

## BLU SERIES

### Battery Load Units

- Lightweight – starting from 12,3 kg (27 lbs)
- Powerful – discharge power of up to 28,4 kW
- Voltage measurement range: up to 480 V DC
- Discharge current – up to 340 A DC
- Easily expandable for larger banks using BXL extra load units
- Current measurement range using Current Clamp 0 – 1 000 A DC
- User - adjustable alarm and shutdown parameters for preventing excessive discharge
- Detailed test analysis using DV-B Win software
- Test resume feature in case of interrupted power supply



#### Description

Batteries are crucial part to the overall reliability of a substation. During the power outage many electric power objects/systems, such as power plants and generator excitation systems, should continue operating using batteries. Inability of a battery string to provide a sufficient voltage/power supply to protection circuits may lead to catastrophic consequences to the substation equipment. Therefore, it is necessary batteries to be inspected regularly in order to monitor their condition and maximize their lifetime. The essential and most reliable test for a condition assessment of a battery health is the capacity measurement test. The best way to measure battery capacity is to perform a discharge test.

The Battery Load Units - BLU series are stand-alone or PC-controlled battery capacity test set, based on a state-of-the-art technology, using the most advanced power electronics solutions with coolers and fans integrated into device.

The BLU series devices are lightweight solution for the test engineers from all around the world, developed to meet customer's wide ranging test procedures (standardized as well as customized). Using a BLU device, the capacity test is performed in an accurate, user-friendly way in accordance to actual standards for battery testing (IEEE 450-2010 / 1188-2005 / 1106-2005, IEC 60896-11/22 and other relevant standards).

Discharging can be performed at constant current, constant power, constant resistance or in accordance with a pre-selected load profile. The discharge test can be conducted even in case a battery remains connected to the load – by measuring and compensating the load current during the process.

The BLU series devices provide the discharge current of up to 340 A and are applicable to up to 480 V battery strings.

When a required discharge current or power exceeds the capacity of a single BLU device, up to 10 BLU devices can be connected in parallel. Alternatively, External Load Units BXL series can also be used to increase discharging capacity. Combined with Battery Voltage Supervisor BVS and Battery Voltage Recorders BVR, BLU series devices are

powerful tool which enables performing detailed evaluation of batteries. Overview of the maximum currents for various battery voltage ranges with the minimum achievable cell voltage of 1,75 V is presented in the table below. Maximum currents available by using BXL series devices are also presented in the table.

Battery voltage (V)		Maximum discharge current (A)							
		BLU100A	BLU200A	BLU340A	BXL-A	BLU220T	BXL-T	BLU360V	BXL-V
Nom.	Min/Max								
6	5,25	40	50	50	80	100	100	50	15
	7,05								
12	10,5	80	100	100	160	200	210	100	35
	14,1								
24	21,0	160	200	160	250	340	420	160	70
	28,2								
48	42,0	160	200	160	250	340	420	160	140
	56,4								
60	52,5	120	120	160	110	275	350	160	180
	70,5								
110	96,3	110	120	160	160	-	-	160	120
	129,3								
120	105,0	100	120	150	180	-	-	150	130
	141,0								
220	192,5	55	75	110	90	-	-	110	110
	258,5								
240	210,0	50	70	100	90	-	-	100	120
	282,0								
480	300,0	-	-	-	-	-	-	55	60
	480,0								
<b>Weight (kg / lbs)</b>		12,3 / 27	14,5 / 32	20,6 / 45.4	12,5 / 28	15,1 / 33	12,5 / 28	20,6 / 45.4	16 / 35
<b>Max Power (kW)</b>		14,2	19,7	28,4	25,4	19,4	24,7	28,4	33,8

## Application

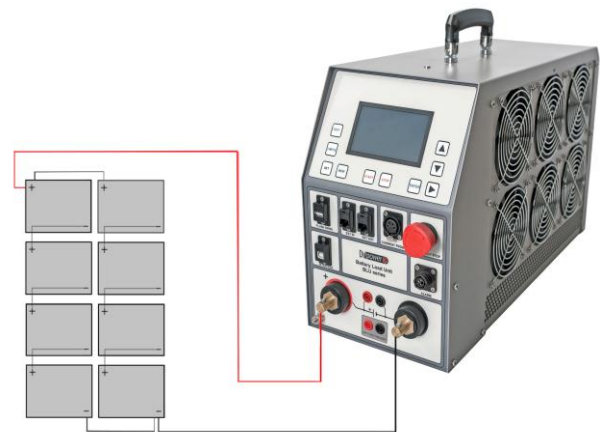
Typical application is measuring the capacity and full voltage of the batteries that serve as a backup power supply in (but not limited to):

- Power plants
- Telecommunication systems
- Generator excitation systems
- Substations
- Protection and control systems

## Connecting BLU to Battery

### Single mode

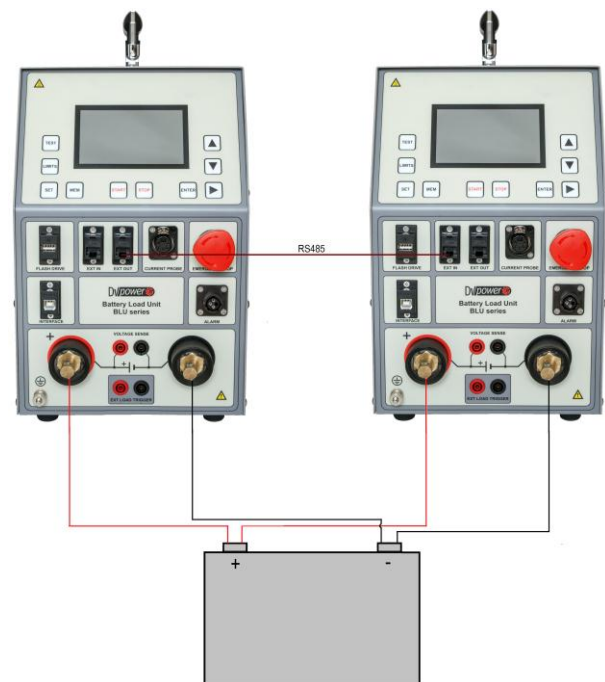
The BLU device can be connected to any battery test object by using a set of current cables and, optionally, a set of voltage sense cables. To maximize the accuracy and measurement repeatability, all clamps must have good connection to the battery terminals while any crossing between the cables should be avoided. BLU displays an appropriate message if connection between a cable clamp and the corresponding battery terminal is not established.



### Parallel discharge test mode

In case the required discharge current or power exceeds the capacity of a single BLU device, several (up to ten) devices can be connected in parallel.

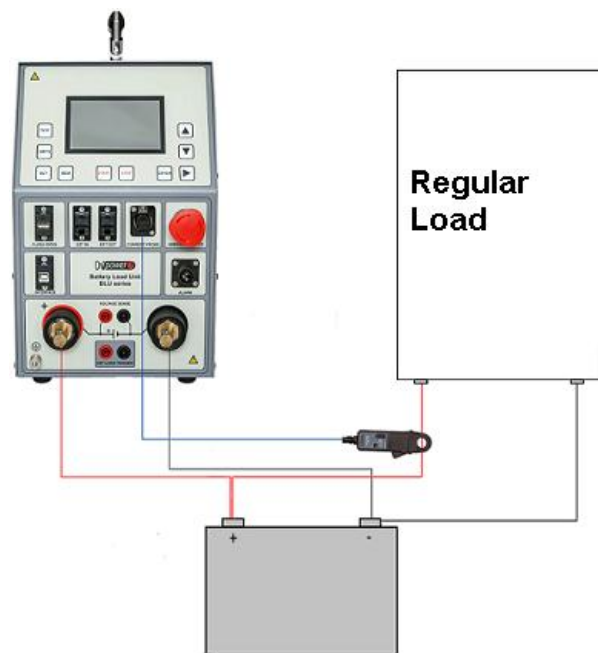
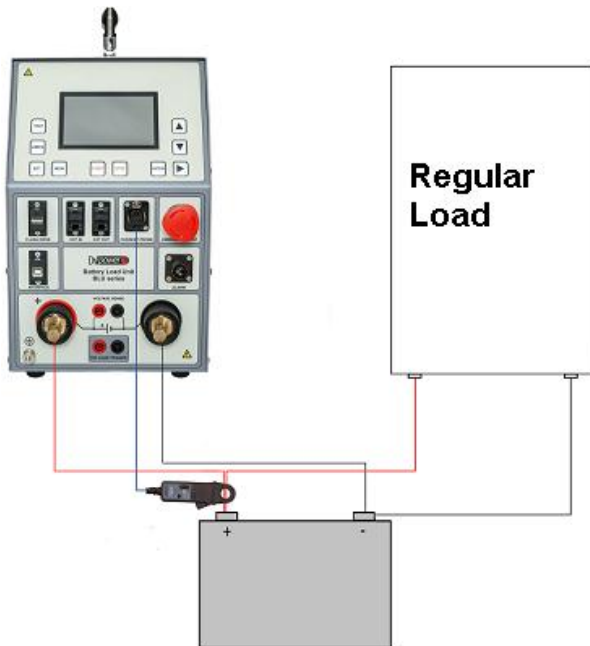
Connection between BLU devices is established by using Ethernet ports and RS485 communication. The communication is based on a MASTER-SLAVE principle – arbitrary selected device is set as MASTER while all the other BLU devices should be set as SLAVE units. In the parallel connection the MASTER will discharge as much energy as possible; the remaining energy (discharge current / discharge power) is distributed evenly to all connected SLAVE units.



## Current Probe mode

In case the battery has to remain connected to the load, or an Extra Load BXL needs to be connected due to increase in discharge power, the discharge test needs to be carried out using the Current Probe CP MODE.

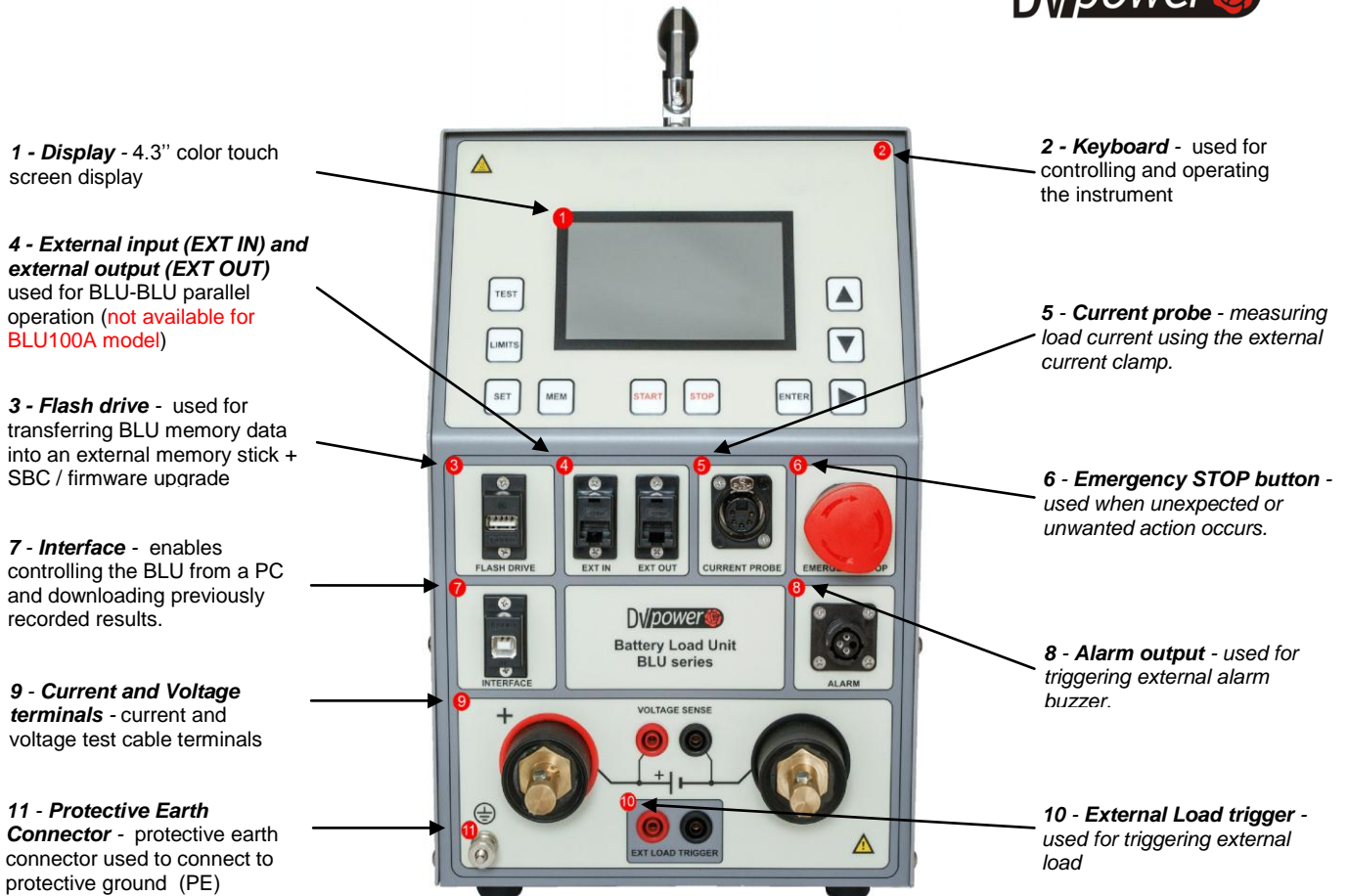
In this mode the measurement will be based either on the total battery current or a load current being measured by the DC current clamp. The current clamp positions for both modes are illustrated in the figures below.



## Benefits and Features

The list of the instruments application, benefits and features includes:

- Battery capacity measurement by conducting a discharge test, in compliance with corresponding IEEE, IEC and other relevant standards
- *Constant I*, *Constant P* and *Constant R* operation modes
- Several Load profile operation modes: *Load profile I*, *Load profile P* and *Load profile R*, enable simulating load characteristics variation during a discharge test
- Parallel operation feature (*not provided for the BLU100A model*)
- Current probe mode enables conducting discharging test while a load remains connected or when BXL units are used
- Test settings can be modified during the test
- Adjustable alarm and shutdown parameters for preventing excessive discharge
- If supported by a Battery Voltage Recorder BVR Series, additional features of cell voltage and cell temperature measurement are available
- Battery internal resistance measurement – in combination with Battery Voltage Supervisor (BVS) according to IEC 60896



## Combining BLU and BVR Series

Battery Voltage Recorder Series (BVR14 and BVR20 models) are lightweight, user-friendly, rechargeable handheld devices intended for individual battery cell voltage and temperature measurement while the battery is either in online or offline mode. When used in combination with the BLU device it serves as an efficient supplement to the battery capacity testing. Options and features, including the main differences between BVR14 and BVR20 models, are presented in the table below.



	BVR11	BVR20
CELL VOLTAGE MEASUREMENT	●	●
STRING VOLTAGE MEASUREMENT	●	○
AMBIENT TEMPERATURE MEASUREMENT	●	●
ELECTROLYTE TEMPERATURE MEASUREMENT	○	●
VOLTAGE MEASUREMENT RANGE	± 500 V DC ± 30 V DC	± 2,35 V DC ± 7 V DC ± 30 V DC
USB COMMUNICATION WITH PC	●	●
BLUETOOTH COMMUNICATION WITH PC	●	○
RFID CELL RECOGNITION	○	●
COMMUNICATION WITH EXTERNAL DENSITY METER	○	●

## Combining BLU and BVS

Battery Voltage Supervisor Capacity Model (BVS-CM) is a battery voltage monitoring system for real time data gathering and presentation. It contains of up to 128 individual BVS Modules (CVM-C), and the Control Unit (BVS CU). Power supply for each module (BVS M) is provided from the Control Unit (BCM-CU). BVS identifies potential battery malfunction by continuously monitoring cell voltage, intercell voltage, and ambient temperature during the discharge test.

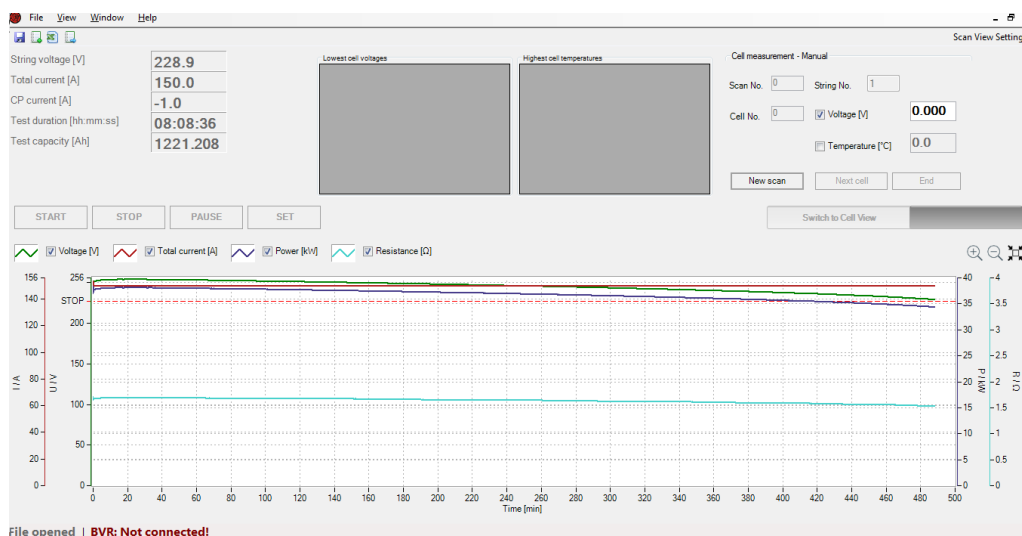
The device is used during a battery charging / discharging process. When used in a combination with the BLU device it serves as an efficient supplement to battery capacity testing. Additional BVS feature available in a combination with the BLU Series is a battery internal resistance measurement.



## DV-B Win Software

The DV-B Win software is included in the purchase price, and all its updates are free of charge. Using the DV-B Win software a test can be performed and observed from a PC, and the results can be saved directly on a PC. Communication between the BLU and a PC is achieved through a USB cable. Using DV-B Win the results can be arranged and printed for a report in a selectable format as

an XLS, PDF, Word, or RTF format. Also, the possibility of importing other types of data format (jpg, png, doc) into standardized DV-B Win report is provided, as well as exporting the numerical and graphical results from DV-B Win into customizable report. Additionally, the software provides a possibility of setting extra parameters (cell voltage, string voltage, capacity and time) for alarming and ending the test.



## BLU Series - models

### BLU100A



- weight – 12,3 kg (27 lbs)
- discharge power – up to 14,2 kW
- discharge current – up to 160 A
- designed for 6 V – 300 V DC battery systems

### BLU200A



- weight – 14,5 kg (32 lbs)
- discharge power – up to 19,7 kW
- discharge current – up to 200 A
- designed for 6 V – 300 V DC battery systems

### BLU340A



- weight – 20,6 kg (45.4 lbs)
- discharge power – up to 28,4 kW
- discharge current – up to 160 A
- designed for 6 V – 300 V DC battery systems

### BLU220T



- weight – 15,1 kg (33 lbs)
- discharge power – up to 19,4 kW
- discharge current – up to 340 A
- designed for 6 V – 60 V DC battery systems

### BLU360V



- weight – 20,6 kg (45.4 lbs)
- discharge power – up to 28,4 kW
- discharge current – up to 160 A
- designed for 6 V – 480 V DC battery systems

## Technical Data

### Mains Power Supply

- Connection according to IEC/EN60320-1; C320
- Voltage:  
90 V – 264 V AC, 50 / 60 Hz, single-phase
- Input power: 200 VA
- Fuse 2 A / 250 V, type F

### Dimensions and Weights

Model	Dimensions	Weight
BLU100A	440 x 221 x 355 mm 17.3 x 8.7 x 14 in	12,3 kg 27 lbs.
BLU200A	560 x 221 x 355 mm 22 x 8.7 x 14 in	14,5 kg 32 lbs.
BLU220T	560 x 221 x 355 mm 22 x 8.7 x 14 in	15,1 kg 33 lbs.
BLU340A	730 x 221 x 355 mm 28.7 x 8.7 x 14 in	20,6 kg 45.4 lbs.
BLU360V	730 x 221 x 355 mm 28.7 x 8.7 x 14 in	20,6 kg 45.4 lbs.

### Maximum discharge current & power

Model	Current	Power
BLU100A	160 A	14,2 kW
BLU200A	200 A	19,7 kW
BLU340A	160 A	28,4 kW
BLU360V	160 A	28,4 kW
BLU220T	340 A	19,4 kW

### Measurement

#### Internal voltage measurement

Model	Range	Resolution
BLU100A	0 – 300 V DC	0,1 V
BLU200A	0 – 300 V DC	0,1 V
BLU340A	0 – 300 V DC	0,1 V
BLU220T	0 – 75 V DC	0,1 V
BLU360V	0 – 480 V DC	0,1 V

- Typical accuracy:  $\pm 0,5\%$  of reading  $\pm 0,1$  V

#### Internal current measurement

Model	Range	Resolution
BLU100A	0 – 300 A DC	0,1 A
BLU200A	0 – 300 A DC	0,1 A
BLU340A	0 – 300 A DC	0,1 A
BLU360V	0 – 300 A DC	0,1 A
BLU220T	0 – 400 A DC	0,1 A

- Typical accuracy:  $\pm 0,5\%$  of reading  $\pm 0,2$  A

#### Current measurement with current clamps

- Range: 0 – 1 000 A DC
- Resolution: 0,1 A DC

#### Time measurement

- Typical accuracy:  
 $\pm 0,1\%$  of reading  $\pm 1$  sec

#### Display

- 4,3 inch color screen display

#### Display range

- Current: 0 – 2 999,9 A DC
- Voltage: 0 – 999,9 V DC
- Time: 00h:00m:00s - 99h:59m:59s

#### Capacity range and resolution

- Range 0 – 9999,9999 Ah
- Resolution 0,0001 Ah

#### Warranty

- Three year warranty applies to the instrument ordered with its transport case (*Transport case is part of the included accessories and should not be ordered separately*)
- 15 months warranty applies to the instrument ordered without the transport case



### Environment conditions

- Operating temperature:  
-10 °C to +45 °C / 14 °F to +113 °F
- Storage & Transportation temperature:  
-40 °C to +70 °C / -40 °F to +158 °F
- Maximum relative humidity 95% for temperatures up to 31 °C (88 °F), decreasing linearly to 40% relative humidity at 55 °C (131 °F)
- Pollution degree: 2

### Applicable Standards

- IEEE 450-2010, IEEE 1188-2005, IEEE 1106-2005, IEC 60896-11, IEC 60896-22 and other relevant standards
- Installation/overvoltage: category II
- Pollution: degree 2
- Safety: LVD 2006/95/EC (CE Confirm)  
EN61010-1
- EMC: Directive 2004/108/EC (CE Confirm)  
Standard EN 61326-1:2006
- CAN/CSA-C22.2 No. 61010-1, 2<sup>nd</sup> edition, including Amendment 1

All specifications herein are valid at ambient temperature of + 25 °C /+ 77°F and recommended accessories. Specifications are subject to change without notice

### Accessories



Current cables



Extension cables



Sense cables with dolphin clips



Transport case



Current probe 30/300 A



Cable bag



Cable set for parallel operation with BXL



Cable for parallel operation



Cable for external alarm

## Order Info

Instrument	Article No
Battery Load Unit BLU100A	BLU100A-N-00
Battery Load Unit BLU200A	BLU200A-N-00
Battery Load Unit BLU220T	BLU220T-N-00
Battery Load Unit BLU340A	BLU340A-N-00
Battery Load Unit BLU360V	BLU360V-N-00

Included Accessories	Article No
Windows based DV-B Win PC software including USB cable	
Mains Power cable	MPCXXA-XX-00
Ground (PE) cable	CABLE-GND-00
Transport case <i>(for BLU100A, BLU200A and BLU220T models)</i>	HARD-CASE-BL
Transport case <i>(for BLU340A and BLU360V models)</i>	HARD-CASE-B1

Recommended	Article No
Current cables 2 x 3 m 35 mm <sup>2</sup> (9.84 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A and BLU360V models)</i>	C2-03-35VA4I
Current cables 2 x 3 m 50 mm <sup>2</sup> (9.84 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU220T)</i>	C2-03-50FA4I
Cable bag	CABLE-BAG-00

Optional	Article No
Battery External Load Unit BXL-A	BXL400X-A-00
Battery External Load Unit BXL-T	BXL400X-T-00
Battery External Load Unit BXL-V	BXL400X-V-00
Cable set 2 x 2 m 1 mm <sup>2</sup> (6.56 ft, 17 AWG) for parallel operation <i>(for BXL models)</i>	PO-02-01BPBP
Battery Voltage recorder BVR11 with accessories	BVR11X-NN-00
Battery Voltage recorder BVR20 with accessories	BVR20X-NN-00
Current cables 2 x 3 m 50 mm <sup>2</sup> (9.84 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models)</i>	C2-03-50VA4I
Current cables 2 x 5 m 35 mm <sup>2</sup> (16.4 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models)</i>	C2-05-35VA4I
Current cables 2 x 5 m 50 mm <sup>2</sup> (16.4 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models)</i>	C2-05-50VA4I
Current cables 2 x 5 m 70 mm <sup>2</sup> (16.4 ft, 00 AWG) with alligator clamps (A4) isolated <i>(for BLU220T and BXL-T models)</i>	C2-05-70FA4I
Current cables 2 x 10 m 35 mm <sup>2</sup> (32.8 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A, BLU360V and BXL models)</i>	C2-10-35VA4I
Current cables 2 x 10 m 50 mm <sup>2</sup> (32.8 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models)</i>	C2-10-50VA4I
Current cables 2 x 10 m 70 mm <sup>2</sup> (32.8 ft, 00 AWG) with alligator clamps (A4) isolated <i>(for BLU220T and BXL-T models)</i>	C2-10-70FA4I

Current cables 2 x 15 m 50 mm <sup>2</sup> (49.2 ft, 0 AWG) with alligator clamps (A4) isolated (for <i>BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models</i> )	C2-15-50VA4I
Current cables 2 x 20 m 50 mm <sup>2</sup> (65.6 ft, 0 AWG) with alligator clamps (A4) isolated (for <i>BLU100A, BLU200A, BLU340A, BLU360V, BXL-A and BXL-V models</i> )	C2-20-50VA4I
Extension cables 2 x 5 m 35 mm <sup>2</sup> (16.4 ft, 2 AWG) (for <i>BLU100A, BLU200A, BLU340A, BLU360V and BXL models</i> )	E2-05-35VA3I
Extension cables 2 x 5 m 70 mm <sup>2</sup> (16.4 ft, 00 AWG) (for <i>BLU220T and BXL-T models</i> )	E2-05-70VFMI
Extension cables 2 x 10 m 35 mm <sup>2</sup> (32.8 ft, 2 AWG) (for <i>BLU100A, BLU200A, BLU340A, BLU360V and BXL models</i> )	E2-10-35VA3I
Extension cables 2 x 10 m 50 mm <sup>2</sup> (32.8 ft, 0 AWG) (for <i>BLU100A, BLU200A, BLU340A, BLU360V and BXL models</i> )	E2-10-50VA3I
Sense cables 2 x 3 m (9.84 ft) with banana plugs + dolphin clip (for <i>BLU models</i> )	S2-03-00BPDC
Sense cables 2 x 5 m (16.4 ft) with banana plugs + dolphin clip (for <i>BLU models</i> )	S2-05-00BPDC
Sense cables 2 x 10 m (32.8 ft) with banana plugs + dolphin clip (for <i>BLU models</i> )	S2-10-00BPDC
Sense cables 2 x 15 m (49.2 ft) with banana plugs + dolphin clip (for <i>BLU models</i> )	S2-15-00BPDC
Sense cables 2 x 20 m (65.6 ft) with banana plugs + dolphin clip (for <i>BLU models</i> )	S2-20-00BPDC
Current clamp 30/300 A power supplied from the instrument with extension 5 m (16.4 ft) (for <i>BLU models</i> )	CACL-0300-06
Cable for external alarm (for <i>BLU models</i> )	CABLE-EXA-05
Extension cable for external alarm 5 m (16.4 ft) (for <i>BLU models</i> )	E1-EXABLU-05
Cable for parallel operation 3 m (9.84 ft) (for <i>BLU200A, BLU220T, BLU340A and BLU360V models</i> )	CP-03RJ45-00
Cable set 2 x 5 m 1 mm <sup>2</sup> (16.4 ft, 17 AWG) for parallel operation (for <i>BXL models</i> )	PO-05-01BPBP