BLU-D Series

Battery Load Unit

- Voltage range: 0 - 1350 V DC
- Discharge power - up to 40 kW
- Full battery discharge (to 0 V) prior recycling
- Temperature controlled discharge process
- Li battery discharge before transport
- Real-time test parameters monitoring on 7 inch touch screen display
- Enables testing batteries while in service
- USB, RS232 or Ethernet communication with PC

Description

DV Power BLU-D Series of Battery Capacity Testers 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 1350 V DC**.

BLU-D Series simplifies battery testing in multiple ways. The instrument provides monitoring of discharge parameters (grap<hical 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) with BVS system, which makes it a complete stand-alone discharge test system.

Besides the capacity test, BLU-D Series can be used to completely and efficiently discharge a battery down to 0 V. Such total discharge is applied to Li cells at the end of their lifetime, as the initial step of the **recycling process**.

BLU-D Series includes **3 models:**

- BLU1000D (up to 1000 V DC)
- BLU1000DZ (up to 1000 V DC with built-in ZVD module)
- BLU1350D (up to 1350 V DC)

All models provides all features and options of the BLU-C Series, including discharge down to 0 V. The difference is related to the battery discharge below 5 V:

BLU1000D & BLU1350D will discharge the battery by selecting minimum resistance (and current will decrease as the voltage decrease).

BLU1000DZ, having built-in Zero Voltage Discharge (ZVD) module, **provides constant current discharge (up to 50 A) down to 0 V**.

Transport of Li battery systems, due to safety reasons, requires batteries to be partially discharged. BLU-D Series provides special discharge mode enabling batteries to be discharged to customer predefined voltage level.

Application

BLU-D Series typical application is measuring the capacity of batteries up to 1350 V DC.
Due to such high maximum operating voltage, any substation, industrial, UPS or EV battery can be tested.
Furthermore, BLU-D can be used to:

- Full discharge (down to 0 V) of any battery up to 1350 V DC prior recycling
- Monitor cell / intercell voltages during capacity / full discharge tests
- Discharge a battery before transport
- Provides temperature controlled discharge process (by measuring ambient / cell temperatures)

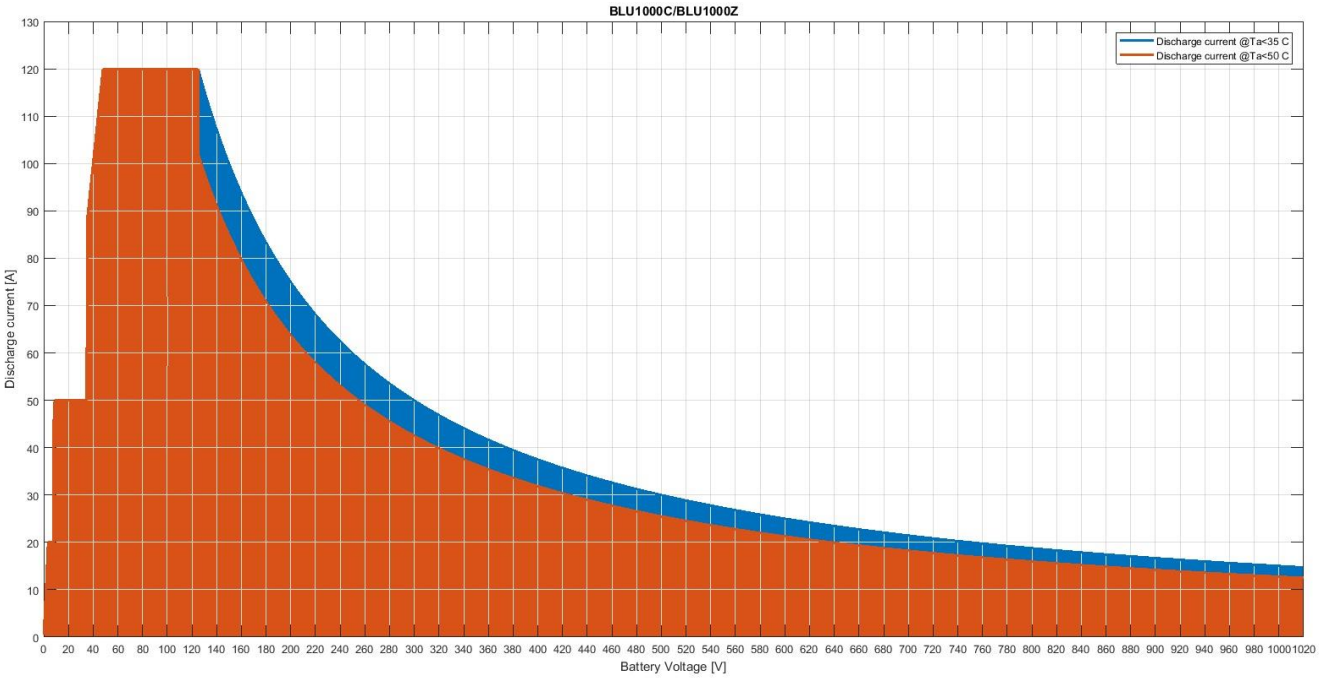
Capacity test

Using a BLU-D Series device, the capacity test is performed in an accordance to actual standards for battery testing (IEEE 450-2010 / IEEE 1188-2005 / IEEE 1106-2015, IEC 60896-11/22 and other relevant standards).

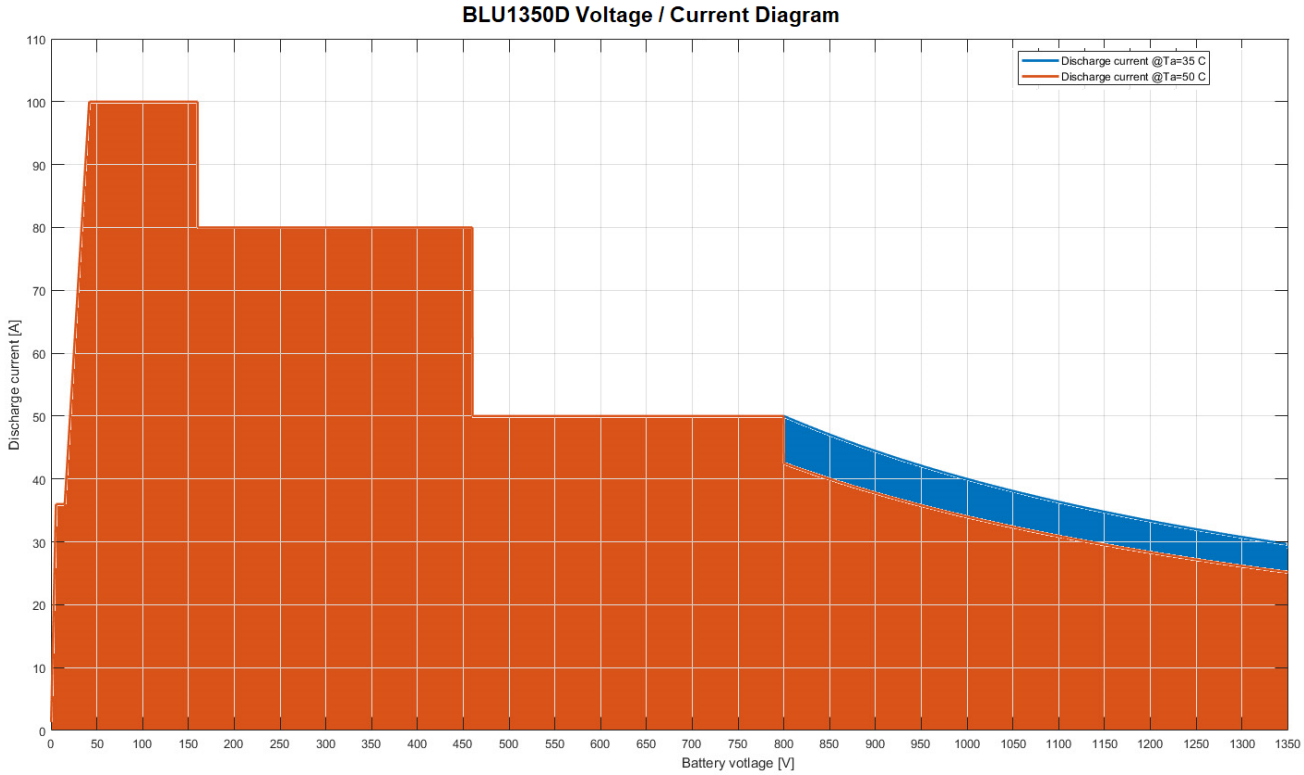
Discharging can be performed at constant current, constant power, constant resistance, constant voltage or in accordance with a pre-selected load profile. The discharge test can be carried out on online batteries as well (connected to its load). By measuring the total or load current by a DC probe, BLU-D enables keeping the total current / power constant during the test.

When a required discharge current or power exceeds the capacity of a single BLU-D device, several same-model BLU-D devices can be connected in parallel.

BLU1000D & **BLU1000DZ** have identical discharge capabilities. Units provide maximum power (15 kW) on wide voltage range (125 – 1020 V DC). Maximum discharge currents (up to 120 A), in relation to the battery voltage, are presented on the graph below.
Maximum discharge power derates at ambient temperatures over 35 °C (up to 50 °C), as indicated by the blue area on the graph.



BLU1350D provides maximum power (40 kW) on wide voltage range (800 – 1350 V DC). Maximum discharge currents (up to 100 A), in relation to the battery voltage, are presented on the graph below. Maximum discharge power derates at ambient temperatures over 35°C (up to 50°C), as indicated by the blue area on the graph.



Battery recycling

BLU-D supports recycling, the battery waste management strategy for green energy. The initial step of the recycling process is a full battery discharge.

With built-in (BLU1000DZ) or external ZVD module (BLU1000D or BLU1350D), BLU-D units provide efficient, controlled and complete battery discharge down to 0 V, which is applied to Li cells at the end of their lifetime. Wide voltage range (up to 1350 V) makes the unit applicable to any available battery system, including EV batteries. During the discharge, BLU-D models can monitor ambient as well as cell/module temperatures, enabling safe discharge process.

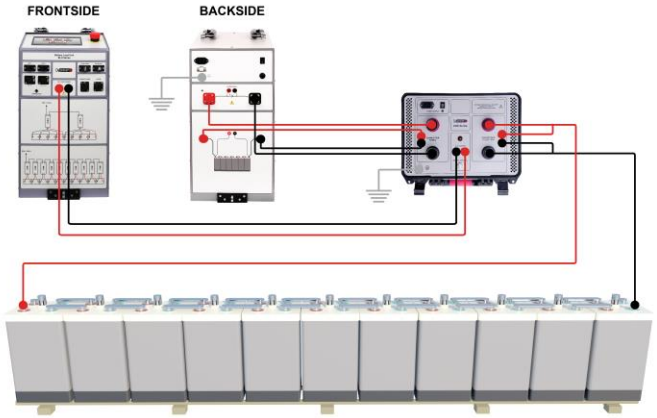
BLU-D + ZVD for Total Discharge

Zero Voltage Discharge Module ZVD is specially designed external module enabling full battery discharge (down to 0 V) required before recycling. It is designed to operate in a system with BLU-D providing total discharge of batteries with voltage up to 1350 V DC.

The total battery discharge is required in the battery recycling process. It is important to discharge a battery completely before entering the recycling process, because the battery can contain some remanent energy.

That remanent energy can be dangerous and create problems during the disassembling of a battery or even during its transportation. In order to prevent that, we created the ZVD Series enabling a full battery discharge.

A single discharge down to 0 V will not extract all the energy from the battery. Once the discharge is finished, battery voltage will rise to some non-zero value, confirming there is still energy in the battery. The phenomenon is called the battery voltage rebound.



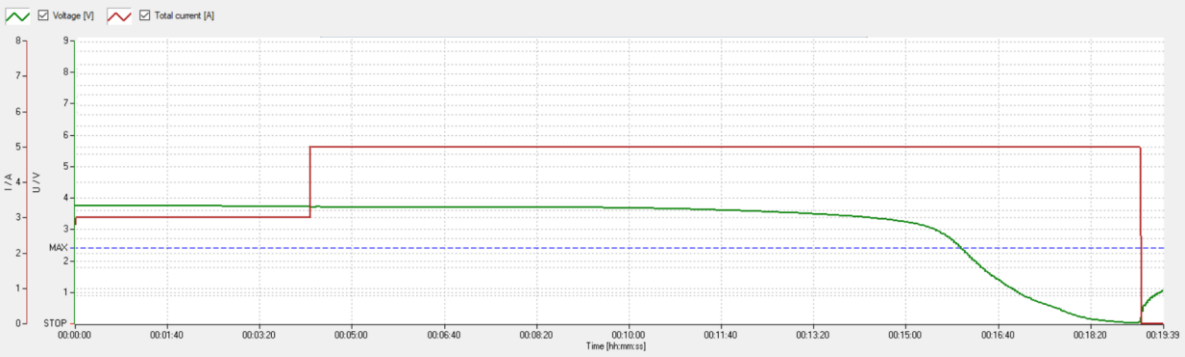
BLU-D & ZVD system improves the discharge process by discharging the battery in 2 steps:

Step 1: Efficient (up to 60 A) and controlled (current is constant down till 0 V is reached) discharge until battery voltage drops to 0 V.

Step 2: ZVD short-circuits the battery to remove the remaining energy.

Benefits and Features of BLU-D & ZVD system

- Efficient total battery discharge down to 0 V required before recycling
- Applicable to any battery type: Lead-acid, Ni-Cd, Li-based etc.
- Efficient constant current discharge (up to 50 A) down to 0 V
- Universal models applicable to up to 1350 V DC
- Discharge current can be modified during the discharge
- Test can be controlled from device interface or PC DV-B Win software. When controlled from device interface, test result will be saved in the BLU-C internal memory and can be downloaded to a USB and transferred to a PC for analysis and report generation. Key test parameters (battery voltage, current, elaped time, etc) will be presented in graphical and numerical form.



Battery discharge before transport

Transport of Li battery systems, due to safety reasons, requires batteries to be discharged down to 30% of their state of charge (SOC). BLU-D Series provides special discharge mode (*constant voltage mode*) enabling batteries to be discharged to customer predefined voltage level. The battery will be discharged by constant current until the preset voltage is reached. After reaching preset voltage, discharge continues at that voltage and the discharge current starts to decrease. The test will be stopped when discharge current decrease to the preset value.
A single discharge down to 0 V will not extract all the energy. As the discharge is finished, battery voltage will rise to some non-zero value.

BLU-D system (with built-in or external ZVD) improves the discharge process by discharging the battery in 2 steps:

Step 1: Efficient (up to 50 A) and controlled (current constant discharge) process until battery voltage drops to 0 V.

Step 2: ZVD short-circuits the battery to remove the remaining energy.

Remote Control Feature

The discharge test on BLU-D units can be stopped externally. A BLU-D unit can have built-in dry or wet contact (depending on customer preferences), which can be used to stop the discharge when certain conditions are fulfilled.

If the dry-type contact is provided, changing the external circuit from close to open or from open to close, will signal the unit to terminate the test.

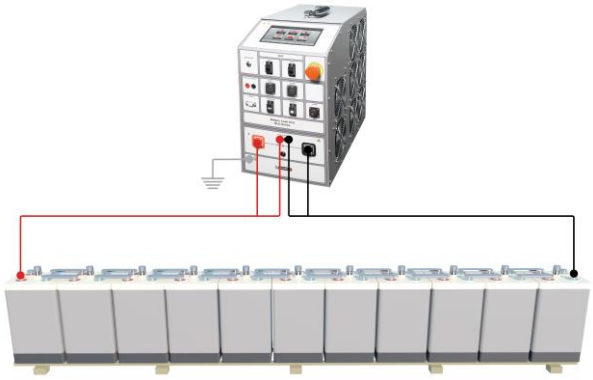
If the wet-type contact is provided, applying or cutting-off the voltage will signal the unit to terminate the discharge.

This feature enables automatic abortion of the discharge process when external systems detect and signal unregular conditions. For example, temperature increase detected by a monitoring system or **thermal camera** will stop the test and avoid safety issues.

Connecting BLU-D to Battery

Single mode

The BLU-D 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. The BLU-D 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 current / power exceeds the capacity of a single BLU-D device, several (up to ten) same-model BLU-D devices can be connected in parallel.
Connection between BLU-D 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 other units should be set as SLAVE units. All units connected (Master + up to ten Slave units) will discharge the battery equaly – all units will be loaded with identical discharge current / power during the test.

Benefits and Features

- Battery capacity measurement by conducting a discharge test
- Full battery discharge (down to 0 V) prior recycling
- Li battery discharge before transport (to preselected voltage)
- Temperature controlled discharge process
- *Constant I*, *Constant P*, *Constant R, Constant U* 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
- Remote Control feature: via built-in dry or wet contact, the test can be externally aborted.
- Enables testing batteries while in service
- Test resume feature in case of interrupted power supply

1 - Display - 7'' color touch screen display

2 – Ambient Temperature Measurement

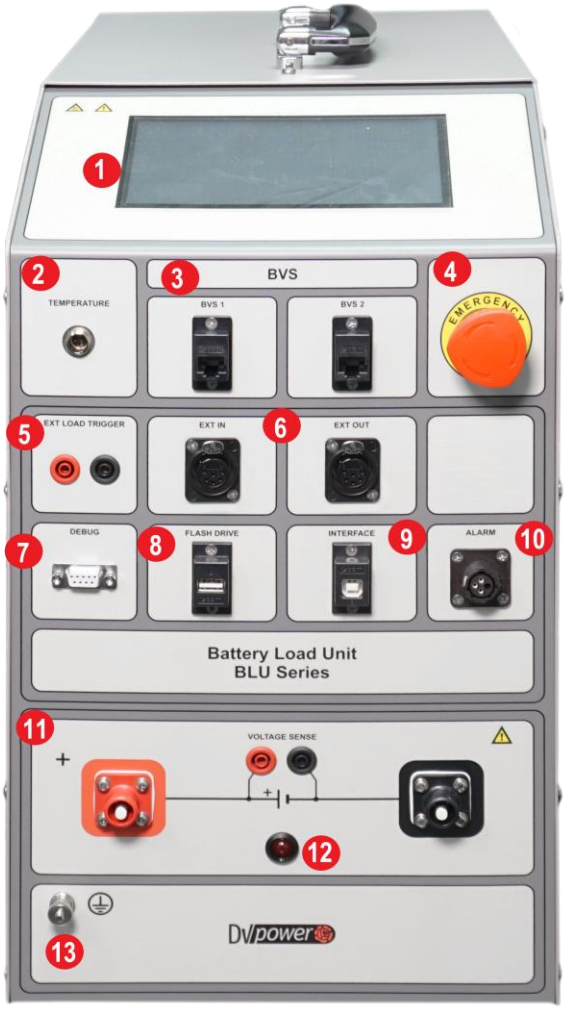
3 – Connection for BVS system *for cell voltage / cell temperature / intercell voltage measurement*

5 - ***External Load trigger*** - used for triggering BXL external load units

7 – Debug *– service port*

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

13 - ***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 - External input (EXT IN) and external output (EXT OUT) used for parallel operation OF BLU1000 units

9 - ***Interface*** *– USB, RS232 or Ethernet communication with a PC*

10 - ***Alarm output*** *or* ***Remote Control***

11 - ***Current and Voltage terminals*** - current and voltage test cable terminals

12 – ZVD activation indication LED *(BLU1000DZ only)*

Cell Voltage Measurement Feature

Combining BLU-D and BVR22

Battery Voltage Recorder Series BVR22 is a lightweight, user-friendly, rechargeable handheld device intended for individual battery cell voltage and temperature measurement while the battery is either in online or offline mode. When used in a system with the BLU-D device it serves as an efficient supplement to the battery capacity testing.

Options and features of the BVR22 model areresented in the table below.

Parameters Measured

- String and cell voltage, cell (electrolyte)/ambient temperature, DC current measurement using current clamps.
- Simultaneous string voltage and DC current measurement
- Bluetooth communication with external Density Meter

Measurement range

- String / Cell Voltage: ± 600 V DC
- Current / Intercell voltage: ± 1 V DC

Data Transfer: Bluetooth and USB to PC

Combining BLU-D and BVS

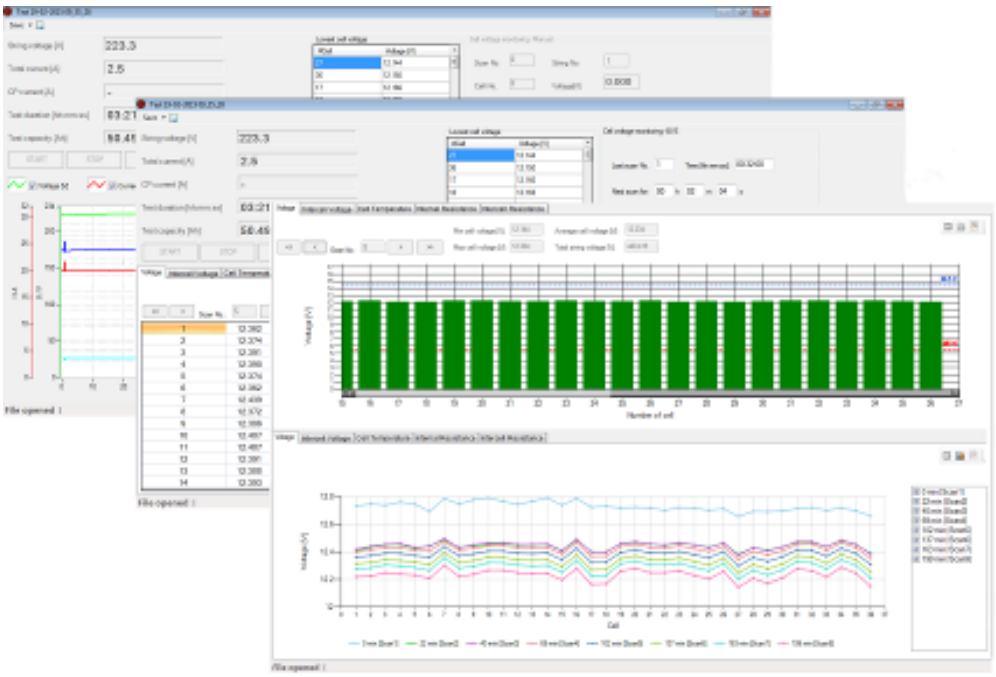
DV Power battery voltage supervisor – BVS, is an accurate battery voltage monitoring system that monitors the state of health of battery systems. It records important battery parameters such as battery voltage, inter-cell connection voltage, and ambient temperature. Because of that, it can be a support tool for BLU-D during capacity testing. There are two types of DV Power battery voltage supervisors:

- BVS – One cell voltage module measures 1 cell
- BVS-4 – One cell voltage module measures 4 cells

Series	BVS	BVS-4
Picture		
No. of Measured Cells	One module measures one cell	One module measures four cells
Inter-cell Connection Voltage	✓	✗
Cell Temperature	YES (one temperature channel per cell)	YES (one temperature channel per 4 cells)
Ambient Temperature	✓	✓

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 controlled, performed and observed from a PC (or notebook), and the results can be saved directly on a PC (or notebook). Communication between the BLU and a PC (or notebook) 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

Dimensions and Weights

Model	Dimensions	Weight
BLU1000D (without acc.)	520 x 260 x 436 mm 20.5 x 10.2 x 17.1 in	23,8 kg 52.5 lbs
BLU1000DZ (without acc.)		24,8 kg 54.7 lbs
BLU1350D (without acc.)	590 x 280 x 600 mm 23.2 x 11.0 x 23.6 in	30,0 kg 66.1 lbs.

Measurement

Internal current measurement

Model	Range	Resolution
BLU1000D & BLU1000DZ	0 – 200 A DC	0,1 A
BLU1350D	0 – 100 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

Internal voltage measurement & accuracy

Model	Range	Res.
BLU1000D & BLU1000DZ	0 – 1020 V DC	0,1 V
BLU1350D	0 – 1350 V DC	0,1 V

- Accuracy: ±0,5% of reading ± 0,1 V

Time measurement

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

Display

Size

- 7 inch color touch screen display

Range / Resolution

- Current: 0 – 2 999,9 A DC / 0,1 A
- Voltage: 0 – 1 999,9 V DC / 0,1 V
- Capacity: 0 – 9 999,9 Ah / 0,1 Ah
- Time: 00h:00m:00s - 23h:59m:59s / 1 sec

Input for current probe

- Range: 0 – 1 V DC
- Input impedance: > 1 MΩ

Communication

- USB
- RS232 (optional)
- Ethernet (optional)

Load section

- Battery voltage
  0,0 – 1350 V
- Power:
  0 – 15 kW (BLU1000D, BLU1000DZ)
  0 – 40 kW (BLU1350D)
- Discharge modes:
  Constant current / power / resistance / voltage; current, power or resistance profile mode

Available languages

- English, German, Italian, Polish, Croatian

STOP parameters

- Battery voltage
- Capacity
- Test time

Environment conditions

- Operating temperature:
  0 °C to +50 °C / 32 °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

Warranty

- 3 years + additional 1 (one) year upon registration on DV Power official website (www.dv-power.com).

Protection

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

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	

* 1 000 A current clamp 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
- Electromagnetic Compatibility:
  - Directive 2014/30/EU (CE conform)
    Applicable standard: EN 61326-1
- CAN/CSA-C22.2 No. 61010-1
- 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

All specifications herein are valid at ambient temperature of + 25 °C /+ 77°F and recommended accessories.
The company reserves the right to change the specification or design without prior notice.

Accessories

Current cables

Extension cables

Sense cables with dolphin clips

Current clamp 30/300 A

Cell Voltage Module CVM-4

Cable bag

Transport case for BLU1000D & BLU1000DZ

Transport case for BLU1350D

Order Info

Instrument	Article No
Battery Load Unit BLU1000D	BLU1000-D-01
Battery Load Unit BLU1000DZ	BLU1000-Z-01
Battery Load Unit BLU1350D	BLU1350-D-01

Included accessories
Windows based DV-B Win PC software including USB cable
Mains Power cable
Ground (PE) cable
Transport case with wheels

Standard accessories	Article No
Current cables 2 x 3 m* 25 mm2 (9.84 ft, 4 AWG) with alligator clamps (A4) isolated *for BLU1000D and BLU1350D*	C2-03-25SL4I
Current cables 2 x 3 m* 25 mm2 (9.84 ft, 4 AWG) and sense cables 2 x 3 m* with alligator clamps (A4) isolated *for BLU1000DZ*	CS-03-25SL4I
Cable bag	CABLE-BAG-00

Optional accessories	Article No
Battery Voltage Recorder BVR22	BVR22X-NN-00
Current cables 2 x XX m XX mm^2 with alligator clamps (A4)	C2-xx-xxSL4I
Current cables 2 x XX m 25 mm2 (XX ft, 4 AWG) and sense cables 2 x XX m with alligator clamps (A4) isolated	CS-xx-254I
Extension current cables 2 x XX m XX mm^2 (xx ft, xx AWG)	E2-xx-xxVA3I
Sense cables 2 x XX m (XX ft) with banana plugs + dolphin clip	S2-xx-00BPDC
Current clamp 30/300 A power supplied from the instrument	CACL-0300-06
Current clamp 1000 A with internal battery supply and adapter	CACL-1002-02
Cell Voltage Module CVM	BVS-CVMNC-00
Cell Voltage Module CVM-4	BVS-CVM4N-00
Communication cable for CVM connection 1 x XX m	C1-xxxx-RJRJ
Voltage sense cable set 2 x XX m, 2 x XX m and 1 x XX m for CVM-4 with banana plugs + dolphin clip	Sxxx-00NN-DC
Voltage sense cable set 2 x XX m, 1 mm2 with banana plugs + dolphin clip	S-xxx-01BPDC
Cable for external alarm	CABLE-EXA-05
Cable for BLU-BLU parallel operation 3 m (9.84 ft)	CP-0003N6-00
PT100 temperature indicator	TI-000-PT100
Plastic transport case for CVM (max. 50 pcs)	PLST-CAS-BV2
Plastic transport case for CVM modules (max. 15 pcs) and accessories	PLST-CAS-BV3
Cable plastic case	CABLE-CAS-0x *

Standard accessories include 3 m cables. Longer cables can be provided on request.

Contact

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