.0	15 Ω -1100W	RE3083150
	0035	2T BA2X2	10.0	15 Ω -1100W	RE3083150
S15	0038	2T BA2X2	7.5	15 Ω //15 Ω -1100W (note2)	2*RE3083150
	0040	2T BA2X2	7.5	15 Ω //15 Ω -1100W (note2)	2*RE3083150
	0049	2T BA2X2	5.0	5 Ω -4000W	RE3482500
S20	0060	2T BA2X2	5.0	5 Ω -4000W	RE3482500
	0067	2T BA2X2	5.0	5 Ω -4000W	RE3482500
	0074	2T BA2X2	4.2	5 Ω -4000W	RE3482500
	0086	2T BA2X2	4.2	5 Ω -4000W	RE3482500
S30	0113	2T BA2X2	3.0	3.3 Ω -8000W	RE3762330
	0129	2T BA2X2	3.0	3.3 Ω -8000W	RE3762330
	0150	2T BA2X2	2.5	3.3 Ω -8000W	RE3762330
	0162	2T BA2X2	2.5	3.3 Ω -8000W	RE3762330
S40	0179	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note 3)	2*RE3762330
	0200	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note 3)	2*RE3762330
	0216	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note 3)	2*RE3762330
	0250	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note 3)	2*RE3762330
S50	0312	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	3*RE3762330
	0366	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	3*RE3762330
	0399	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	3*RE3762330
S60	0457	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	3*RE3762330
	0524	2T XA2X0	4 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	4*RE3762330
S65	0598	2T XA2X0	4 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	4*RE3762330
	0748	2T XA2X0	5 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	5*RE3762330
	0831	2T XA2X0	5 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -8000W (note 3)	5*RE3762330

(note 1): Two parallel-connected resistors, 56 Ohm/350 W

(note 2): Four parallel-connected resistors, 15 Ohm/1100 W

(note 3): For the connection of BU200 and braking resistors, see manual relating to braking unit.

**DANGER**

Braking resistors may reach temperatures higher than 200°C.

**CAUTION**

Braking resistors may dissipate approx. 10% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.

**CAUTION**

Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.1.5. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 20% AND 200 - 240 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter Ω	DUTY CYCLE 20%	
				Degree of protection IP54 or IP55 up to 25 Ω /1800W IP20 for higher power ranges	Code
S05	0005	2T BA2X2	25.0	56 Ω -350W	RE2643560
	0007	2T BA2X2	25.0	100 Ω //100 Ω -350W (note1)	2*RE2644100
	0009	2T BA2X2	25.0	56 Ω //56 Ω -350W	2*RE2635560
	0011	2T BA2X2	25.0	56 Ω //56 Ω -350W	2*RE2635560
	0014	2T BA2X2	25.0	100 Ω //100 Ω //100 Ω //100 Ω -350W (note2)	4*RE2644100
S10	0016	2T BA2X2	25.0	100 Ω //100 Ω //100 Ω //100 Ω -350W (note2)	4*RE2644100
	0017	2T BA2X2	25.0	100 Ω //100 Ω //100 Ω //100 Ω -350W (note2)	4*RE2644100
	0020	2T BA2X2	25.0	25 Ω -1800W	RE3103250
	0025	2T BA2X2	10.0	75 Ω //75 Ω //75 Ω //75 Ω //75 Ω -550W (note3)	6*RE3063750
	0030	2T BA2X2	10.0	75 Ω //75 Ω //75 Ω //75 Ω //75 Ω -550W (note3)	6*RE3063750
S15	0035	2T BA2X2	10.0	75 Ω //75 Ω //75 Ω //75 Ω //75 Ω -550W (note3)	6*RE3063750
	0038	2T BA2X2	8.0	25 Ω //25 Ω -1800W (note4)	2*RE3103250
	0040	2T BA2X2	8.0	25 Ω //25 Ω -1800W (note4)	2*RE3103250
	0049	2T BA2X2	5.0	5 Ω -4000W	RE3482500
S20	0060	2T BA2X2	5.0	5 Ω -8000W	RE3762500
	0067	2T BA2X2	5.0	5 Ω -8000W	RE3762500
	0074	2T BA2X2	4.2	5 Ω -8000W	RE3762500
	0086	2T BA2X2	4.2	5 Ω -8000W	RE3762500
S30	0113	2T BA2X2	3.0	3.3 Ω -12000W	RE4022330
	0129	2T BA2X2	3.0	3.3 Ω -12000W	RE4022330
	0150	2T BA2X2	2.5	3.3 Ω -12000W	RE4022330
	0162	2T BA2X2	2.5	3.3 Ω -12000W	RE4022330
S40	0179	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note5)	2*RE3762330
	0200	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -8000W (note5)	2*RE3762330
	0216	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -12000W (note5)	2*RE4022330
	0250	2T XA2X2	2 * BU200	3.3 Ω -3.3 Ω -12000W (note5)	2*RE4022330
S50	0312	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -12000W (note5)	3*RE4022330
	0366	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -12000W (note5)	3*RE4022330
	0399	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -12000W (note5)	3*RE4022330
S60	0457	2T XA2X0	3 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -12000W (note3)	3*RE4022330
	0524	2T XA2X0	4 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -12000W (note3)	4*RE4022330
S65	0598	2T XA2X0	4 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -12000W (note3)	4*RE4022330
	0748	2T XA2X0	5 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -12000W (note3)	5*RE4022330
	0831	2T XA2X0	5 * BU200	3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -3.3 Ω -12000W (note3)	5*RE4022330

(note 1): Two parallel-connected resistors, 100 Ohm/350 W
(note 2): Four parallel-connected resistors, 100 Ohm/350 W
(note 3): Six parallel-connected resistors, 75 Ohm/550 W
(note 4): Two parallel-connected resistors, 25 Ohm/1800 W
(note 5): For the connection of BU200 and braking resistors, see relevant manual section.



DANGER Braking resistors may reach temperatures higher than 200°C



CAUTION Braking resistors may dissipate approx. 20% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.



CAUTION Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.1.6. BRAKING RESISTORS FOR APPLICATIONS WITH A BRAKING DUTY CYCLE OF 50% AND 200 - 240 VAC SUPPLY VOLTAGE

Size	Inverter Model SINUS PENTA		Min. resistor to be applied to the inverter Ω	DUTY CYCLE 50%	
				Degree of protection IP54 or IP55 up to 25 Ω /1800W IP20 for higher power ranges	Code
S05	0005	2T BA2X2	25.0	5 Ω -1100W	RE3083500
	0007	2T BA2X2	25.0	5 Ω -1100W	RE3083500
	0009	2T BA2X2	25.0	25 Ω -1800W	RE3103250
	0011	2T BA2X2	25.0	25 Ω -1800W	RE3103250
	0014	2T BA2X2	25.0	25 Ω -4000W	RE3483250
S10	0016	2T BA2X2	25.0	25 Ω -4000W	RE3483250
	0017	2T BA2X2	25.0	25 Ω -4000W	RE3483250
	0020	2T BA2X2	25.0	25 Ω -4000W	RE3483250
	0025	2T BA2X2	10.0	10 Ω -8000W	RE3763100
	0030	2T BA2X2	10.0	10 Ω -8000W	RE3763100
	0035	2T BA2X2	10.0	10 Ω -8000W	RE3763100
S15	0038	2T BA2X2	7.5	10 Ω -8000W	RE3763100
	0040	2T BA2X2	7.5	10 Ω -8000W	RE3763100
	0049	2T BA2X2	5.0	6,6 Ω -12000W	RE4022660
S20	0060	2T BA2X2	5.0	6,6 Ω -12000W	RE4022660
	0067	2T BA2X2	5.0	10 Ω //10 Ω -8000W (note1)	2*RE3762500
	0074	2T BA2X2	4.2	10 Ω //10 Ω -8000W (note1)	2*RE3763100
	0086	2T BA2X2	4.2	10 Ω //10 Ω -8000W (note1)	2*RE3763100
S30	0113	2T BA2X2	3.0	6.6 Ω //6.6 Ω -12000W (note2)	2*RE4022660
	0129	2T BA2X2	3.0	6.6 Ω //6.6 Ω -12000W (note2)	2*RE4022660
	0150	2T BA2X2	2.5	10 Ω //10 Ω //10 Ω -12000W (note3)	RE4023100
	0162	2T BA2X2	2.5	10 Ω //10 Ω //10 Ω -12000W (note3)	RE4023100
S40	0179	2T XA2X2	2*BU200	6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	3*RE4022660
	0200	2T XA2X2	2*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -12000W (note4)	4*RE4022660
	0216	2T XA2X2	2*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -12000W	4*RE4022660
	0250	2T XA2X2	3*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	5*RE4022660
S50	0312	2T XA2X0	3*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -12000W (note4)	6*RE4022660
	0366	2T XA2X0	3*BU200	6.6 Ω //6.6 Ω //6.6 Ω //6.6 Ω //6.6 Ω //6.6 Ω -12000W (note4)	6*RE4022660
	0399	2T XA2X0	4*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	7*RE4022660
S60	0457	2T XA2X0	4*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	8*RE4022660
	0524	2T XA2X0	5*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	10*RE4022660
S65	0598	2T XA2X0	5*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	10*RE4022660
	0748	2T XA2X0	6*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	12*RE4022660
	0831	2T XA2X0	6*BU200	6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω //6.6 Ω -6.6 Ω -12000W (note4)	12*RE4022660

(note 1): Two parallel-connected resistors, 10 Ohm/8000 W

(note 2): Four parallel-connected resistors, 6.6 Ohm/12000 W

(note 3): Three parallel-connected resistors, 10 Ohm/12000 W

(note 5): For the connection of BU200 and braking resistors, see manual relating to braking unit BU200



DANGER Braking resistors may reach temperatures higher than 200°C.



CAUTION

Braking resistors may dissipate approx. 50% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.



CAUTION

Do not connect any braking resistor with an Ohm value lower than the value stated in the tables.

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6.1.2. AVAILABLE MODELS

The specifications given for each resistor model also include the mean power to be dissipated and the max. operating time, depending on the inverter voltage class.

Based on these values, parameters C211 and C212 (concerning braking features) in the Resistor Braking menu can be set up. (See relevant section in the Programming Manual).

The max. operating time set in C212 is factory-set in order not to exceed the allowable time for each resistor model (see section below).

Parameter C211 represents the max. duty-cycle of the resistor and is to be set to a value lower than or equal to the value stated in the dimensioning table (see sections above).



DANGER Braking resistors may reach temperatures higher than 200°C.



CAUTION For parameters C211 and C212, do not set values exceeding the max. allowable values stated in the tables above. Failure to do so will cause irreparable damage to the braking resistors; also, fire hazard exists.



CAUTION Braking resistors may dissipate up to 50% of the rated power of the connected motor; use a proper air-cooling system. Do not install braking resistors near heat-sensitive equipment or objects.

6.1.2.1. MODEL 56-100 OHM/350 W

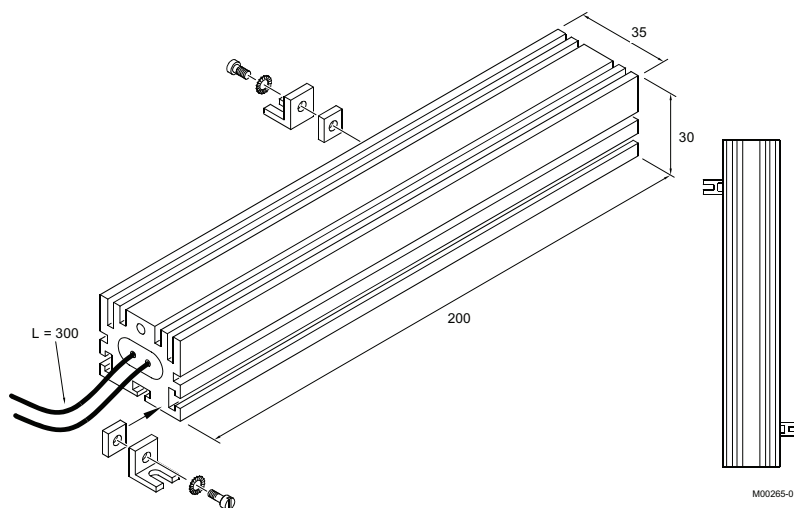


Fig. 51: Overall dimensions, resistor 56-100Ω/350W

	Weight (g)	Degree of protection	Mean power to be dissipated (W)	Max. duration of continuous operation for 200 - 240 VCA (s)*
56Ohm/350W RE2643560	400	IP55	350	3.5
100Ohm/350W RE2644100	400	IP55	350	3.5

(*) max. value to be set for parameter C212

6.1.2.2. MODEL 75 OHM/1300 W

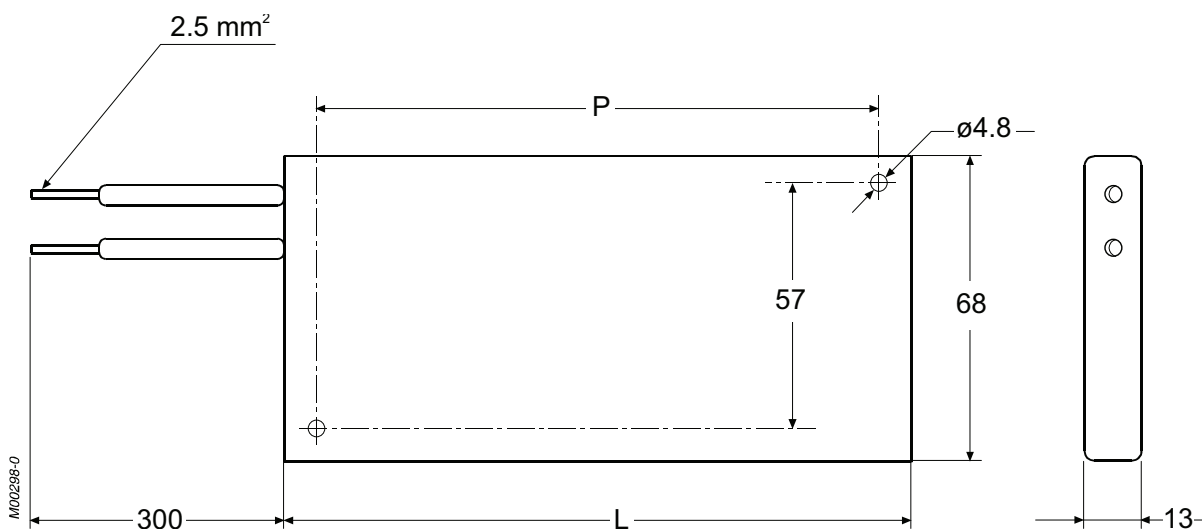
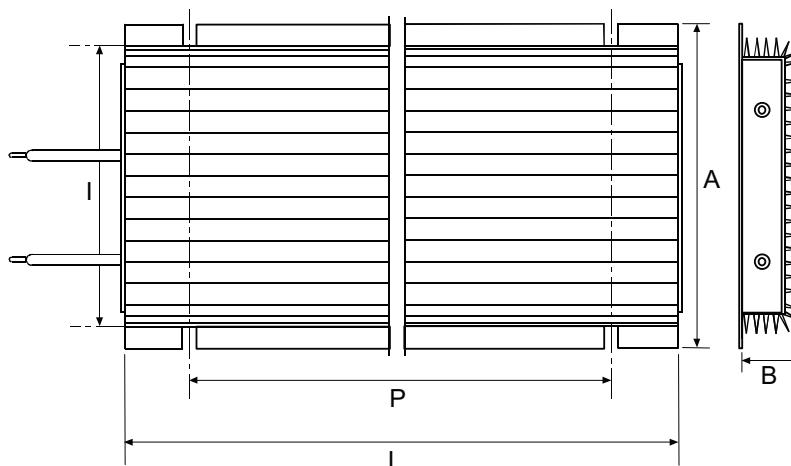


Fig. 52: Overall dimensions and technical features resistor 75 Ω /1300W

Type	L (mm)	P (mm)	Wgt (g)	Degree of protection	Mean power to be dissipated (W)	Max. duration of continuous operation for 380 - 5000 VCA (s)*
75Ohm/750W RE3063750	195	174	500	IP33	550	2.25

(*) max. value to be set for parameter C212

6.1.2.3. MODELS IP55-54 FROM 1100 W TO 2200 W



M00619-0

Fig. 53: Overall dimensions and mechanical features for braking resistors from 1100 W to 2200 W

Type	A (mm)	B (mm)	L (mm)	L (mm)	P (mm)	Wgt (g)	Degree of protection	Mean power to be dissipated (W)	Max. duration of continuous operation	
									380 - 500 Vac (s)*	200 - 240 Vac (s)*
15Ohm/1100W RE3083150	95	30	320	80-84	240	1250	IP55	950	not applicable	6
20Ohm/1100W RE3083200									not applicable	8
50Ohm/1100W RE3083500									5	20
100Ohm/1500W RE3093100	120	40	320	107- 112	240	2750	IP54	1100	not applicable	4.5
90Ohm/1500W RE3093390									4.5	18
00Ohm/1500W RE3093500										
50Ohm/1800W RE310250	120	40	380	107- 112	300	3000	IP54	1300	3	12
50Ohm/2200W RE3113500	190	67	380	177- 182	300	7000	IP54	2000	8	not limited
75Ohm/2200W RE3113750									11	

wire standard length 300mm

(*) max. value to be set for parameter C212

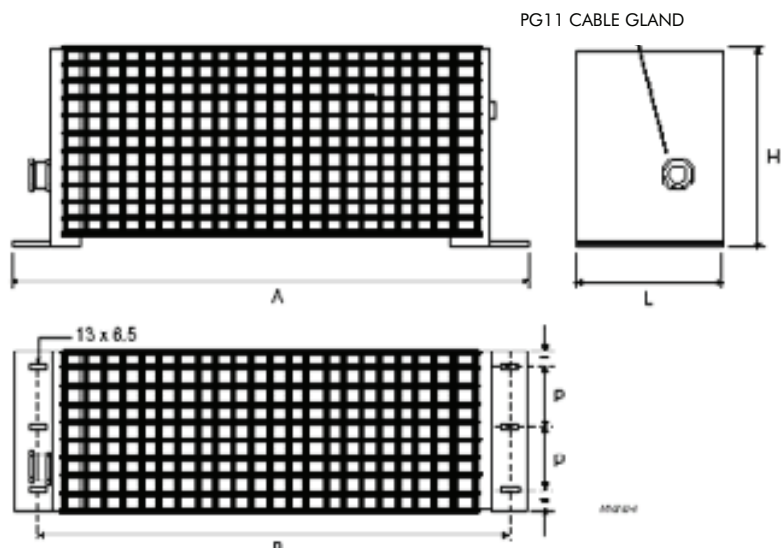
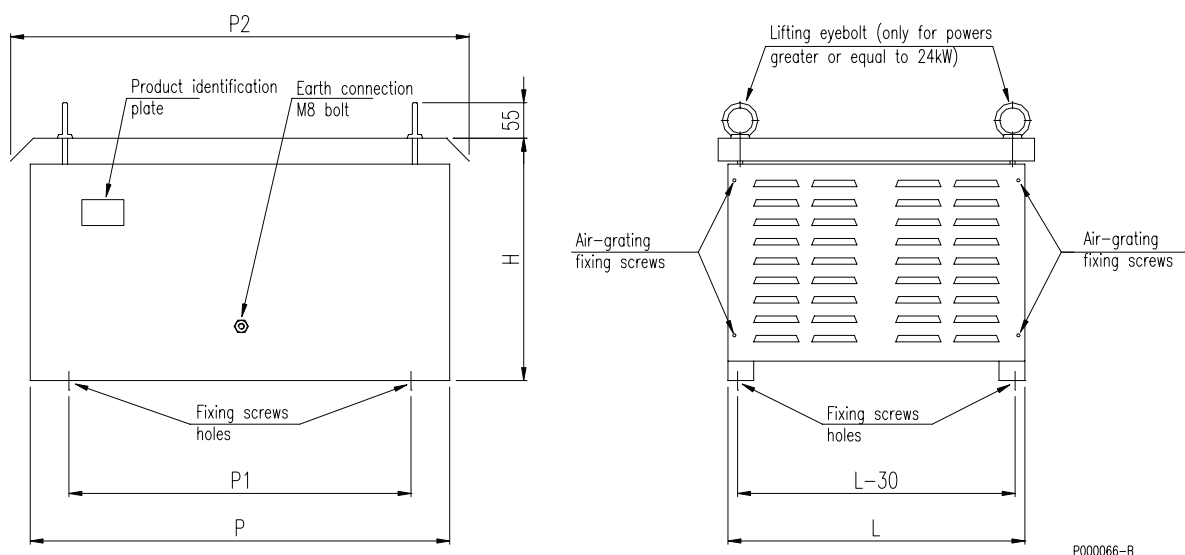
6.1.2.4. IP20 MODELS 4kW-8kW-12kW

Fig.54: Overall dimensions for braking resistors 4 kW, 8 kW and 12 kW

RESISTOR	A (mm)	B (mm)	L (mm)	H (mm)	P (mm)	Weight (Kg)	Degree of protection	Mean power to be dissipated (W)	Max. duration of continuous operation	
									380 - 500 Vac (s)*	200 - 240 Vac (s)*
5Ω4kW RE3482500	620	600	100	250	40	5.5	IP20	4000	not applicable	10
15Ω4kW RE3483150									5	100
25Ω4kW RE3483250									20	not limited
39Ω4kW RE3483390									60	
50Ω4kW RE3483500									90	
3.3Ω/8kW RE3762330	620	600	160	250	60	10.6	IP20	8000	not applicable	5
5Ω/8kW RE3762500									not applicable	40
10Ω/8kW RE3763100									2	100
3.3 Ω/12kW RE4022330	620	600	200	250	80	13.7	IP20	12000	not applicable	70
6.6Ω/12kW RE4022660									5	200
10Ω/12kW RE4023100									12	not limited

(*) max. value to be set for parameter C212

6.1.2.5. BOX RESISTORS MODELS IP23 4 kW-64 kW



OVERALL DIMENSIONS

Fig. 55: Box Resistor IP23

WIRING

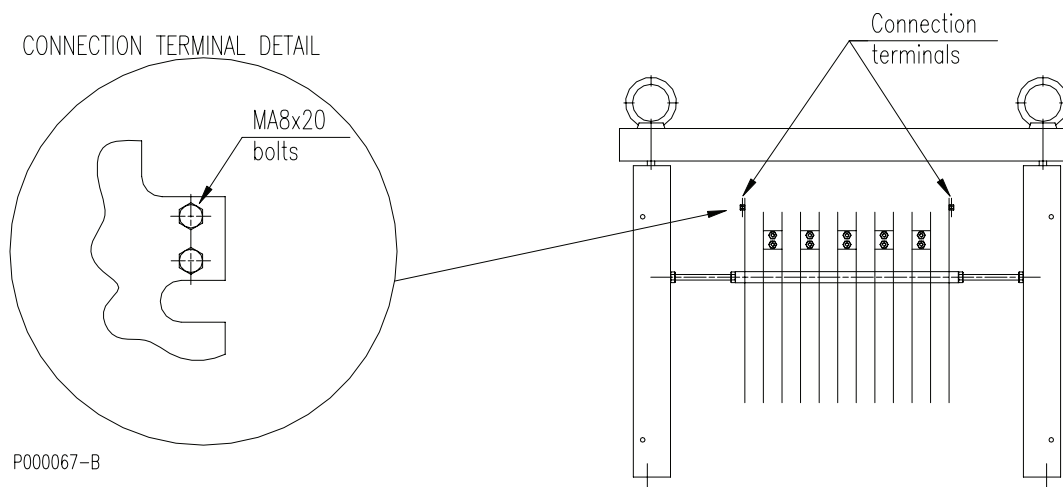


Fig.56: Position of electrical connections in box resistors

Remove grids to gain access to wiring terminals, handling on the fastening screws.

NOTE: Figure shows resistor 20 Ohm/12 kW. For certain models, remove both panels to gain access to wiring terminals.

RESISTOR	P (mm)	P1 (mm)	P2 (mm)	L (mm)	H (mm)	Weight (Kg)	Degree of protection	Mean power to be dissipated (W)	Max. duration of continuous operation (s)*	
									380 - 500 Vac	200 - 240 Vac
50Ω/4KW RE3503500	650	530	710	320	375	20	IP23	4000	30	not limited
50Ω/8KW RE3783500	650	530	710	380	375	23	IP23	8000	50	not limited
20Ω/12KW RE4053200	650	530	710	460	375	34	IP23	12000	50	not limited
15Ω/16KW RE4163150	650	530	710	550	375	40	IP23	16000	58	not limited
10Ω/24kW RE4293100	650	530	710	750	375	54	IP23	24000	62	not limited
6.6Ω/32kW RE4362660	650	530	710	990	375	68	IP23	32000	62	not limited
6Ω/48kW RE4452600	650	530	710	750	730	101	IP23	48000	90	not limited
5Ω/64kW RE4552500	650	530	710	990	730	128	IP23	64000	106	not limited

(*) max. value to be set for parameter C212

6.2. BRAKING UNIT

A braking unit is available to be connected to terminals + and – (see section 1.4 “Wiring”) of the inverter for sizes S40 to S65; braking units can be used when a high braking torque is needed, particularly when a prompt braking is needed for high inertial loads (e.g. fans).

The braking power required to brake a rotating object is proportional to the total moment of inertia of the rotating object, to speed variations, and to absolute speed, while it is inversely proportional to the deceleration time required.

This braking power is dissipated over a resistor (external to the braking unit) with an Ohm value depending on the inverter size and the mean power to be dissipated.

6.2.1. INSPECTION UPON RECEIPT OF THE GOODS

Make sure that the equipment is not damaged and it complies with the equipment you ordered by referring to the nameplate located on the inverter front part (see figure below).

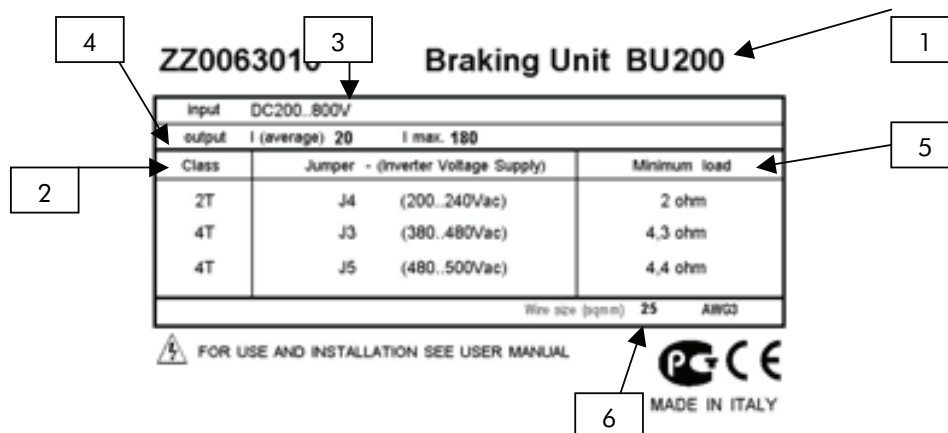
If the equipment is damaged, contact the supplier or the insurance company concerned. If the equipment does not comply with the one you ordered, please contact the supplier as soon as possible.

If the equipment is stored before being started, make sure that temperatures range from - 20 °C to + 60 °C and that relative humidity is < 95% (non-condensing).

The equipment guarantee covers any manufacturing defect. The manufacturer has no responsibility for possible damages due to the inverter transportation or unpacking.

The manufacturer is not responsible for possible damages or faults caused by improper and irrational uses; wrong installation; improper conditions of temperature, humidity, or the use of corrosive substances; the manufacturer is not responsible for possible faults due to the inverter operation at values exceeding the inverter ratings. The manufacturer is not responsible for consequential and accidental damages.

Braking unit BU200 is covered by a 12-month guarantee starting from the date of delivery.



1. Model (BU200-braking unit)
2. Voltage class
3. Supply ratings: 200 ÷ 800 VDC for BU200 (DC supply voltage produced by the inverter terminals).
4. Output current; 18 A (average): mean current in output cables, 180 A (Peak): peak current in output cables
5. Minimum value of the resistor to be connected to the output terminals (see application tables).
6. Power Wiring Size

6.2.2. OPERATING

The basic size of the braking unit can be used with a braking resistor avoiding exceeding a max. instant current of 180 A, corresponding to a peak braking power of approx. 138 kW and to a mean power of 69 kW. For applications requiring higher braking power values, multiple braking units can be parallel-connected in order to obtain a greater braking power based on the number of braking units.

To ensure that the overall braking power is evenly distributed to all braking units, configure one braking unit in MASTER mode and the remaining braking units in SLAVE mode, and connect the output signal of the MASTER unit (terminal 84 in connector M1) to the forcing input for all SLAVE braking units (terminal 4 in connector M1).

6.2.2.1. JUMPER

Jumpers located on board ES839 are used for the configuration of the braking unit. The location of the configuration jumpers on the board and their meaning are following:

Jumper	Function
J1	when on, it configures braking unit in SLAVE mode
J2	when on, it configures braking unit in MASTER mode



NOTE

one of the two jumpers must always be "on". Do not enable both jumpers at a time.

Jumper	Function
J3	To be activated for class 4T inverters and mains voltage ranging from 380 Vac to 480 Vac
J4	To be activated for class 2T inverters and mains voltage ranging from 200 Vac to 240 Vac
J5	To be activated for class 4T inverters and mains voltage ranging from 481 Vac to 500 Vac
J6	To be activated for special adjustment requirements



NOTE

one of the two jumpers must always be "on". Do not enable both jumpers at a time

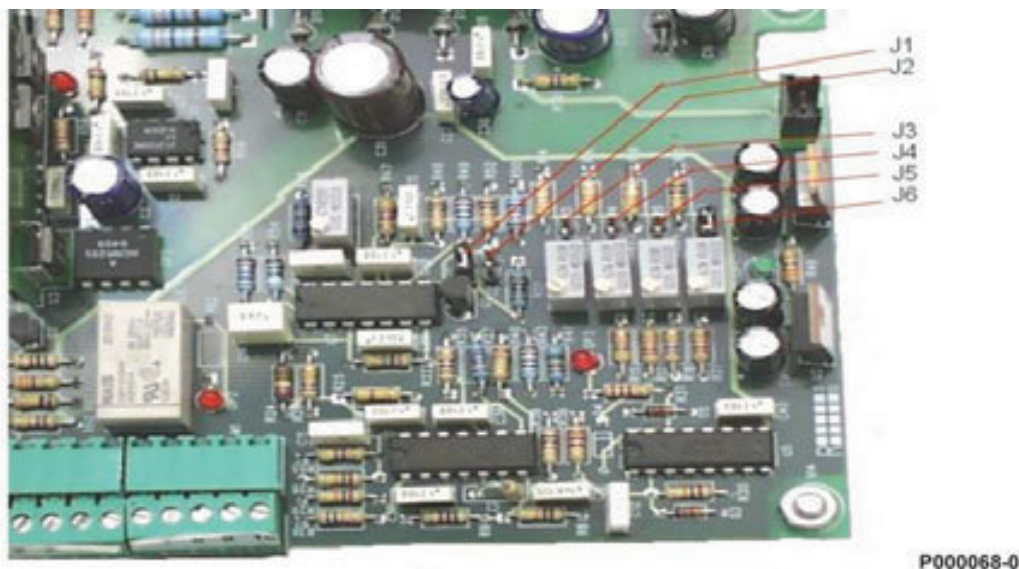


Fig.57: Position of the jumpers for the configuration of BU200



DANGER

Before changing jumper positions, remove voltage from the equipment and wait at least 5 minutes.



CAUTION

Never set jumpers to a voltage value lower than the inverter supply voltage, to avoid continuous activation of the braking unit. Never set jumpers to a voltage value lower than the inverter supply voltage, to avoid continuous activation of the braking unit.

6.2.2.2. TRIMMER

Four trimmers are installed on control board; depending on the jumper configuration, each trimmer allows a fine-tuning of the braking unit voltage threshold trip.

The similarities of the configuration jumpers and relevant trimmers are the following:

Jumper	Function
J3	Fine-tuning of pick-up voltage through trimmer RV2
J4	Fine-tuning of pick-up voltage through trimmer RV3
J5	Fine-tuning of pick-up voltage through trimmer RV4
J6	Fine-tuning of pick-up voltage through trimmer RV5

The rated voltage for the braking unit activation and its range to be set with the trimmers for each of the 4 configuration possibilities are stated in the table below:

Mains voltage [Vac]	Jumper	Trimmer	Minimum braking voltage [Vdc]	Rated braking voltage [Vdc]	Maximum braking voltage [Vdc]
200÷240 (2T)	J4	RV2	339	364	426
380÷480 (4T)	J3	RV3	700	764	826
481÷500 (4T)	J5	RV4	730	783	861
230-500	J6	RV5	464	650	810



CAUTION!!:

Max. values in the table below are theoretical; their use must be authorized by Elettronica Santerno. Those values are calculated for special applications only. For standard applications, never change the factory-set rated value.

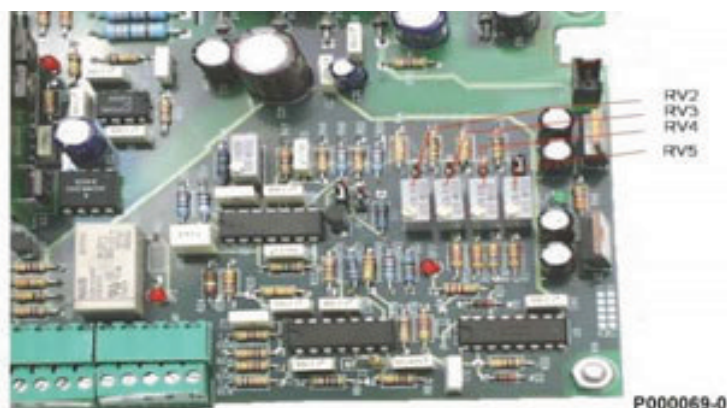


Fig.58: Trimmer positions

6.2.2.3. INDICATOR LEDs

The indicator LEDs below are located on the front part of the braking units:

OK LED	Normally "on"; the equipment is running smoothly. In case of stall for overvoltage or fault of power circuit this LED turns off led.
B LED	Normally "off"; this LED turns on when the braking unit activates.
TMAX LED	Normally "off"; this LED turns on when the thermoswitch located on the heatsink of the braking unit trips; if overtemperature protection trips, the equipment is locked until temperature drops below the alarm threshold.

6.2.3. RATINGS

SIZE	Max. braking current (A)	Min. braking current (A)	INVERTER SUPPLY VOLTAGE and JUMPER POSITION		
			200 – 240 Vac (class 2T)	380 - 480 Vac (class 4T)	480 – 500 Vac 4T class
			J4	J3	J5
			MIN. BRAKING RESISTOR (Ohm)	MIN. BRAKING RESISTOR (Ohm)	MIN. BRAKING RESISTOR (Ohm)
BU200	180	50	2	4.3	4.4

6.2.4. INSTALLATION

6.2.4.1. MOUNTING

- install vertically;
- make sure to allow a min. clearance of 5 cm on both sides and 10 cm on top and bottom; - use cable-glands to maintain degree of protection IP20.

ENVIRONMENTAL REQUIREMENTS FOR THE EQUIPMENT INSTALLATION, STORAGE AND TRANSPORT

Operating ambient temperatures	0 – 40 °C with no derating from 40°C to 50°C with a 2% derating of the rated current for each degree beyond 40°C
Ambient temperatures for storage and transport	- 25 °C - + 70 °C
Installation environment	Pollution degree 2 or higher. Do not install in direct sunlight and in places exposed to conductive dust, corrosive gases, vibrations, water sprinkling or dripping; do not install in salty environments.
Altitude	Up to 1000 m above sea level. For higher altitudes, derate the output current of 2% every 100 m above 1000 m (max. 4000 m).
Operating ambient humidity	From 5% to 95%, from 1g/m ³ to 25g/m ³ , non condensing and non freezing (class 3k3 according to EN50178)
Storage ambient humidity	From 5% to 95%, from 1g/m ³ to 25g/m ³ , non condensing and non freezing (class 1k3 according to EN50178).
Ambient humidity during transport	Max. 95%, up to 60g/m ³ ; condensation may appear when the equipment is not running (class 2k3 according to EN50178)
Storage and operating atmospheric pressure	From 86 to 106 kPa (classes 3k3 and 1k4 according to EN50178)
Atmospheric pressure during transport	From 70 to 106 kPa (class 2k3 according to EN50178)



CAUTION!!: Ambient conditions strongly affect the inverter life; do not install the equipment in places that do not have the above-mentioned ambient conditions.

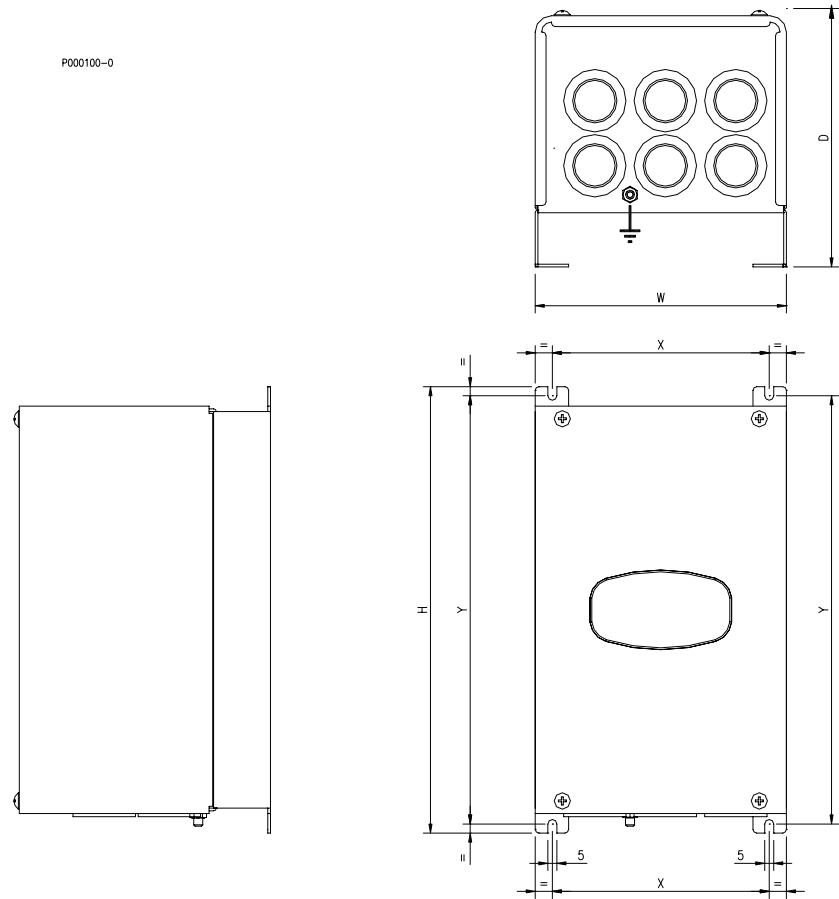
COOLING SYSTEM AND DISSIPATED POWER

The braking unit is provided with a heatsink reaching a max. temperature of 70 °C.

Make sure that the bearing surface for the braking unit is capable of withstanding high temperatures. Max. dissipated power is approx. 150 W and depends on the braking cycle required for the operating conditions of the load connected to the motor.

STANDARD MOUNTING

Braking unit BU200 must be installed in an upright position inside a cabinet. The unit BU200 must be fixed with four M4 screws.



Dimensions (mm)			Fixing points distance (mm)		Screws	Weight (Kg)
W	H	D	X	Y	M4	4
139	247	191	120	237		

Fig.59: Dimensions and fixing points of BU200



NOTE

Elettronica Santerno reserves the right to make any technical changes to this manual and to the device described herein without prior notice.

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6.2.4.2. ELECTRIC INSTALLATION

WIRING DIAGRAM

The braking unit must be connected to the inverter and the braking resistor.

The connection to the inverter must be direct or to DC output terminals (or copper bar for the greatest inverter sizes); the braking resistor must be connected to the inverter and to the braking unit.

The figure below shows the wiring diagram:

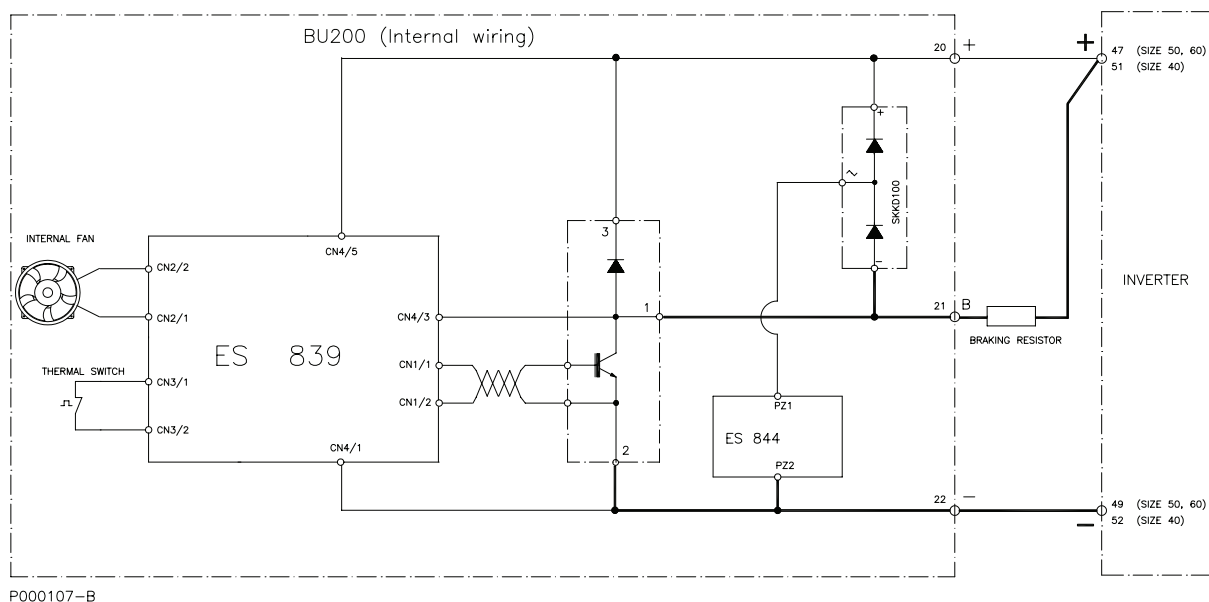


Fig.60: Power connections of a single BU200



NOTE!!

The braking resistor must be connected between terminal **B** of braking unit BU200 and terminal **+** of the inverter. In this way, no braking current high peak flows through the plus connection line between the inverter and braking unit BU200. In order to limit electromagnetic radiated emissions during a braking operation, the loop made by the connections between terminal **+** of the inverter, braking resistor, terminals **B** and **-** of BU200 module and terminals **-** of inverter, must be kept as short as possible.

MASTER – SLAVE CONNECTION

The Master-Slave connection must be used when multiple braking units are connected to the same inverter; a connection between the master output signal (M1 terminal 8) and the slave input signal (M1 terminal 4); the ground signal of the master unit control terminal block (M1 terminal 2) must be connected to the ground signal of the slave unit control terminal block (M1 terminal 2).

The connection of more than two modules must always be done by configuring one module like a master and the other modules like slaves through the configuration jumpers.

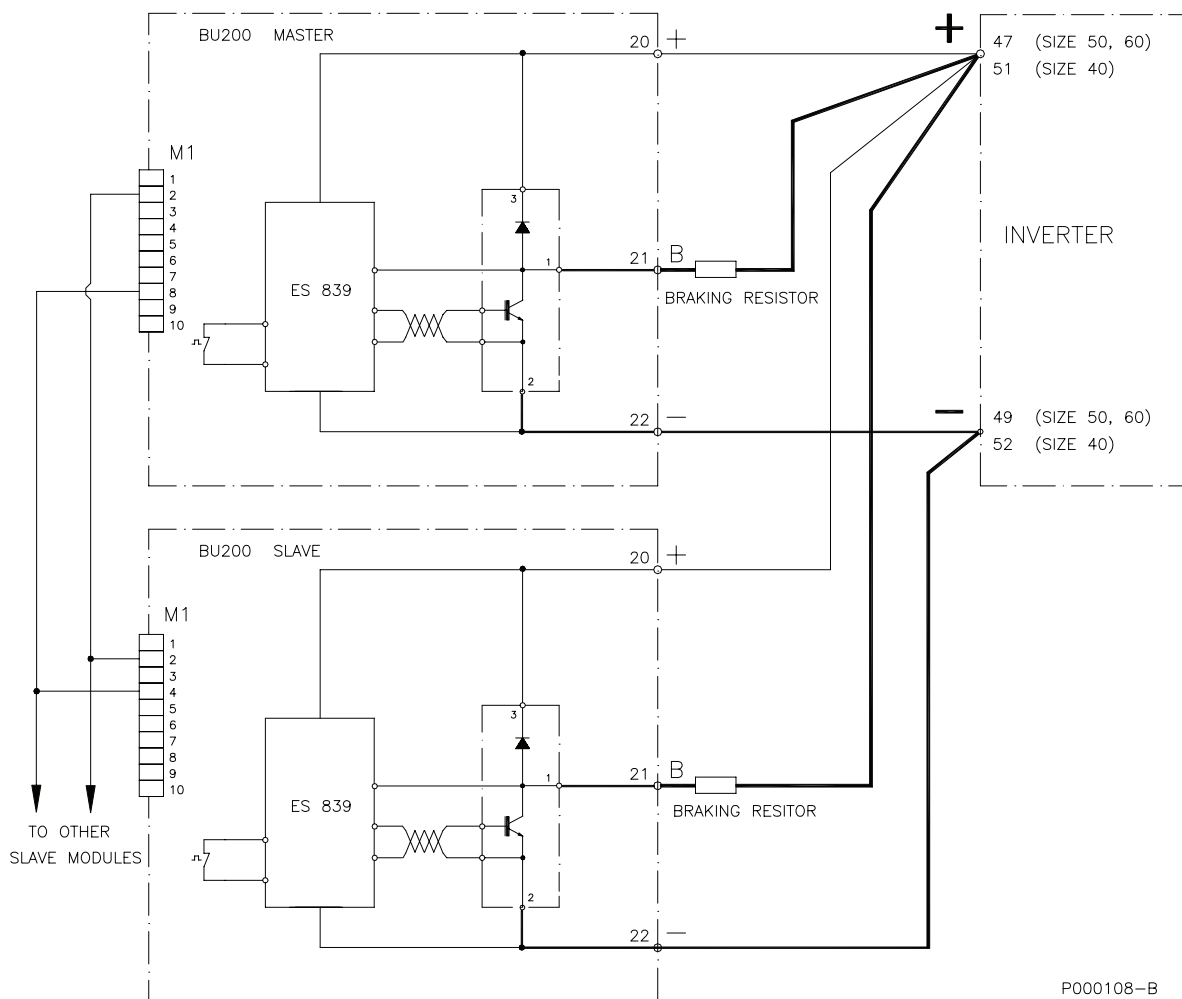


Fig.61: Master – Slave multiple connection

**NOTE!!**

Never connect the ground of the control signals (M1 for terminal 2) to zero volt of power connections (-).

LOCATION OF POWER/CONTROL TERMINALS

To gain access to the terminal blocks, remove the inverter cover; just loosen the four fixing screws of the cover located on the bottom side and on the top side of the unit.

Loose the screws in order to slide off the cover from above.

Power terminals consist of copper bars, that can be reached through the three front holes placed on the bottom of the base;

Terminal	Number	Type of terminal	Connection
+	20	Copper bar	Inverter DC side connected to terminal +
B	21	Copper bar	connection to braking resistor
-	22	Copper bar	inverter DC side connected to terminal -

Signal terminal block M1 can be accessed through its relevant hole (see figure below);

Terminal M1:

No.	Name	Description	Notes	Features
M1: 1		not used		
M1: 2	0VE	signal zero volt		Control board zero volt
M1: 3	Vin	modulation input (0 ÷ 10 V)	for special applications	Rin = 10 kOhm
M1: 4	Sin	logic input for signal sent from Master	The SLAVE brakes if a signal > 6 V is sent	30 V max
M1: 5	RL-NO	NO contact of "thermoswitch on" relay	The relay energizes when an overtemperature alarm trips for BU200	250 Vac, 3 A 30 Vdc, 3 A
M1: 6	RL-C	common of the contact of the "thermoswitch on" relay		
M1: 7	RL-NC	NC contact of "thermoswitch on" relay		
M1: 8	Mout	digital output for Slave command signal	High level output when the Master is braking	PNP output (0-15 V)
M1: 9		not used		
M1: 10		not used		

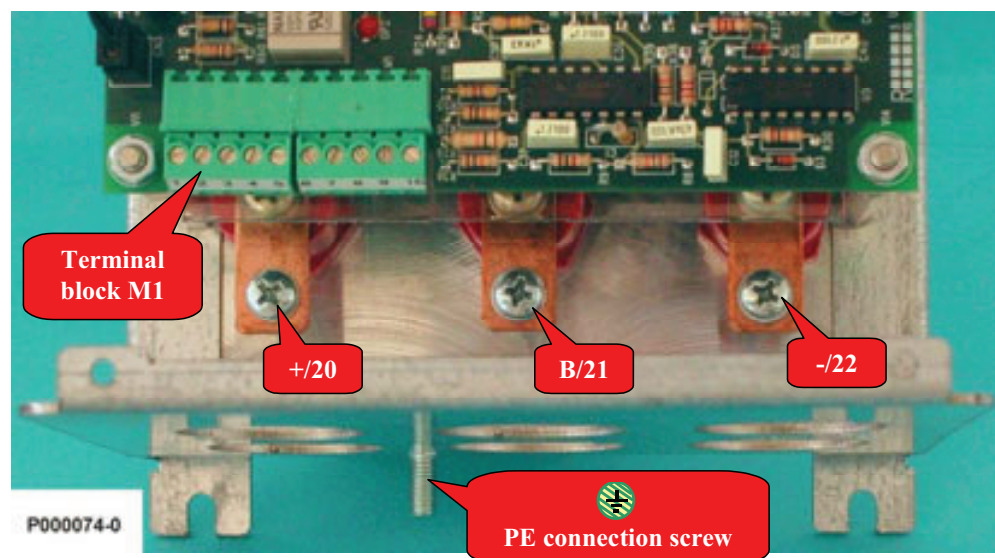


Fig.62: Terminals of BU200

WIRE CROSS-SECTIONS

Use 25 sqmm wires for power connection wirings and 0.5 or 1sqmm wires for control wirings. The connection to the braking resistor must be done with a cable capable of withstanding high temperatures (200 °C) that the surface of the braking resistor can reach.