BLU500C

Battery Load Unit

- Lightweight – 17,0 kg (37.5 lbs)
- Powerful – discharge power up to 20,0 kW
- Voltage measurement range: 5,25 - 500 V DC
- Discharge current – up to 220 A DC
- Real-time test parameters monitoring on 7 inch touch screen display
- Easily expandable for larger banks using BXL-V extra load units
- Battery internal resistance measurement according to IEC 60896
- Enables testing batteries while in service
- 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 life-time. 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.

DV Power BLU500C Battery Capacity Tester is the latest DV Power solution for comprehensive battery capacity measurement. This universal instrument is applicable to any battery string (lead-acid, lithium-ion, nickel-cadmium based or other) with voltages up to 500 V DC.

The BLU500C capacity tester simplifies battery testing in multiple ways. The instrument provides monitoring of discharge parameters (graphical and numerical) on 7 inch touch screen display. Parameters such as battery voltage, capacity, test current / power / resistance and elapsed time can be monitored in real time. As an addition, the instrument enables measurement and monitoring of cell parameters (voltage/intercell voltage/temperature), which makes it a complete stand-alone discharge test system. The capacity tester can also be used with DV-B Win software, enabling detailed numerical and graphical presentation of key parameters, including report creating in various formats.

Using the BLU500C 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).

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Discharging can be performed at constant current, constant power, constant resistance or in accordance with a pre-selected load profile. If battery needs to supply its load continuously, the discharge test can be conducted by measuring and taking into account the load current during the test.
The BLU500C provides the discharge current of up to 220 A and is applicable to up to 500 V battery voltages.
When a required discharge current or power exceeds the capacity of a single BLU500C device, several BLU500C devices can be connected in parallel. Alternatively, External Load Units BXL-V can also be used to increase discharging capacity. 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 available currents of BXL-V unit are also presented in the table.

Battery voltage	6 V		12 V		24 V		48 V		60 V		110 V		120 V		220 V		240 V		480 V	
Min-Max voltage (V)	5,25	7,05	10,5	14,1	21,0	28,2	42,0	56,4	52,5	70,5	96,3	129,3	105,0	141,0	192,5	258,5	210,0	300,0	300,0	500,0
BLU500C Maximum current (A)	55		115		185		220		220		150		140		75		70		40	
BXL-V Maximum current (A)	11	15	26	35	55	75	115	155	141	190	96	130	107	145	85	115	93	125	34	55

Application

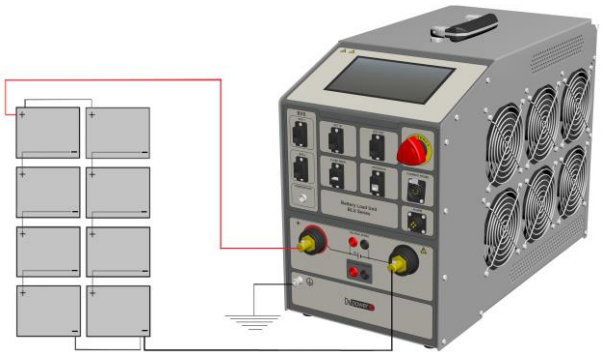
Typical application is measuring the capacity and full voltage of the batteries that serve as a backup power supply in (but not limited to):

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

Connecting BLU500C to Battery

Single mode

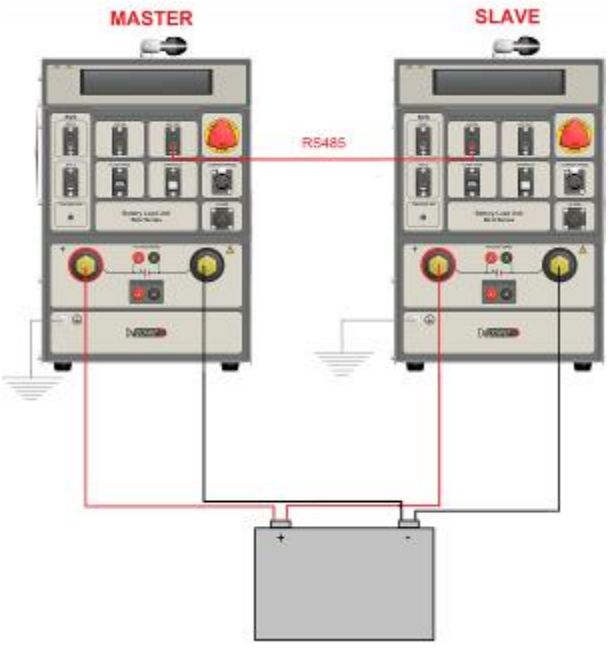
The BLU500C device can be connected to any battery test object by using a set of current cables and, optionally, a set of voltage sense cables. To maximize the accuracy and measurement repeatability, all clamps must have good connection to the battery terminals while any crossing between the cables should be avoided. The BLU500C 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 BLU500C device, several (up to ten) devices can be connected in parallel.

Connection between BLU500C 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 BLU500C 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) will be discharged on the first SLAVE unit in a chaine. If MASTER and the first SLAVE does not have capacity to cover the discharge requirements, the remaining energy will be discharged on the next SLAVE in a chain, etc.

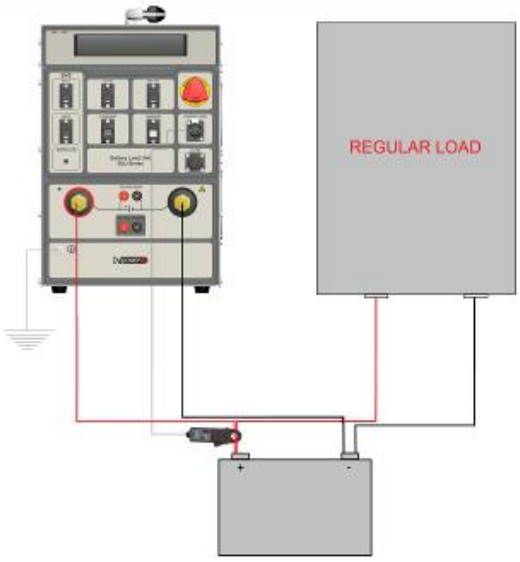


Current Probe mode

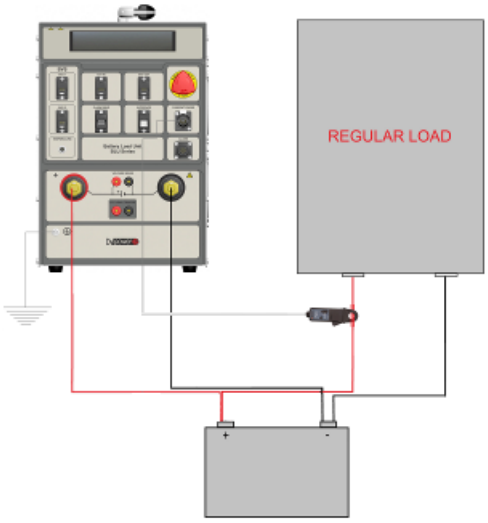
If the battery needs to supply its regular load continuously, the load current should be taken into account during the discharge test. Also, testing high-capacity battery strings may require engaging additional load units (such as Extra Load BXL-V or any other load units). In both cases, the current probe should be used to enable BLU500C to regulate the total current / power.

The current probe can be connected in one of the following ways:

1. To measure the total discharge current (***Battery current mode***)



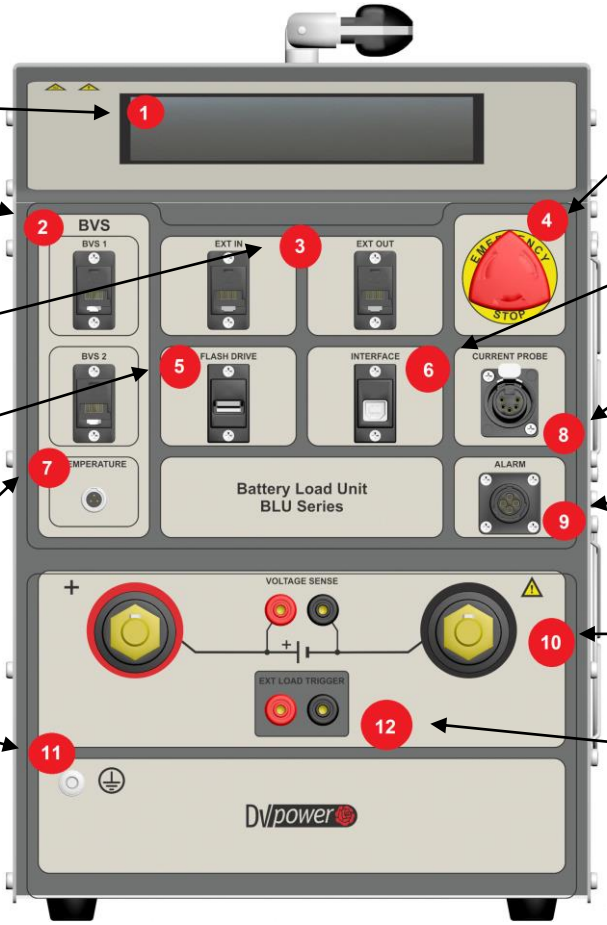
1. To measure the current of all loads, except the BLU500C current (***Load current mode***)



Benefits and Features

The list of the instrument's 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
- Real-time test parameters monitoring on 7 inch touch screen display, including Voltage / Time and Capacity / Time graphs
- Cell parameters measurement and monitoring (voltage/intercell voltage/temperature)
- Parallel operation feature
- Enables testing batteries while in service
- Test settings can be modified during the test
- Test resume feature in case of interrupted power supply
- Results saved in the internal memory can be downloaded to u USB and transferred to a PC for analysis and report generation
- Adjustable alarm and shutdown parameters for preventing excessive discharge
- If supported by a Battery Voltage Recorder BVR Series or Battery Voltage Supervisor BVS Series, additional features of cell voltage, inter-cell voltage and cell temperature measurement are available



1 - Display - 7'' color touch screen display

2 – Connection for BVS modules *for cell voltage / intercell voltage measurement*

3 - External input (EXT IN) and external output (EXT OUT) used for BLU500C-BLU500C parallel operation

5 - Flash drive - used for transferring BLU memory data into an external memory stick + SBC / firmware upgrade

7 – Ambient Temperature Measurement.

10 - Protective Earth Connector - protective earth connector used to connect to protective ground (PE)

4 - Emergency STOP button - used when unexpected or unwanted action occurs.

6 - Interface *– USB or RS232 communication with a PC*

8 - Current probe - measuring load current using the external current probe.

9 - Alarm output - used for triggering external alarm buzzer.

10 - Current and Voltage terminals - current and voltage test cable terminals

12 - External Load trigger - used for triggering BXL external load units

Cell Voltage Measurement Feature

The BLU500C enables real time data gathering and presentation for each cell in the string. Individual BVS Modules (CVM) can be directly linked to the BLU500C and provide continuous information on cell and intercell voltage, and optionally cell temperature. Potential battery malfunction can be easily identified by continuously monitoring cell parameters. Potential battery malfunction can be easily identified by continuously monitoring cell voltage, intercell voltage, and ambient temperature during the discharge test.

The CVM modules detect cells that fail a discharge test based on measured voltage values.

All out-of-tolerance measurement values are announced by a LED signalization on an individual CVM module, so the failing cells can be detected before endangering the entire battery system. This enables detecting and safely bypassing the failing cell during a discharge process.



Data acquisition and extensive analysis capabilities of data collected from the CVM are available in the DV–B Win application software suite, providing a user data viewing, tracking and generation of comprehensive reports.



Combining BLU500C and BVR Series

Battery Voltage Recorder Series (BVR11, BVR20 & BVR22 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 BLU500C device, it serves as an efficient supplement to the battery capacity testing.

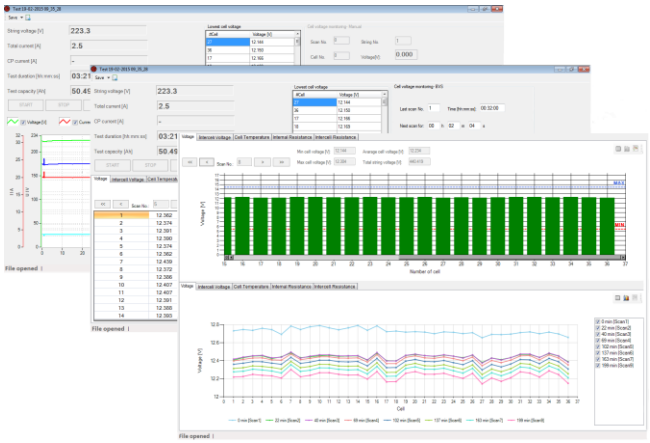
Options and features, including the main differences between BVR11/BVR20/BVR22 models, are presented in the table below.



	BVR11	BVR20	BVR22
CELL VOLTAGE MEASUREMENT	●	●	●
STRING VOLTAGE MEASUREMENT	●	○	●
AMBIENT TEMPERATURE MEASUREMENT	●	●	●
ELECTROLYTE TEMPERATURE MEASUREMENT	○	●	●
VOLTAGE MEASUREMENT RANGE	Cell / String voltage ± 30 V DC ± 500 V DC	Cell voltage ± 2,35 V DC ± 7 V DC ± 30 V DC	Intercell voltage / Current ± 30 mV DC ± 300 mV DC ± 1 V DC Cell / String Voltage ± 3 V DC ± 30 V DC ± 600 V DC
CURRENT MEASUREMENT	○	○	●
USB COMMUNICATION WITH PC	●	●	●
BLUETOOTH COMMUNICATION WITH PC	●	○	●
RFID STRING RECOGNITION	○	●	●
COMMUNICATION WITH EXTERNAL DENSITY METER	○	●	●

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.



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: 400 VA
- Fuse 5 A / 250 V, type F

Dimensions and Weights

Model	Dimensions	Weight
BLU500C (without acc.)	560 x 267 x 412 mm 22 x 10.5 x 16.2 in	17,0 kg 37.5 lbs.
CVM	66 x 28 mm x 139 mm 2.6 in x 1.1 in x 5.5 in	0,14 kg 0.3 lbs

Measurement

Internal voltage measurement

Type	Range	Resolution
Battery voltage	0 – 500 V DC	0,1 V
Cell voltage	± 30 V DC	1 mV
Intercell connection voltage	± 50 mV DC	1 µV
Temperature	-20 °C to +80 °C -4 °F to +176 °F	0,1 °C / °F

- Typical accuracy:
  - ±0,5% of reading ± 0,1 V (0 - 500 V DC)
  - ±50 mV DC: ± (1% rdg + 1% F.S)
  - ±1 V DC: ± (0,1% rdg + 0,1% F.S)
  - ±30 V DC: ± (0, 1% rdg + 0, 1% F.S)

Internal current measurement

Model	Range	Resolution
BLU500C	0 – 300 A DC	0,1 A

Current measurement

- Display range: 0 – 2 999,9 A DC
- Basic accuracy: ± (0,5 % of reading + 0,1 A)
- Resolution: 0,1 A

Time measurement

- Typical accuracy:
  ± 0,01 % of reading ± 1 digit

Input for current probe

- Range: 0 – 1 V DC
- mV/A ratio: Software settable values:
  0,3 to 100 mV/A
- Input impedance: > 1 MΩ

Communication with PC

- USB
- RS232 (optional)

Load section

- Battery voltage:
  5,25 – 500 V
- Power: 20 kW (max)
- Discharge modes:
  Constant current / power / resistance; current, power or resistance profile mode

Constant current (Const I)

Model	Range
BLU500C	1 – 220 A DC

Typical accuracy: ± (0,5 % of reading + 0,2 A)

- Resolution: 0,1 A
- Ripple: max 0,4 A peak

Constant resistance (Const R)

Model	Resistance
BLU500C	0,1 – 500 Ω

- Typical accuracy: ± 1%
- Resolution: 0,01 Ω

Constant power (Const P)

Model	Range	Resolution
BLU500C	0 – 20 kW*	0,01 kW

- Typical accuracy: ± (1% + 50 W)
- Ripple: max 0,2 kW

* Instrument maximum power derates at temperatures over +35˚C (+95˚F).

Warranty

- 3 years

Display

- 7 inch color touch screen display

Range / Resolution

- Current: 0 – 2 999,9 A DC / 0,1 A
- Voltage: 0 – 999,9 V DC / 0,1 V
- Capacity: 0 – 9999,9999 Ah / 0,0001 Ah
- Time: 00h:00m:00s - 24h:59m:59s / 1 sec

STOP parameters

- End voltage (total battery voltage)
- Capacity
- Test time

Environment conditions

- Operating temperature:
  -10 °C to +50 °C / 14 °F to +122 °F
- Storage & Transportation temperature:
  -40 °C to +70 °C / -40 °F to +158 °F
- Relative humidity: up to 95%, non-condensing
- Pollution degree: 2

Shock/Vibration/Fall

- Instrument: ETSI EN 300 019-2-7 class 7M2
- Instrument in transport case: ISTA 2A

Protection

- Thermal cut-outs and automatic overload protection
- Emergency Stop button
- Overcurrent, overheat and overvoltage protection

Available languages

- English, German, Franch, Spanish

Battery resistance measurement *

- Range / Resolution
  - 1,00 mΩ – 99,99 mΩ / 10 µΩ
  - 100,0 mΩ – 999,9 mΩ / 0,1 mΩ
  - 1000 mΩ - 5000 mΩ / 1 mΩ

* internal resistance measurement of the entire battery string according to IEC 60896

Current probe specifications

Current probe	Ranges	mV/A – ratio	Supply
Current clamp 30/300 A*	30 A	10 mV / A	From the instrument
	300 A	1 mV / A	

* current clamp 200/1000 A can be provided on request.

Encapsulation class / Ingress protections

- IP20

Applicable Standards

- IEEE 450-2010, IEEE 1188-2005, IEEE 1106-2015, IEC 60896-11, IEC 60896-22 and other relevant standards
- Safety
  - Low Voltage Directive:
    Directive 2014/35/EU (CE conform)
    Applicable standards, for a class I instrument, pollution degree 2, Installation category II: IEC EN 61010-1
- Electromagnetic Compatibility:
  - Directive 2014/30/EU (CE conform)
    Applicable standard: EN 61326-1
- 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



Sense cables with dolphin clips



Transport case



Canvas trans. case



Current clamp 30/300 A



Cable bag



Cable set for BLU-BXL simultaneous triggering



Communication cable



Cable for external alarm



CVM Module



Voltage sense cables with alligator clips

Order Info

Instrument	Article No
Battery Load Unit BLU500C	BLU30C-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 for BLU – medium size	HARD-CASE-BL

Recommended	Article No
Current cables 2 x 3 m 50 mm^2 (9.84 ft, 0 AWG) with alligator clamps (A4) isolated	C2-03-50VA4I
Cable bag	CABLE-BAG-00

Optional	Article No
Battery External Load Unit BXL-V	BXL400X-A-00
Cable set 2 x 2 m 1 mm^2 (6.56 ft, 17 AWG) for BLU-BXL simultaneous triggering	PO-02-01BPBP
Battery Voltage recorder BVR11 with accessories	BVR11X-NN-00
Battery Voltage recorder BVR20 with accessories	BVR20X-NN-00
Battery Voltage recorder BVR22 with accessories	BVR22X-NN-00
Extension cables 2 x 3 m 50 mm^2 (9.84 ft, 0 AWG)	E2-05-50VA3I
Sense cables 2 x 3 m (9.84 ft) with banana plugs + dolphin clip	S2-03-00BPDC
Sense cables 2 x 10 m (32.8 ft) with banana plugs + dolphin clip	S2-10-00BPDC
Current clamp 30/300 A power supplied from the instrument with extension 5 m (16.4 ft)	CACL-0300-06
Cable for external alarm	CABLE-EXA-05
Extension cable for external alarm 5 m (16.4 ft)	E1-EXABLU-05
Cable for BLU-BLU parallel operation 3 m (9.84 ft)	CP-03RJ45-00
Cable set 2 x 5 m 1 mm^2 (16.4 ft, 17 AWG) for BLU-BXL simultaneous triggering	PO-05-01BPBP
Voltage sense cables 2 x 0,5 m 1mm2 with banana plugs + alligator clips	S-005-01BPAC
Voltage sense cables 2 x 0,25 m 1mm2 with banana plugs + dolphin clips	S-025-01BPDC
Voltage sense cables 2 x 0,5 m 1mm2 with banana plugs + dolphin clips	S-005-01BPDC
Voltage sense cables 2 x 0,25 m 1mm2 with banana plugs	S-025-01BPBP
Voltage sense cables 2 x 0,5 m 1mm2 with banana plugs	S-005-01BPBP
Sense cables 2 x 5 m with banana plugs + dolphin clip	S2-05-00BPDC
Current clamp 30/300 A with internal battery supply and extension 5 m	CACL-0300-08
Cable bag	CABLE-BAG-00
Rechargeable NiMH battery 8,4 V 300 mAh for current clamps	RCGB-30084-0
Battery charger 2 x 9 V for NiMH/NiCd batteries	BATCH-2X9V-0

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