MOM200A/600A

Micro-ohmmeters

User's Manual

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Art No. ZP-BB04E	Doc. BB0141OE	V07A	2018

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MOM200A/600A

Micro-ohmmeters

User's Manual

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CE

Contents

1 Introduction

General

This manual is for the MOM200A, and MOM600A micro-ohmmeters.

The micro-ohmmeter is designed to measure the resistances of breaker contacts, bus-bar joints, contact elements in bus-bars and other high-current links.

When contact resistance rises because of oxidation, loosened or improperly tightened threaded joints, temperatures rise abnormally at the points of contact. This abnormal heating reduces conductivity thereby accelerating the rise in temperature — and this often leads to serious trouble.

The micro-ohmmeter can be used to detect such problems early so that they can be remedied long before trouble starts. Checking contact resistance at regular intervals provides a clear indication of the state of your system.

Function description

Connect the instrument to the object being tested.

After you have adjusted the instrument to provide the desired current through the test object (100 A for example), the actual voltage drop across the test object will be measured automatically, and all you have to do is press a button to display the actual resistance.

High current is generated and sent out by the instrument during measurement. A miniature circuit breaker and a thermal cut-out are provided to make certain this current doesn't generate excessive heat inside the instrument.

The instrument is equipped with a device that guards against induction. A relay short-circuits the sensing input when the instrument's ON/OFF switch is off and also when the instrument is in the mΩ mode. To protect against external overvoltages, both the current output and the sensing input are decoupled to ground.

MOM200A is used for currents up to 200 A.

MOM600A can provide an output current of up to 600 A, and it can be set to six different measuring ranges.

Full-wave rectified current is used for measuring.

2 Safety

General

Important
Read and comply with the following instructions.

Always comply with local safety regulations.

Symbols on the instrument

Caution, refer to accompanying documents.

Protective conductor terminal.

WEEE, Waste Electrical and Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

Safety instructions

Warning

1. Before measuring resistances in circuit breakers or disconnecting switches (isolators), always check to see that the object being tested is closed and grounded on one side.
2. If there is a current transformer in the current circuit, the protective relay equipment that is connected to it must be blocked to prevent actuation. After completing your measurements, you can follow the normal procedures that are used to demagnetize current transformer cores after DC has passed through their current transformer.
3. Never open a circuit breaker while a micro-ohmmeter is connected to it.
4. Current continues to flow for a while after the micro-ohmmeter is turned off. How long it continues depends on the ratio of the components in the L/R circuit.
5. Always connect protective earth (ground).
6. Always use safety connecting leads.
7. Always turn the equipment off before connecting.
8. High voltage/current on input/output terminals.
9. Never leave the instrument unattended while it is turned on and in the high current mode.
10. Unplug the instrument from the mains supply when it is left unattended or not in use.
11. Do not attempt to service the instrument yourself. Opening or removing covers may expose you to dangerous voltage. If you attempt to service the instrument yourself the warranty is no longer valid.
12. Do not use any accessories that are not intended for use together with the instrument.
13. Disconnect the instrument from the mains before cleaning. Use a damp cloth for cleaning. Do not use liquid cleaners or aerosol cleaners.

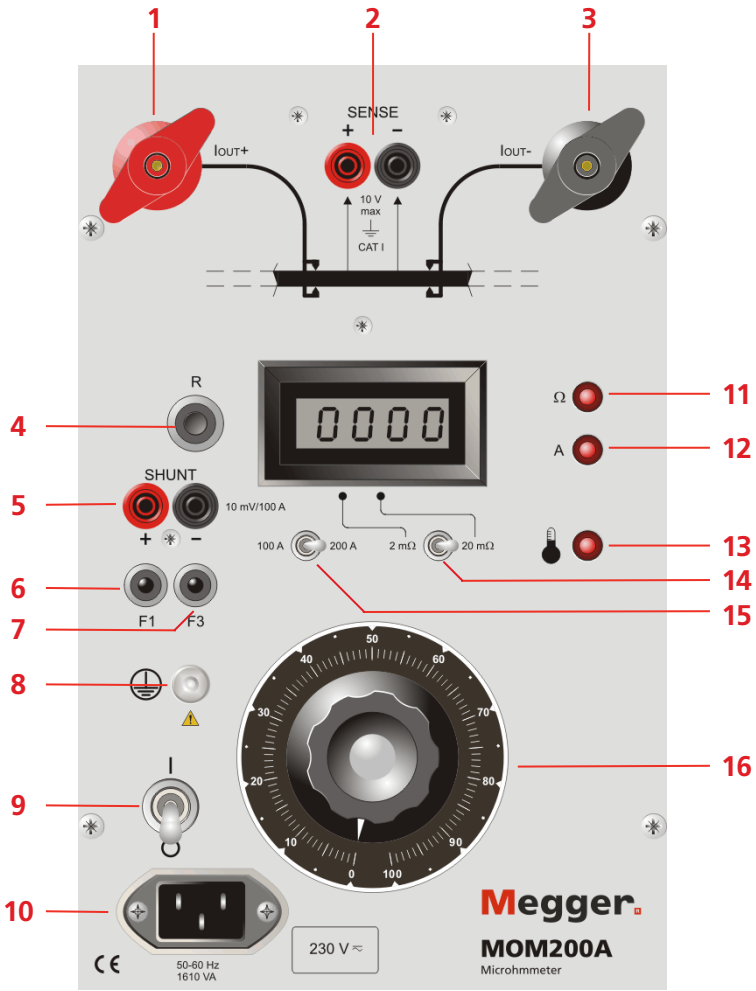
Important

1. Use only approved mains detachable cable set with the instrument. Main supply cables shall be rated for the maximum current for the equipment and the cable shall meet the requirements of IEC 60227 or IEC 60245. Mains supply cables certified or approved by a recognized testing authority are regarded as meeting this requirement.
2. Refer all servicing to authorized personnel.
3. If you need to return the instrument, please use either the original crate or one of equivalent strength.

3 Control panels

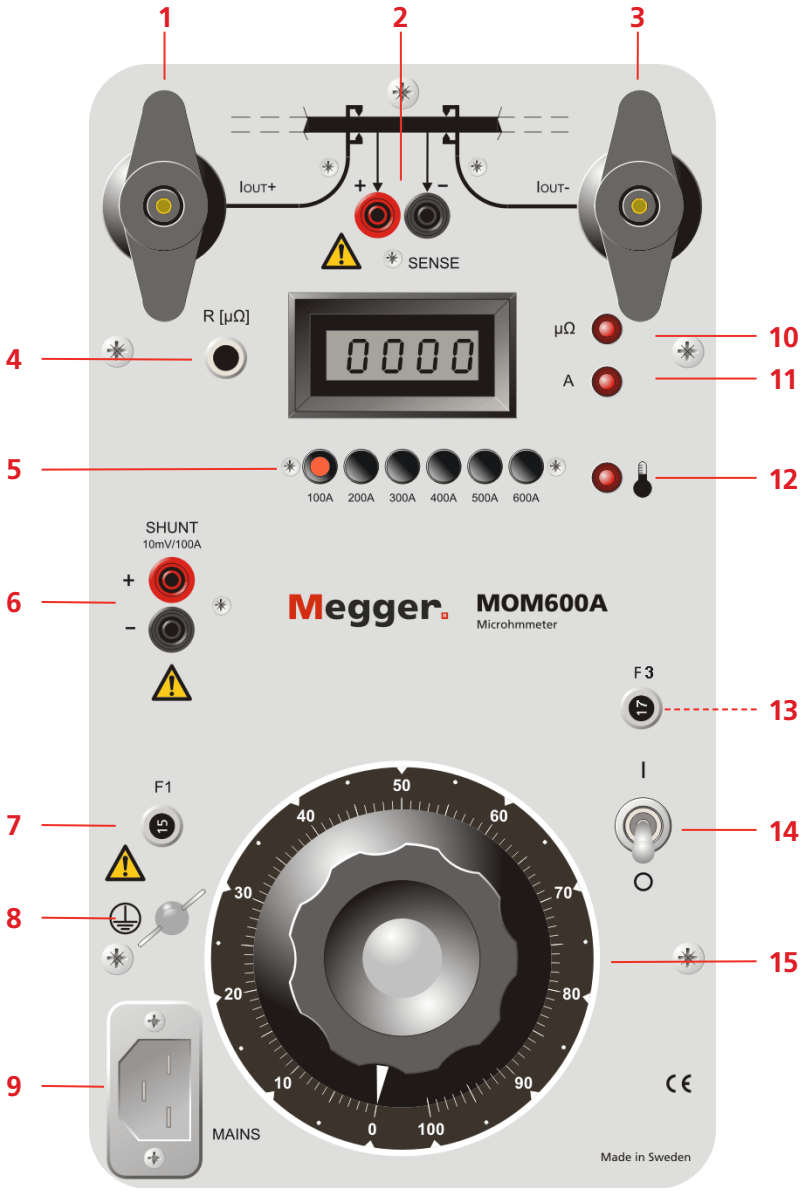
Control panel – MOM200A

1. Positive current output (IOUT+)
2. Sensing terminal (SENSE)
3. Negative current output (IOUT-)
4. Resistance button (R)
5. Current-shunt terminal (SHUNT)
6. Miniature circuit breaker for mains (F1)
7. Miniature circuit breaker for variable transformer
8. Grounding terminal
9. ON/OFF switch
10. Mains inlet
11. LED, resistance
12. LED, current
13. LED, thermal cut-out
14. Resistance range switch
15. Test current switch
16. Variable transformer



Control panel – MOM600A

1. Positive current output (I_{OUT}+)
2. Sensing terminal (SENSE)
3. Negative current output (I_{OUT}-)
4. Resistance button (R)
5. Test current push buttons
6. Current-shunt terminal (SHUNT)
7. Miniature circuit breaker for mains (F1)
8. Grounding terminal
9. Mains inlet
10. LED, resistance
11. LED, current
12. LED, thermal cut-out
13. Miniature circuit breaker, 17 A (F3, MOM600 115 V only)
14. ON/OFF switch
15. Variable transformer



4 Operating instructions

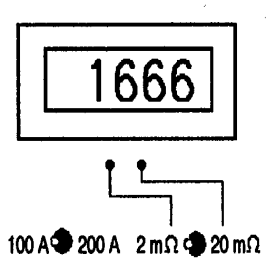
Important
Read the manual and comply with the Safety instructions before using the micro-ohmmeter.

Always comply with local safety regulations.

Note *Operating this equipment near sources of strong electric fields may cause it to display erroneous current values.*

Since power consumption is high, the instrument requires a 16 A fuse.

On the MOM200A model, you must set the decimal point selector so that the decimal point is located correctly for the test current. If the display shows an "1" to the far left, the resistance range has been exceeded



If the thermal cut-out trips (indicated by a lamp), you must wait until the instrument's temperature drops. The thermal cut-out will then be reset automatically, whereupon the micro-ohmmeter will be ready to use again.

WARNING
Current continues to flow for a while after the micro-ohmmeter is turned off. How long it continues depends on the ratio of the components in the L/R circuit.

1] Keep the micro-ohmmeter disconnected from the mains while making connections.

2] Ground one side of the test object.

3] Ground the micro-ohmmeter.

4] Connect the two current cables on two sides of the test object.

5] Connect the two sensing cables (using the same polarities as those used for the current cables) on two sides of the test object and as close to the test object as possible.

Note *The sensing cables must be connected inside the current cables. Otherwise the test data may be incorrect. See Fig.1.*

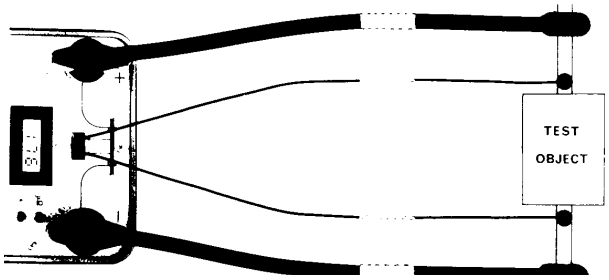


Fig. 1

6] Connect the micro-ohmmeter to the mains.

7] Turn on the ON/OFF switch.

8] **MOM200A**: Select the desired current using the "Test current switch".
MOM600A: Select the desired current using the proper "Test current push button".

9] Clear, 0-set, the instrument by turning the variable transformer down to "0", whereupon it will enter the current-generation mode and the LED "A" will light up.

10] Turn the knob (16) on the variable transformer to the right until the current rises to the selected value. Check the value on the digital measurement instrument.

Important
To obtain the best micro-ohm reading, you should generate a current value as close as possible (±1 A) to the current that has been set with the current switch on MOM200A or the push buttons on MOM600A.

11] Press resistance button R.
The instrument will interrupt the current flowing through the test object and enter the calculation mode. After about two seconds, the resistance reading will appear on the digital display expressed in micro-ohms (on model MOM600A) or milliohms (on model MOM200A). The current flowing through the test object is interrupted automatically, but the reading remains visible on the display.

12] Turn off and disconnect the micro-ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

External measuring instrument

If, for some reason, you want to use an external measuring instrument to set the measurement current, you can connect it to the current shunt. Voltage across the current shunt is proportional to the measurement current flowing through the test object, 10 mV per 100 A.

Troubleshooting

Fault	Cause	Remedy
Display shows only a 1 at left.	Current range set on instrument has been exceeded.	If possible, select another test current.
		Expand the resistance range using the method described in section "Expanded measuring range".
	Poor contact at ends of sensing cables.	Check the sensing cable connections.
Thermal cut-out has tripped.	Overload.	Wait until the temperature drops and the light-emitting diode goes out.
Mains miniature circuit breaker has tripped	Overload or fault in instrument.	Reset the miniature circuit breaker. If it trips again, contact service personnel.

5 Application examples

Measuring resistance in a breaker

Important
Read the manual and comply with the Safety instructions before using the micro-ohmmeter.

Always comply with local safety regulations.

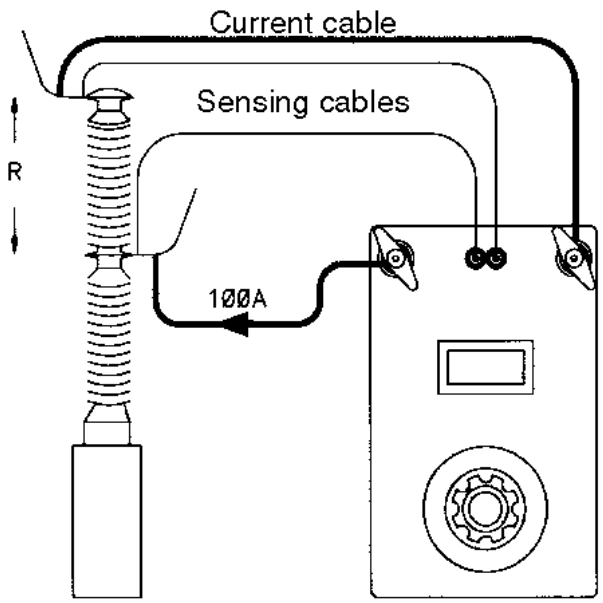


Fig. 2

1] Make certain the mains are de-energized on both sides of the breaker. Ground the breaker on one side and make certain it is closed.

2] Keep the micro-ohmmeter disconnected from the mains while making connections.

3] Ground the micro-ohmmeter.

4] Connect the current cables and the sensing cables (with the same polarities) on both sides of the breaker.

Important
The sensing cables must be connected inside the current cables. Otherwise the test data may be incorrect. See fig. 2.

5] Connect the micro-ohmmeter to the mains.

6] Turn on the ON/OFF switch.

7] **MOM200A**: Select the desired current (100 A for example) using the "Test current switch". **MOM600A**: Select the desired current (100 A for example) using the proper "Test current push button".

8] Clear, 0-set, the instrument by turning the the variable transformer down to "0", whereupon it will enter the current-generation mode and LED "A" will light up.

9] Increase the current as close as possible (±1 A) to the desired value (100 A in this case, which was the current you just selected). Set the current accurately using the digital measuring instrument.

10] Press the resistance button R, whereupon the instrument will calculate the actual resistance and present it on the display.

11] Turn off and disconnect the micro-ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

Note *If you want to generate currents that are outside the selected test current, you must calculate the resistance manually as set forth in application example "Expanded measuring range"(see below).*

Measuring resistance at bus-bar joints

Important
Read the manual and comply with the Safety instructions before using the micro-ohmmeter.

Always comply with local safety regulations.

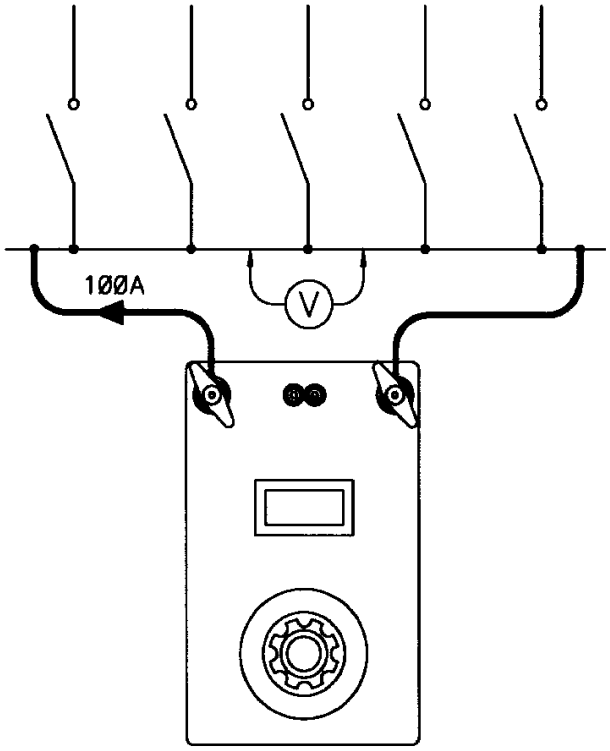


Fig. 3

1] Make certain the mains are de-energized on both sides of the bus-bar. Ground the bus-bar on one side.

2] Keep the micro-ohmmeter disconnected from the mains while making connections.

3] Ground the micro-ohmmeter.

4] Connect the micro-ohmmeter's current cables to the test object, see fig. 3. Do not connect the sensing cables. Measurement will be done manually using an external portable voltmeter.

5] Connect the micro-ohmmeter to the mains.

6] Turn on the ON/OFF switch.

7] **MOM200A**: Select the desired current (100 A for example) using the "Test current switch".
MOM600A: Select the desired current (100 A for example) using the proper "Test current push button".

8] Clear, 0-set, the instrument by turning the variable transformer down to "0", whereupon it will enter the current-generation mode and LED "A" will light up.

9] Increase the current as close as possible (±1 A) to the desired value (100 A in this case, which was the current you just selected). Set the current accurately using the digital measuring instrument.

10] Using an external voltmeter, measure the voltage drop (voltage) across each contact element within every section of the bus-bar being tested. The multimeter must be set to DC and to measure voltage. You must calculate the actual resistance yourself.
Example: If the voltage drop is 0.0067 V at a current of 100 A, the resistance will be 0.0067/100 ohms, i.e. 67 microohms.

11] Turn off and disconnect the micro-ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

Expanded measuring range

The measuring range can be expanded by setting the current lower than what was selected using the test current switch for MOM200 or the test current push buttons for MOM600. Here you must measure and calculate the resistance manually, and the accuracy is somewhat lower than normal. Application example (see below) illustrates the procedure.

Application example

Important
Read the manual and comply with the Safety instructions before using the micro-ohmmeter.

Always comply with local safety regulations.

1] Make certain that the mains are de-energized and that the test object is grounded.

2] Keep the micro-ohmmeter disconnected from the mains while making connections.

3] Ground the micro-ohmmeter.

4] Connect the two current cables and two sensing cables (using the same polarities) to the two sides measurement site. The sensing cables must be connected close to the test object.

5] Connect the micro-ohmmeter to the mains.

6] Turn the instrument's ON/OFF switch ON.

7] Select the desired current (400 A for example) using the "Test current push buttons" on the MOM600A.

8] Clear, 0-set, the instrument by turning the variable transformer down to "0", whereupon it will enter the current-generation mode and LED "A" will light up.

9] Increase the current as close as possible (±1 A) to the desired value (100 A in this case). Set the current accurately using the digital measuring instrument.

10] Press resistance button R. The instrument will do the calculation and present an incorrect resistance reading.

11] To obtain the correct resistance reading you must multiply the displayed reading by a factor of X. To obtain X, divide the selected current setting by the generated current. **Example**: 400/100 = 4.

Note *This procedure expands the micro-ohmmeter's measuring range, but the accuracy drops somewhat.*

12] Turn off and disconnect the micro-ohmmeter from the mains before doing any disconnection work or moving any cables or wiring.

6 Specifications

Specifications MOM200A

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments.
Temperature	
Operating 115 V	0°C to +50°C (32°F to +122°F)
Operating 230 V	0°C to +40°C (32°F to +104°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

LVD	2006/95/EC
EMC	2004/108/EC

General

Mains voltage	115/230 V AC, 50/60 Hz
Power consumption	1610 VA (max)
Protection	Miniature circuit breakers, thermal cut-outs
Dimensions	
Instrument	280 x 178 x 246 mm (11" x 7" x 9.7")
Transport case	560 x 260 x 360 mm (22" x 10.2" x 14.2")
Weight	14.6 kg (32.2 lbs) 26 kg (54.1 lbs) with accessories and transport case
Current cables	2 x 5 m (16 ft), 25 mm²
Sensing cables	2 x 5 m (16 ft), 2.5 mm²

Measurement section

Resistance

Range	0 – 1999 µΩ 0 – 19.99 mΩ
Resolution	1 µΩ 10 µΩ
Inaccuracy	±1% of reading + 1 digit

Output

Current	0 – 200 A DC
Open circuit voltage	4.7 V DC
Current shunt output	10 mV/100 A ±0.5%, max 20 mV out, max 10 V to protective earth (ground)

Max. load capacity

Current adjustment set to 100%

Output current	***Min. output voltage***	***Max. load time***	***Rest time***	***Input current at 115/230 V AC***
100 A DC	3.8 V DC	5 min. 15 min.	15 min. 60 min.	–
200 A DC	3.0 V DC	20 s	5 min.	14 A/7 A

Specifications MOM600A

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environment

Application field	The instrument is intended for use in high-voltage substations and industrial environments
Temperature	
Operating	0°C to +50°C (32°F to +122°F)
Storage & transport	-40°C to +70°C (-40°F to +158°F)
Humidity	5% – 95% RH, non-condensing

CE-marking

LVD	2006/95/EC
EMC	2004/108/EC

General

Mains voltage	115/230 V AC, 50/60 Hz
Power consumption (max)	115 V, 4370 VA 230 V, 7360 VA
Protection	Miniature circuit breakers, thermal cut-outs
Dimensions	
Instrument	356 x 203 x 241 mm (14" x 8" x 9,5")
Transport case	610 x 290 x 360 mm (24.0" x 11.4" x 14.2")
Weight, 115 V model	25 kg (55.1 lbs) 43.1 kg (95 lbs) with accessories and transport case
Weight, 230 V model	24.7 kg (54.5 lbs), 42.8 kg (94.4 lbs) with accessories and transport case
Current cables	2 x 5 m (16 ft), 50 mm²
Sensing cables	2 x 5 m (16 ft), 2.5 mm²

Measurement section

Resistance

Range	0 – 1999 µΩ
Resolution	1 µΩ
Inaccuracy	±1% of reading + 1 digit (at 100 – 600 A test current)

Output, 115 V model

Current	0 – 600 A DC
Open circuit voltage	5.2 V DC
Current shunt output	10 mV/100 A ±0.5%, max 60 mV out, max 10 V to protective earth (ground)

Output, 230 V model

Current	0 – 600 A DC
Open circuit voltage	9 V DC
Current shunt output	10 mV/100 A ±0.5%, max 60 mV out, max 10 V to protective earth (ground)

Max. load capacity, 115 V model

Current adjustment set to 100%

Output current	*Min. output voltage*	*Max. load time*	*Rest time*	*Input current*
100 A DC	4.6 V	-	-	8 A
300 A DC	3.8 V	1.5 min.	15 min.	20 A
600 A DC	2.6 V	10 s	5 min.	38 A

Max. load capacity, 230 V model

Current adjustment set to 100%

Output current	*Min. output voltage*	*Max. load time*	*Rest time*	*Input current*
100 A DC	8.3 V	–	–	6 A
300 A DC	7.2 V	2.5 min.	15 min.	16 A
600 A DC	5.6 V	15 s	5 min.	32 A

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Subject to change without notice. Printed matter No. ZP-BB04E | Doc. BB0141OE | V07a | 2018