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BTS200 MKII

BATTERY TEST SET

REVISIONS			SUMMARY	VISA
N.	**PAG.**	**DATE**		
1	All	23/10/2012	Issued	Lodi
2	8	27/03/2013	Corrected the discharging current at 220 V	Lodi

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1 GENERAL DESCRIPTION

This technical specification is to describe the technical characteristics of the battery test set BTS200 MKII, designed for the test of battery benches using the discharge method. This testing device can discharge the battery in different modes, to measure the capacity of new and used battery. With respect to the former BTS200, the MKII uses a technological improvement, that has allowed to reduce weight and dimensions.

BTS200 MKII allows the connection to up to nine auxiliary modules type ELU200 MKII (or ELU200, or other BTS200 MKII, or other BTS200), that enhance the discharging capability. With the optional current clamp, or with the external shunt, it is also possible to use the real burden as the additional burden, and to control the total discharging current in the selected mode.

The device is microprocessor based. This allows the control of all the discharging parameters in real time. It also allows communication with a PC for the control and the data representation of the discharging parameters. The following is the test set picture.

With respect to the former version, MKII features the following improvements.
- The weight has been decreased of 9 kg, from 48 kg to 39 kg.
- Dimensions have been reduced, from 283 x 803 x 420 mm (WDH) to 283 x 700 x 420 mm.
- Two wheels have been added, to ease the transport.
- The number of discharging steps that can be programmed have been increased from 10 to 20: this eases drawing any discharge profile.

- In addition to the external clamp, the external burden current can now be measured also with a shunt.
- If a test is interrupted, for instance because of a faulty contact or cell, after the repair it is possible to continue the test: this was not possible with the former device.
- The test set firmware can be upgraded with a supplied software.

2 APPLICABLE STANDARDS

The test set conforms to the EEC directives regarding Electromagnetic Compatibility and Low Voltage instruments.

2.1 Electromagnetic Compatibility

Directive no. 2004/108/EC. Applicable Standard : EN61326-1 + A1 + A2.
EMISSION
- EN61000-3-2: harmonic content induced into the power supply: class A.
- EN 61000-3-3: Limitation of voltage fluctuations and flicker. Acceptable limits: basic.
- CISPR16 (EN 55011 class A): Limits and measurement methods of radio-electric disturbances for industrial, medical and scientific instruments at radio-electric frequencies.
Acceptable limits for conducted emission:
. 0.15-0.5 MHz: 79 dB pk; 66 dB avg.
. 0.5-5 MHz: 73 dB pk; 60 dB avg.
. 5-30 MHz: 73 dB pk; 60 dB avg.
Acceptable limits for radiated emission:
. 30-230 MHz: 40 dB (30 m)
. 230-1000 MHz: 47 dB (30 m)
IMMUNITY
- EN 61000-4-2: Immunity tests for ESD. Test values: 8 kV in air; 4 kV in contact.
- EN 61000-4-3; Immunity tests for radio frequency interference. Test values (f= 900 ± 5 MHz): field 10 V/m, modulated AM 80%; 1 kHz
- EN 61000-4-4; Immunity tests for high speed transients (burst). Test values: 2 kV peak; 5/50 ns.
- EN 61000-4-5; Immunity tests for surge. Test values: 1 kV peak differential mode; 2 kV peak common mode; 1.2/50 us.
- EN 61000-4-6: immunity to low-voltage sinusoidal waveform. Test values: 0.15-80 MHz, 3 Vrms, 80% AM 1 kHz.
- EN 61000-4-8: Immunity tests for low frequency magnetic fields. Test values: 30 Arms/m.
- EN 61000-4-11: Immunity test for power supply drops. Test value: 1 cycle; 100% drop.

2.2 Low voltage directive

- Directive n. 2006/95/EC.
Applicable standards, for a class I instrument, pollution degree 2, Installation category II: CEI EN 61010-1. In particular:
- Dielectric Rigidity: 1.4 kV, 1 minute.
- Isolation resistance: > 100 Mohm @ 500 V DC.
- Earth resistance : < 0.1 Ohm.
- Dispersion current: < 5 mA.
- Inputs/outputs protection: IP 20 - IEC 60529.
- Acoustic noise: < 75 dB, at full power.
- Operating temperature: 0 - 40°C; storage: -25°C to 70°C.
- Relative humidity : 5 - 95%, not condensing.
- Vibration: IEC 68-2-6 (20 m/s^2 at 10 – 150 Hz);
- Shock: IEC 68-2-27 (15 g; 11 ms; half-sine).
- Altitude: less than 2000 m.

3 PERFORMANCE SUMMARY

3.1 Introduction

BTS200 MKII can discharge batteries with different nominal voltages, from 24 V to 240 V DC. The discharging current can be up to 130 A for voltages of 24 to 120 V DC nominal, and up to 70 A for 220 to 240 V. It is possible to use in parallel up to 10 BTS200 MKII, thus arriving up to 1300 A for voltages of 24 to 120 V DC nominal, and up to 700 A for 220 to 240 V.

The use of BTS200 MKII is very simple:
- Connect the cables to the battery to be discharged;
- Power-on BTS200 MKII;
- Choose the memory area where to save the test data;
- Program the discharging current (or power);
- Program the maximum discharge duration;
- Program the minimum battery voltage;
- Program the Ah to be discharged;
- Press START.

During the discharge actual parameters are displayed on the graphic screen; all the measured parameters are saved into the selected memory. It is also possible to connect BTS200 MKII to a PC with TDMS: this allows to have on the PC display the discharging diagram.

Via PC, it is possible to download a current sequence with up to 20 steps, each step being programmable in current and duration. This enables simulating a typical current profile encountered during the day.

If, during the discharge, any of the programmed limits is trespassed, the test is immediately stopped, and the alarm contact closed.

Once the test is finished it is possible to watch the discharging current and voltage on the display, or to download the test result to the PC.

The selection of discharging parameters is performed using the encoder with confirmation switch, and the graphic display. The operation is menu driven: turning the encoder knob it is possible to select the desired operation; pressing it the selection is confirmed.

Optionally, it is possible to leave an external load connected to the battery under test. In this situation, the externally discharged current will be measured by means of a DC current probe or by a shunt: BTS200 MKII takes into account this current, and ensures that the total discharging current is the programmed one.

The device is equipped with an emergency pushbutton, located on the front. When pressed, it stops all the BTS200 MKII activities. The pushbutton is mechanically self-locking: the operator has to rotate it in order to reset the normal operation.

The device can be powered by the battery under test itself, for batteries with a nominal voltage of 220 or 240 V; else, on the front is provided a power supply plug for a wide range AC supply.

3.2 Specification

PARAMETER	VALUE
A) HARDWARE	
Maximum number of paralleling test sets	10: 1 master, 9 slave
Absolute maximum battery voltage	270 V
Minimum battery voltage	18 V
Maximum power that can be discharged (one module)	16 kW
Maximum power that can be discharged (10 modules)	160 kW
Max discharging current from 24 V DC to 120 V DC (one module)	130A
Max discharging current from 24V DC to 120 V DC (ten modules)	1300A
Max discharging current from 220 V DC to 240 V DC (one module)	70 A
Max discharging current from 220 V DC to 240 V DC (ten modules)	700 A
Discharging modes: constant current; constant power; current profile; manual adjustment	4
Discharging power resolution	100 W
Nominal battery ranges	24, 48, 110, 240 V DC
Battery range setting	Automatic, on 4 ranges, as test starts
24 V range limits	20 to 34 V DC
48 V range limits	34 to 60 V DC
72 V range limits	60 to 84 V DC
110/120 V range limits	84 to 140 V DC
240 V range limits	140 to 270 V DC
Maximum starting voltages on the 24 V range	20 to 35 V DC
Maximum starting voltages on the 48 V range	34 to 65 V DC
Maximum starting voltages on the 72 V range	58 to 97 V DC
Maximum starting voltages on the 110 V range	84 to 140 V DC
Maximum starting voltages on the 240 V range	169 to 270 V DC
Battery voltage measurement resolution	$\pm$ 0.1 V DC
Battery voltage measurement accuracy	$\pm$ 1% of the maximum range = 2.7 V
Battery current measurement resolution (direct and clip-on CT)	1 A
Battery current measurement accuracy	$\pm$ 1% of the maximum range = 1.3 A, starting from 15 A
V and I measurements refresh period	15 s
Time measurement resolution	1 s
External clip-on CT conversion factor range (programmable)	1 to 500 mV. NOTE: the 1 mV range is to be used for currents greater than 400 A.
External shunt voltage input	1 to 60 mV
External clip-on CT or shunt accuracy	$\pm$ 2%
Audible end of test alarm buzzer	5 tones
Alarm output contact	1 SPDT
Display type	Graphic 128 x 64 points
Display backlight	YES

PARAMETER	VALUE
Operator interface	Encoder with push-button
Test start	ON-OFF pushbutton
Test stop from a remote contact	YES
Alarms	10-segments LED bar with current and alarms Test system LED
Date and time	Yes, with back-up battery
PC communication	USB 2.0 interface
Paralleling interconnection	2 connectors: in-out
Paralleling interconnection cable type	CAN bus; RJ11 connector
Paralleling address selection	By rotary switch
Power supply modes: Mode 1: from the battery being discharged; Mode 2: from an AC voltage supply; Mode 3: from an external DC voltage supply.	3 ways: . 100 to 240 V DC . 100 to 240 V AC, 50 to 60 Hz . 100 to 270 V DC
Power supply mode selection	By switch
Power from the supply	. 10 W in stand-by; . 150 W during the discharge.
Emergency push-button	Independent from the microprocessors
Thermal protection	Independent from the microprocessors
Dimensions	283 x 700 x 420 mm (WDH)
Weight	39 kg, without transport case.
Transport wheels	YES
Transport case dimension	330 x 900 x 600 mm (WDH)
Transport case weight	16 Kg
Provided with:	- USB connection cable, 2 m; - RJ11 connection cable, 2 m; - Battery discharge cable pair with crocodiles; - Power supply cable, 2 m; - TDMS software

NOTES:

1. The above specified current and power ranges apply when the ambient temperature is 25 °C or less. For higher temperatures, apply a de-rating factor of – 1 A/°C for the current; for the power, it is the product of the voltage by the current scaling factor.

2. The absolute maximum ambient tempperature for full power operation is 40 °C.

3. The test set cannot operate with a direct sun exposition, or located nearby an heat source.

4. The test set generates very hot air, both above and on the rear: don't touch it until the automatic cooling down procedure is completed.

PERFORMANCE	CHARACTERISTICS
B) RESIDENT FIRMWARE	
Test settings	Recorded in a NVM
Number of memories	8
Maximum test duration that can be recorded	15 h, with 15 s resolution
Maximum test duration, not recorded in memory	infinite
Memory profile mode: maximum number of test steps	20
Memory profile mode: time and current resolution	1 minute – 1 A
Memory profile mode: maximum time and current steps	600 minutes – 1300 A
Test set control mode	Via encoder + push-button and menu on the display
Measurements on the display	. Date; . Time; . Internal discharge current; . External discharge current; . Battery voltage; . Ah discharged; . Elapsed test time.
Test stop settings	. Minimum voltage; . Maximum Ah; . Maximum test time; . System alarms; . Test stop from remote contact.
Continue after an alarm	YES
Firmware upgrade	YES
System control	Digital, by two microprocessors
Test set protections	. Heat sink over-temperature; . Fuse failure; . Fans failure; . Minimum battery voltage; . Maximum battery voltage; . Wrong battery voltage; . Overload; . Control circuit error; . Power circuits failure; . CAN-bus error; . External current metering error; . Manual emergency pressed; . USB interface error; . EEPROM memory error; . Firmware error.
Reversed battery insertion protection	YES
Automatic cool down procedure at end of test	YES

PERFORMANCE	CHARACTERISTICS
C) TDMS SOFTWARE	
Create, save, upload test plans	
Edit test profiles	Current discharge profile: diagram, table
Upload test profiles	
Download test results	Input reference data, save, recall
Examine test results	Result diagram, table of values Zoom in-out Cursors
Print test results	Printer editor capability Customized report creation
Results and settings data base	Integrated in the TDMS Substation data base

PERFORMANCE	CHARACTERISTICS	CODE
D) OPTIONS		
Transport case, with wheels	Dimensions: 330 x 900 x 600 mm; weight 16 kg.	PII18167
DC current clamp	Ranges: 40 A DC (10 mV/A) and 400 A DC (1 mV/A). Accuracy: 1.5% up to 40 A; 2% up to 400 A. Maximum conductor diameter: 30 mm.	PII12167
ELU200 MKII	Same as BTS200 MKII, without the local control	PII21167

The following table lists a number of different types of batteries, the discharge current and the discharge power that can be programmed. The value chosen for the Ah capacity is just a reference one: test current can be scaled to the actual capacity.

NOMINAL BATTERY VOLTAGE V	NOMINAL CAPACITY Ah	CONSTANT CURRENT A	CONSTANT POWER kW	TEST DURATION h	DISCH. CAPACITY Ah	END OF TEST VOLTAGE V
24	500	50	1	10	500	20
48	500	50	2	10	500	40
110	500	50	4.7	10	500	94
120	500	50	5.1	10	500	102
220	500	50	9.4	10	500	188
240	500	50	10.2	10	500	204