GAUS STARTER BATTERY CAPACITY TESTER GSBCT25A12V

DESCRIPTION AND USER MANUAL

Belgrade, April 2018.

1. TABLE of CONTEST

2. GAUS DISCHARGE TESTER GSBCT25A12V

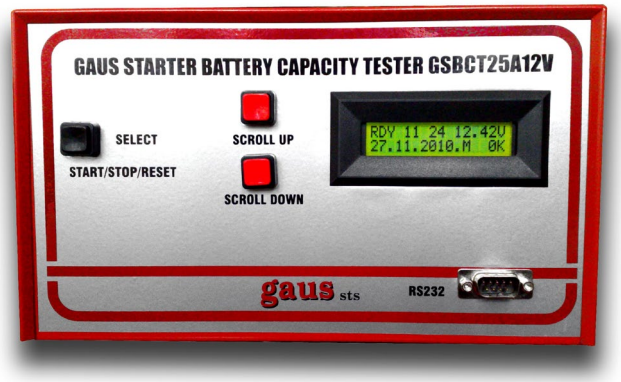
GSBCT25A12V (GSBCT) is microprocessor device for capacity testing lead-acid 6V and 12V batteries with nominal capacity up to 250Ah (C10) or 500Ah (C20). It is developed as a consequence of need for small, easy for use, safe, reliable and relatively cheep device for servicing and maintenance of starter and industrial batteries. GSBCT25A12V is dissipative discharger with fine regulation of testing current. It can be used for testing 20 hours capacity C-20 (I=Cn/20, 1.75V per cell) or for reserve capacity testing Rc (I=25A, 1.75V per cell). Discharging current is setting according to battery nominal capacity and test type. It measures, regulates and shows current, voltage, duration and discharged capacity in each second of test. LCD display shows the test flowing and results are stored in flash memory. With **Software for GSBCT25A12V** it is possible to connect device with PC computer via RS232 serial port. Software gives opportunity of showing discharge graphs (testing) in real time, possibility of reading discharge data in case that device wasn't connected with PC, printing and storing the results, creating reports etc. GSBCT has real time clock RTC with calendar and backup battery. It has a great amount of internal flash memory for storing test results and many precaution measures are implemented. Also, measuring of battery voltage is differential by measuring cables; device has analog-digital 12bit regulation.

As device is microprocessor, with measuring current, voltage, duration, Ah, temperature of heat sink of semiconductor parts, it is possible to implement different algorithms. It is possible to change voltage and current limits, conditioning of discharge characteristic, pausing, waiting for event (measuring Ah during discharge), conditioning end of discharging (duration, Ah...), connection with PC computer, analyze and printing discharge graphs etc.

Energy circuit is made of mosfet transistors (International Rectifier IR) and power resistor.

In a case of main power failure during charge, after it's returning device automatically continues charging with parameters, which were previously set (before power failure). LCD display with 2x16 characters shows values of current, voltage, time, capacity, device status, warnings, alarms etc. There are more than 10 menus for setting the parameters of discharging. Device is placed in red steel box with PVC distancers and handle. Buttons *start/stop/reset/select*, *scroll up* and *scroll down* and connector for communication with PC computer are placed on the device front panel. Energy cables connectors, power supply cable, main switch and main fuse in AC circuit are on the back panel of device.

Gaus Discharger GSBCT25A12V has following protections:



1. No sparks during connecting or disconnecting plugs from battery in discharge operation;
2. Forced temperature controlled air cooling;
3. Control of a minimum of allowed connected battery voltage (forbidden start for voltages less than 0.5V/Cell);
4. Temperature protection on heat-sink of semiconductor energy components;
5. In case of main power failure, after its restoring, charging automatically continues with earlier set parameters;
6. Slow fuse T1.6A 20 mm in AC circuit;
7. Slow fuse 30A in DC circuit;
8. Short circuit protection (if detected current is more than 30A charger is automatically turned off);
9. Over voltage protection (>18V);
10. Protection from plugs (cables) falling during charge (freezing device until solving of problem);
11. Reverse polarity protection with forbidden start.

3. TECHNICAL SPECIFICATIONS

-Type of voltage converter: dissipative transistor-resistor discharger with analogue-digital regulation of discharging current (12 bit D/A converter);
-Supply 230V +/- 10%, 50Hz 30W
-Nominal input current: 0.5A
-Instruments: LCD display 2x16 characters, ampermeter 0-50.00A, voltmeter 0-20.00V
-Cables with Pb plugs: l=2m, S=6mm2
-Ambient temperature: 5 do +40ºC

Discharge current	0.5-25A, Cn/20 (250Ah), step 0.1A
Battery type	Un: 6V and 12V; Cn from 10Ah to 250Ah (500Ah C20)
Discharging voltage range	from 4V to 18V until 1.75V per cell (min. 1.5V/Cell)
Accuracy	Better than 3%
Resolution	50mA and 20mV (10-bit A/D)
Current pulsation	Up to 0.15A
Energy circuit	MOSFET transistors, power resistor
Cooling	Forced air
Control characteristic	Constant current
Control variable	Current, voltage, capacity Ah, time
Display	LCD display with 2x16 characters
Control elements	Main switch, START/STOP/RESET/SELECT, SCROLL UP and SCROLL DOWN buttons
Housing	Steel red box
Dimension (WxDxH)	245x325x160mm
Weight	6kg

GSBCT25A12V complies with **Directives 89/336/EEC-Electromagnetic compatibility (EMC) and 2006/95/EC-Low voltage equipment (LVD).**..

4. LCD Display

4.1. Main screen

The example of enlarged main screen:

R	D	Y		0	8	:	4	8			0	.	0	0	V
2	9	.	1	1	.	2	0	1	0	.	M			0	K

The first three characters in the first line of LCD display show the condition of device and they can be:

DCH -marks DISCHARGE.
FIN -marks finished operation,
PA -marks the condition of pause during alarm,
RDY -marks ready condition after reset or at turning on the device.

The following 5 characters are reserved for discharging period (duration). The firs row LCD ends with voltage information. Second line begins with a date (altogether 11 characters for day, month and year). At the end is information about internal memory.
Alarms are showing by blinking message on screen.

4.2. The list of all the messages GSBCT25A12V is able to register while operating

G	a	u	s		D	i	s	c	h	a	r	g	e		T
	-	G	S	B	C	T	2	5	A	1	2	V	-		

It shows while turning the switch on if the device is plugged (Power ON).

P	O	W	E	R		F	A	I	L	U	R	E	!		
p	r	o	c	e	s		c	o	n	t	i	n	u	e	d

Right after turning the device it's been checked whether it had turned off by pressing OFF button or by power failure during discharge process. If GSBCT detects this situation the previous discharge process continues automatically with parameters as were set before.

S	t	o	p	p	e	d		b	y		t	i	m	e	r
	B	a	t	t	e	r	y		i	s		O	K		

This is message if test ends after desired test time.

	P	R	O	C	E	S	S		S	t	o	p	p	e	d
				b	y		U	S	E	R					

This message appears when the user manually stops charge process by pressing STOP button.

U	n	d	e	r		V	o	l	t	.	L	i	m	i	t
C	h	e	c	k		T	i	m	e	&	C	a	p	A	h

This is the message if battery voltage drops under voltage limit (U/Cell*NoCell). In this case, elapsed time and discharged capacity (Ah) are relevant for battery condition.

C	a	n	‘	t		S	T	A	R	T		t	e	s	t
B	a	t	t	.		V	o	l	t	a	g	e	<	4	V

Voltage of connected battery is to low to start discharging.

T	e	m	p	e	r	a	t	.		a	l	a	r	m	
h	e	a	t	s	i	n	k		t	.		>	7	5	C

If the temperature of transistor heat sink is over 75˚C discharge process will automatically be stopped. Start is not possible at this stage. The discharge process will automatically be continued when the temperature falls under 50˚C unless the user resets the device earlier.

T	e	m	p	e	r	a	t	.		a	l	a	r	m	
A	m	b	i	e	n	t		t	.	<				5	C

Ambient temperature is too low. Start is not possible. If test was started it would be stopped until temperature exceeds 5C. Then it automatically continues unless the user hasn’t manually reset GSBCT.

-		M	E	M	O	R	Y		F	U	L	L		-	
e	r	a	s	e		f	r	o	m		m	e	n	u	

This message indicates that internal devices memory is full...It could be erased from menu 5.

T	E	S	T	0	0	1	5		S	t	o	r	e	d	
i	n		F	L	A	S	H		M	E	M	O	R	Y	

After test ends, press on RESET button will memorize data from test.

C	o	o	l	i	n	g		A	c	t	i	v	a	t	e
t	e	m	p	:	X		0	C			1	5	s	e	c

Cooling...

5. INSTRUCTION FOR USE

5.1. Device installation and testing

1. Turn the power supply socket on;
2. Turn POWER switch on;
3. An intro message will appear on LCD display and will be on for 3 seconds. Display shows current devices state, time and date, voltage of connected battery and used space in internal memory max. 128KByte.
4. Press UP button (entering into menus figure 1.). Buttons SCROLL UP and SCROLL DOWN are for navigation through menus and button START/STOP/RESET/SELECT is for selecting discharge parameters etc.
5. Menus 1, 2 and 3 are for setting discharge parameters. Under voltage (cutoff) limit is setting in the first menu (scroll up and scroll down buttons for choosing and select for confirmation). Value of this voltage is defined by battery manufacturer (1.75V/Cell). Test duration is setting in the second menu. Discharge current is setting in the third menu (from 0.5A to 25A). Press on SELECT button in each menu confirms chosen parameters and returns to the main menu.
6. Cutoff voltage range is from Umin=9V to Umax=13V with step 0.1V, Imin=0.5A Imax=25A with step 0.1A, Tmin=1min Tmax=48h with step 1min.
7. Put test cables onto battery poles. **BE SHOORE IN RIGHT POLARITY. IN A CASE OF FAILURE YOU CAN DAMAGE THE BATTERY AND TEST DEVICE.**
8. Device condition is ready (RDY) and GSBCT is ready for start (test). Battery voltage shows on display.
9. Pressing on START button starts discharging. Display shows discharge current and elapsed test time. If you press START button during test, test stops. Also, if battery voltage drops bellow cutoff voltage test stops before desired duration of time elapsed.
10. After test ending, display blinks the last measured values of voltage, current and time as well as discharged capacity. Pressing the START button, resets the display and puts test results into the flash memory. All stored results can be read on display from menu 4 or by PC with software for GSBCT25A12V. 15seconds after test stops, another one can be started.
11. Battery is good if hers voltage doesn't drop under cutoff voltage during testing. This is valid if battery is previously well charged.
12. In the 4th menu, you can read test results from memory.
13. The 5th menu is for some devices settings. The most interesting is option for erasing the memory and for set up of date and time.

WARNING: battery poles and connectors has to be clean, contact has to be very tide and good. Also, a care should be taken to avoid measuring cables damaging.

WARNING: devices damaging as a result of mechanical actions or H2SO4 and moisture in the air are not cover with warranty. GSBCT25A12V should be placed in a well ventilated room.

5.2. Starting discharge

Pressing on START button GSBCT shows current parameters of capacity test and asks for their confirmation.

1	**.**	**7**	**5**	**V**	*****		**6**	**C**		**2**	**5**	**.**	**0**	**0**	**A**
	5	**0**	**0**	**A**	**h**		**2**	**0**	**h**	**0**	**0**	**m**		**N**	**o**

Pressing on SCROLL UP button you are selecting confirmation of test parameters YES (condition for continuing with test), while with button SCROLL DOWN you can select No. Pressing on SELECT button in a case YES test starts, while in case NO basic display appears.

-		**1**	**1**	**2**	**.**	**5**	**A**	**h**			**1**	**1**	**.**	**5**	**V**
0	**4**	**:**	**3**	**0**	**:**	**2**	**8**			**2**	**5**	**.**	**0**	**0**	**A**

Message while test is ON...
After test, if you press button RESET, test data are memorized with messages from chapter 4.2.

6. DEVICE SETTINGS

Pressing on SCROLL UP button in RDY (ready) state opens menu 1:

-	-	-	-	-	M	E	N	U		1	-	-	-	-	-
B	R	E	A	K		U	/	C	e	l	l			>	>

Pressing on SELECT button opens menu for selecting final discharge voltage.

I	f		U	/	C	e	l	l	<	1	.	7	5	V
T	H	E	N		S	t	o	p	T	e	s	t		

Combining buttons SCROLL UP and SCROLL DOWN you have to choose desired value in range (none) 1.50-2.20V/Cell.
Pressing on SELECT button you are entering in submenu for selecting number of cells.

2	V		C	e	l	l		N	o	.		=		6
<	<		B	a	c	k								

Combining buttons SCROLL UP and SCROLL DOWN you have to choose between 3 or 6 cells.
Pressing on SELECT you are confirming selected value and returning to base menu.
If you choose option NONE this voltage condition will be ignored.

After 2 pressings on SCROLL UP button in RDY (ready) state opens the following menu:

-	-	-	-	-	M	E	N	U		2	-	-	-	-	-
T	e	s	t		D	u	r	a	t	i	o	n		>	>

Pressing on SELECT button you are entering in submenu for selecting test duration.

I	f		T	i	m	e	>		5	h		3	0	m	
T	H	E	N		S	t	o	p		T	e	s	t		

Combining buttons SCROLL UP and SCROLL DOWN you have to choose desired value from 15min up to 48h. Pressing on SELECT you are confirming selected value and returning to base menu.

After 3 pressings on SCROLL UP button in RDY (ready) state opens the following menu:

-	-	-	-	-	M	E	N	U		3	-	-	-	-	-
C	h	o	o	s	e		C	u	r	r	e	n	t	>	>

Pressing on SELECT button you are entering in submenu for selecting discharging current.

S	e	l	e	c	t		D	i	s	c	h	a	r	g	e
	C	u	r	r	e	n	t	=		2	5	.	0	0	A

Combining buttons SCROLL UP and SCROLL DOWN you have to choose desired value from 0.5 to 25A.
Pressing on SELECT button you are entering in submenu for selecting amount of discharging Ah

C	a	p	a	c	i	t	y		A	h	=		1	0	0
<	<		B	a	c	k									

Combining buttons SCROLL UP and SCROLL DOWN you have to choose desired value of discharging capacity from 5 to 500Ah. If you choose 0Ah capacity condition will be ignored.
Pressing on SELECT you are confirming selected value and returning to base menu.
Warning: device is performing test while the first of selected end conditions appears or until you press STOP button.

After 4 pressings on SCROLL UP button in RDY (ready) state opens the following menu:

-	-	-	-	-	M	E	N	U		4	-	-	-	-	-
V	i	e	w		R	e	s	u	l	t	s			>	>

Pressing on SELECT button you are entering in menu for viewing memorized test results.

T	0	0	5		1	.	7	5	V	2	5	.	0	0	A
1	5	0	3	1	8		2	3	:	0	1	S	u	c	c

Here you can get some information about test, like test number (here T005), test parameters (here 1.75V/Cell, 25A), test date (here 15.03.2018.), test done time (here 23:01) and about test success...(elapsed desired time «Succ») or «not» (with message to check amount of Ah and test duration C&t?). Combining buttons SCROLL UP and SCROLL DOWN and SELECT you can get info about current and voltage of battery during test in each minute. Some of following messages can appear:

	-	B	E	F	O	R	E		S	T	A	R	T	-	
U	=	1	2	.	7	5	V		I	=			0	.	0

0	0	6	0	m		C	=		2	5	.	0	A	h	
U	=	1	2	.	1	V			I	=	2	5	.	0	0

E	N	D		O	F		L	I	S	T					
<	<	B	a	c	k										

N	O		R	E	S	U	L	T	S		F	O	U	N	D
m	e	m	o	r	y		i	s		e	m	p	t	y	

B	e	g	i	n	i	n	g		O	f		l	i	s	t
E	n	d		o	f		l	i	s	t					

After 5 pressings on SCROLL UP button in RDY (ready) state opens the following menu:

-	-	-	-	-	M	E	N	U		5	-	-	-	-	-
S	y	s	t	e	m		S	e	t	i	n	g	s	>	>

Pressing on SELECT button you are entering in menus for some device settings.
Combining buttons SCROLL UP and SCROLL DOWN you have to choose desired value.
Pressing on SELECT button you are confirming selected value and return back to menu 5.
Menu 5a is for clearing the memory.

-	-	-	-		M	E	N	U		5	a	-	-	-	-
C	l	e	a	r		A	l	l		M	e	m	o	r	Y

A	r	e		Y	o	u		S	h	u	r	e	?		
[	Y	e	s	/	N	o	]							N	o

The next menu is for setting real time and date with following messages:

-	-	-	-		M	E	N	U		5	b	-	-	-	-
S	e	t		D	a	t	e	/	T	i	m	e		>	>

y	y	y	y	.	M	M	.	d	d	.	H	H	.	m	m

The next one is menu with following information:

-	-	-	-		M	E	N	U		5	c	-	-	-	-
C	o	n	t	a	c	t		u	s					>	>

G	a	u	s		S	t	S	,		p	h	o	n	e	:
+	3	8	1		1	1		2	2	7	9	-	1	4	2

e	m	a	i	l	:		g	a	u	s	.	s	t	s	@
							g	m	a	i	l	.	c	o	m

w	e	b		s	i	t	e							
w	w	w	.	g	a	u	s	-	s	t	s	.	c	o	m

Pressing on SCROLL DOWN returns you to the base menu.

7. LEGEND OF MARKS (SIGNS) AND CONCEPTS

A-(Amper) current unit
V- (Volt) voltage unit
Capacity Ah – battery capacity unit
Charge (CHR) – Charge
Discharge (DIS) - Discharging
Ready (RDY) – Ready for work (start)
Start – Starting process
Stop – Stopping process
Current – value of DC current
LCD Display – Display with 2x16 characters
Voltage limit – value of charging voltage on which some action has to be done
Power failure – Main power supply failure
Finish (FIN) – Finishing operation
Pause (PA) – Freezing operation
Alarm current – unacceptable current level
Time Condition – time condition for charge ending
Capacity Condition – capacity condition for discharge ending

7.1. Default settings

Parameter	Range	Default
Discharge Voltage Limit	None, 1.50V-2.20V/Cell	10.5V
Discharge Current	0.5A-25A	5A
NoCell	3, 6	6
Alarm Low Voltage	-	4V
Alarm High Voltage	-	18V
Alarm Current	-	30A
Alarm Higt Temperature		80C
Capacity Condition	5-500Ah step (korak) 5Ah	Not defined (0 means that capacity condition is not in use)
Time Condition	15min-48h step 15min	20h:00min

Symbol 12. means: there is dangerous voltage in the unit. Do not open discharger. In case of failure contact the manufacturer:

Manufacturer: GAUS-S.T.S. d.o.o. Belgrade, Jurija Gagarina 167/41,

Symbol 14 means: The instructions shall be read before use of the equipment.

Warning:

- It is not allowed to cover holes.
- The back part where is mains switch must be easily accessible.
- If the equipment is used in a manner not specified by the manufacturer the degree of protection can be impaired.
- Plug on supply cord shall be readily identifiable and easily reached by the OPERATOR

8. PRECAUTION MEASURES

1. Please read the instruction for use and warnings;
2. To avoid electric shock, disconnect the cable and test cables from the battery before taking the device cover off or before safety fuse change;
3. WARNING! Gases realized during charge process are explosive. Do not smoke, avoid fire and sparkles;
4. Do not expose device to direct sun light, extreme temperature or moisture;
5. Device must be earth grounded;
6. Do not connect device to battery with nominal voltage larger than 12V. Connected battery voltage must be ranged 4 to 18 volts;
7. Do not connect the device on a battery that is in a vehicle. Discharging or tested battery should be outside any vehicle;
8. Always take into consideration the correct polarity while connecting the battery. Red cable onto plus, black onto minus battery pole. Inversion polarity is situation in which it is not possible to start discharging;
9. Place the device to enable right flow of dissipated heat (do not cover ventilation holes). Use the device only in well ventilated areas. Keep the device away from children;
10. Only skilled and qualified person can service the device.

9. DEVICES PLATE

GSBCT25A12V

Power consumption: 30W
Main voltage: 230VAC 50Hz
Main current: 0.5A max.
Discharge current: 25ADC
Nominal input voltage: 6, 12VDC
Main fuse: T1.6A 250V 32mm
Dimensions (WxHxL): 245x160x325mm
Weight: 6kg