

BLU-K SERIES

Battery Load Units

- Lightweight – starting from 12,3 kg (27 lbs)
- Powerful – discharge power of up to 28,2 kW
- Voltage measurement range: up to 480 V DC
- Discharge current – up to 330 A DC
- Discharge capacity expandable using BXL extra load units or other available load units
- Current probe measurement range: 0 – 300 / 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-K 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-K 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-K 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 / 1106-2015, 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-K series devices provide the discharge current of up to 330 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-K device, additional BLU-K and / or External Load Units BXL series devices can be used to increase discharge capacity. Combined with Battery Voltage Supervisor BVS and Battery Voltage Recorders BVR, BLU-K 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)							
Nom.	Min/Max	BLU100K	BLU200K	BLU340K	BXL-A	BLU220TK	BXL-T	BLU360V	BXL-V
6	5,25	40	50	50	59	100	74	50	11
	7,05				80		100		15
12	10,5	80	100	100	119	200	156	100	26
	14,1				160		210		35
24	21,0	150	150	150	186	330	312	150	55
	28,2				250		420		75
48	42,0	150	150	150	186	330	312	150	115
	56,4				250		420		155
60	52,5	100	100	150	81	250	260	150	141
	70,5				110		350		190
110	96,3	110	120	150	119	-	-	150	96
	129,3				160				130
120	105,0	100	120	150	134	-	-	150	107
	141,0				180				145
220	192,5	55	70	100	67	-	-	100	85
	258,5				90				115
240	210,0	50	70	100	67	-	-	100	93
	282,0				90				125
480	300,0	-	-	-	-	-	-	50	34
	480,0								55
Weight (kg/lbs)		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
Max Power (kW)		14,2	19,7	28,4	25,4	19,4	24,7	28,4	35

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-K device can be connected to any battery test object by using a set of current 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-K displays an appropriate message if connection between a cable clamp and the corresponding battery terminal is not established.

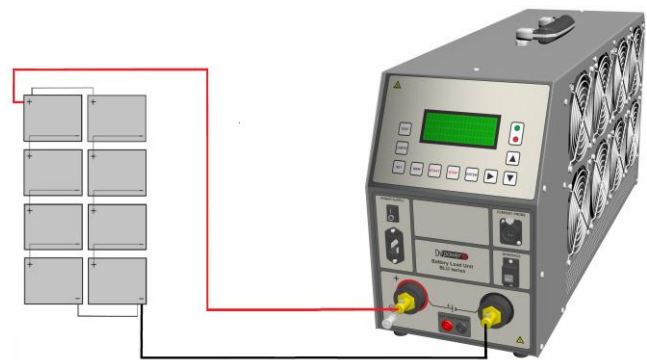


Figure 1: BLU-K to battery system connection diagram

Current Probe mode

In case the battery has to remain connected to the load, or an additional BLU-K device or Extra Load unit BXL need to be used due to high discharge capacity demands, 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 probe. The current probe position for both modes are illustrated in the Figures 2-4.

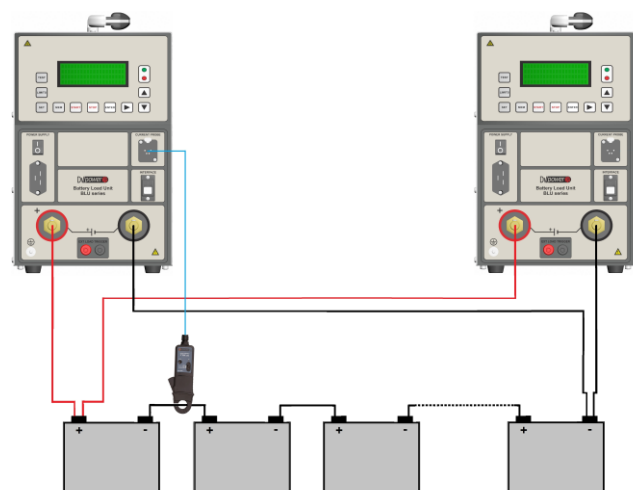


Figure 2: 2 x BLU-K connection diagram in CP Battery current mode

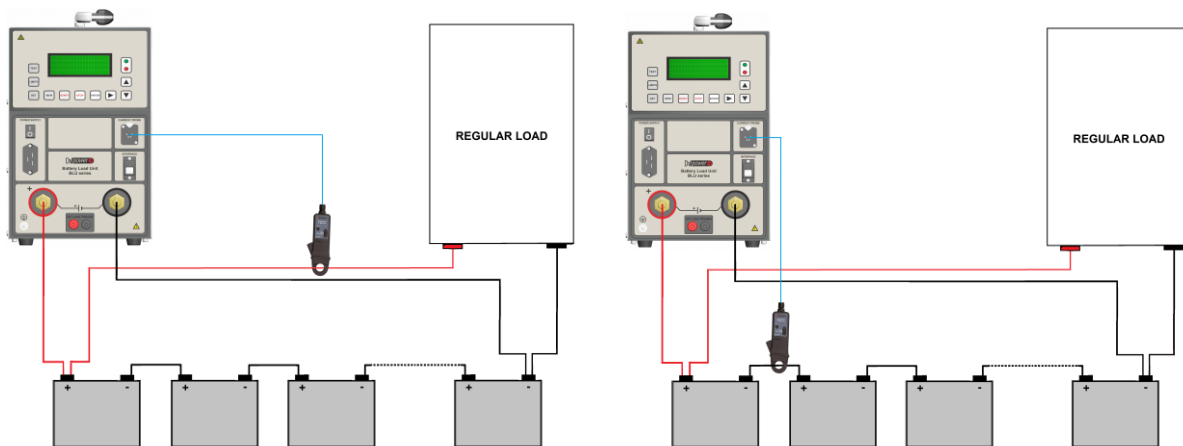


Figure 3: BLU-K connection diagram in CP mode in case load is connected:
Load current mode (left) and Battery current mode (right)

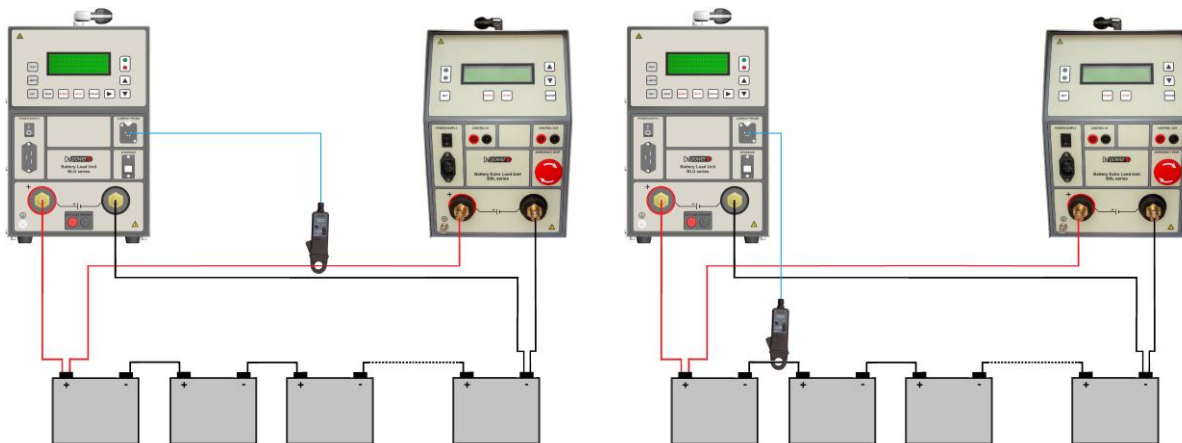
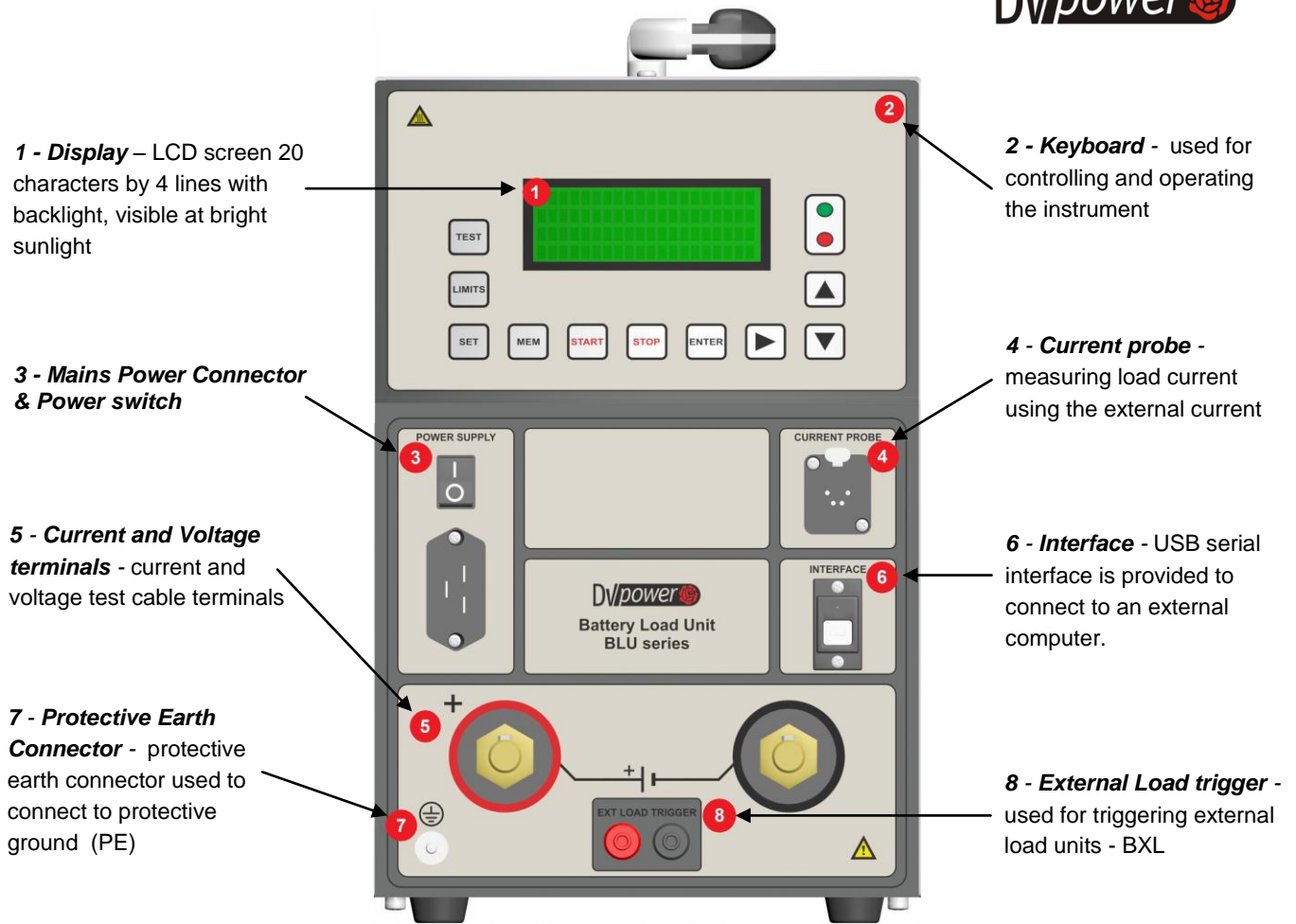


Figure 4: BLU-K & BXL connection diagram in CP *Load current mode (left) and Battery current mode (right)*

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
- Current probe mode enables conducting discharging test while a load remains connected or when additional BLU-K, BXL units or other load 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-K and BVR Series

Battery Voltage Recorder Series (BVR11 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-K device it serves as an efficient supplement to the battery capacity testing. Options and features, including the main differences between BVR11 and BVR20 models, are presented in the table below.

	BVR11	BVR20
PICTURE		
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
CURRENT MEASUREMENT	●	●
USB COMMUNICATION WITH PC	●	●
BLUETOOTH COMMUNICATION WITH PC	●	○
RFID CELL RECOGNITION	○	●
COMMUNICATION WITH EXTERNAL DENSITY METER	○	●

Combining BLU-K 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.

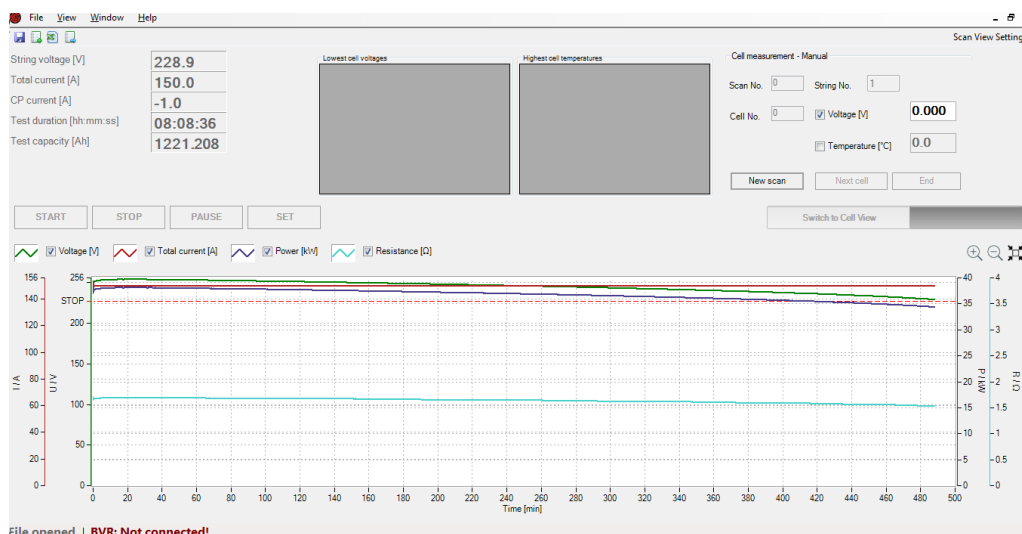
The device is used during a battery charging / discharging process. When used in a combination with the BLU-K device it serves as an efficient supplement to battery capacity testing. Additional BVS feature available in a combination with the BLU-K Series is a battery internal resistance measurement.



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-K 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-K Series - models


BLU100K

	<ul style="list-style-type: none"> • weight – 12,3 kg (27 lbs) • discharge power – up to 14,2 kW • discharge current – up to 150 A • designed for 6 V – 300 V DC battery systems
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BLU200K

	<ul style="list-style-type: none"> • weight – 14,5 kg (32 lbs) • discharge power – up to 19,7 kW • discharge current – up to 150 A • designed for 6 V – 300 V DC battery systems
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BLU340K

	<ul style="list-style-type: none"> • weight – 20,6 kg (45.4 lbs) • discharge power – up to 28,2 kW • discharge current – up to 150 A • designed for 6 V – 300 V DC battery systems
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BLU220TK

	<ul style="list-style-type: none"> • weight – 15,1 kg (33 lbs) • discharge power – up to 18,6 kW • discharge current – up to 330 A • designed for 6 V – 60 V DC battery systems
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BLU360VK

	<ul style="list-style-type: none"> • weight – 20,6 kg (45.4 lbs) • discharge power – up to 28,2 kW • discharge current – up to 150 A • designed for 6 V – 480 V DC battery systems
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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
BLU100K	440 x 221 x 355 mm 17.3 x 8.7 x 14 in	12,3 kg 27 lbs.
BLU200K	560 x 221 x 355 mm 22 x 8.7 x 14 in	14,5 kg 32 lbs.
BLU220TK	560 x 221 x 355 mm 22 x 8.7 x 14 in	15,1 kg 33 lbs.
BLU340K	730 x 221 x 355 mm 28.7 x 8.7 x 14 in	20,6 kg 45.4 lbs.
BLU360VK	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
BLU100K	150 A	14,2 kW
BLU200K	150 A	19,7 kW
BLU340K	150 A	28,2 kW
BLU360VK	150 A	28,2 kW
BLU220TK	330 A	18,6 kW

Measurement

Internal voltage measurement

Model	Range	Resolution
BLU100K	0 – 300 V DC	0,1 V
BLU200K	0 – 300 V DC	0,1 V
BLU340K	0 – 300 V DC	0,1 V
BLU220TK	0 – 75 V DC	0,1 V
BLU360VK	0 – 480 V DC	0,1 V

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

Internal current measurement

Model	Range	Resolution
BLU100K	0 – 300 A DC	0,1 A
BLU200K	0 – 300 A DC	0,1 A
BLU340K	0 – 300 A DC	0,1 A
BLU360VK	0 – 300 A DC	0,1 A
BLU220TK	0 – 400 A DC	0,1 A

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

Current probe range and resolution

- Range: 0 – 300 / 1 000 A DC
- Resolution: 0,1 A DC

Time measurement

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

Display

- LCD screen 20 characters by 4 lines with backlight, visible at bright sunlight

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 1106-2015, IEC 60896-11, IEC 60896-22 and other relevant standards
- Safety: LVD 2014/35/EU (CE Conform)
Applicable standards, for a class I instrument, pollution degree 2, Installation category II: IEC EN 61010-1
- EMC: Directive 2014/30/EU (CE Conform)
Standard EN 61326-1:2006
- CAN/CSA-C22.2 No. 61010-1

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



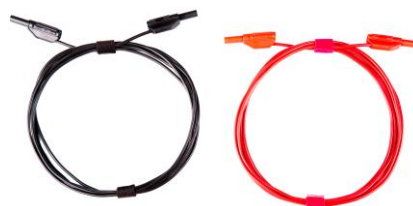
Extension cables



Transport case



Current probe 30/300 A



Cable set for parallel operation with BXL



Cable bag

Order Info

Instrument	Article No
Battery Load Unit BLU100K	BLU100A-K-00
Battery Load Unit BLU200K	BLU200A-K-00
Battery Load Unit BLU220TK	BLU220T-K-00
Battery Load Unit BLU340K	BLU340A-K-00
Battery Load Unit BLU360VK	BLU360V-K-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 BLU100K, BLU200K and BLU220TK models)</i>	HARD-CASE-BL
Transport case <i>(for BLU340K and BLU360VK models)</i>	HARD-CASE-B1

Recommended	Article No
Current cables 2 x 3 m 35 mm ² (9.84 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K and BLU360VK models)</i>	C2-03-35VA4I
Current cables 2 x 3 m 50 mm ² (9.84 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU220TK)</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 ² (6.56 ft, 17 AWG) for parallel operation <i>(for BXL models)</i>	PO-02-01BPBP
Cable set 2 x 5 m 1 mm ² (16.4 ft, 17 AWG) for parallel operation <i>(for BXL models)</i>	PO-05-01BPBP
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 ² (9.84 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-03-50VA4I
Current cables 2 x 5 m 35 mm ² (16.4 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-05-35VA4I
Current cables 2 x 5 m 50 mm ² (16.4 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-05-50VA4I
Current cables 2 x 5 m 70 mm ² (16.4 ft, 00 AWG) with alligator clamps (A4) isolated <i>(for BLU220TK and BXL-T models)</i>	C2-05-70FA4I

Current cables 2 x 10 m 35 mm ² (32.8 ft, 2 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK and BXL models)</i>	C2-10-35VA4I
Current cables 2 x 10 m 50 mm ² (32.8 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-10-50VA4I
Current cables 2 x 10 m 70 mm ² (32.8 ft, 00 AWG) with alligator clamps (A4) isolated <i>(for BLU220TK and BXL-T models)</i>	C2-10-70FA4I
Current cables 2 x 15 m 50 mm ² (49.2 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-15-50VA4I
Current cables 2 x 20 m 50 mm ² (65.6 ft, 0 AWG) with alligator clamps (A4) isolated <i>(for BLU100K, BLU200K, BLU340K, BLU360VK, BXL-A and BXL-V models)</i>	C2-20-50VA4I
Extension cables 2 x 5 m 35 mm ² (16.4 ft, 2 AWG) <i>(for BLU100K, BLU200K, BLU340K, BLU360V and BXL models)</i>	E2-05-35VA3I
Extension cables 2 x 5 m 70 mm ² (16.4 ft, 00 AWG) <i>(for BLU220TK and BXL-T models)</i>	E2-05-70VFM I
Extension cables 2 x 10 m 35 mm ² (32.8 ft, 2 AWG) <i>(for BLU100K, BLU200K, BLU340K, BLU360V and BXL models)</i>	E2-10-35VA3I
Extension cables 2 x 10 m 50 mm ² (32.8 ft, 0 AWG) <i>(for BLU100K, BLU200K, BLU340K, BLU360V and BXL models)</i>	E2-10-50VA3I
Current clamp 30/300 A power supplied from the instrument with extension 5 m (16.4 ft) <i>(for BLU-K models)</i>	CACL-0300-06