



ACCREDITED TEST LABORATORY "STARBAT"

Page 1 of 6

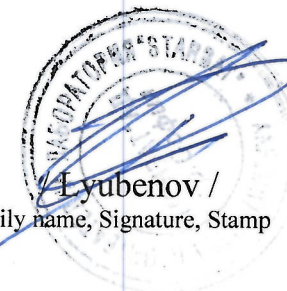
TEST PROTOCOL

NO 0086 / 16.05.2017

- 1. Product type, model:** *Valve regulated lead-acid battery UP-FTS*
- 2. Applicant for the test:** *Masterbattery*
- 3. Name & Number of the standardizing documents:** *IEC 60896 – 21/22 cl.6.15 Service life at an operating temperature of 40 °C*
- 4. Date of receipt of samples at the laboratory:** *13.07.2017*
- 5. Number of test samples:** *3 pcs. UP-FTS*
452 # 453 # 454
- 6. Date of test:** *14.07.2013 – 15.05.2017*

Accredited Test Laboratory Head:

Lyubenov /
/ Family name, Signature, Stamp



ACCREDITED TEST LABORATORY "STARBAT"

Page 2 of 6

7. Table of test results:

PROTOCOL NO. 0086 / 16.05.2017

No.	Test /characteristics/	Measuring Unit	Standards/ Verified Test Methods	Sample No. as per Ref. Log	Test Results (value, uncertainty)	Test Parameter Value & Tolerance	Test Conditions
1	2	3	4	5	6	7	8
1	Discharge capacity	Ah	IEC 60896 – 21/22 cl. 6.11.	No. 452	$C_a = 153.8 \pm (<0.1\%)$	$C_a \geq 153.0 \text{ Ah}$	Rated capacity C_3 is 153.0 Ah – declared by the manufacturer. $I_3 = 51.0 \text{ A}$, at temperature 25°C . Final voltage $U_f = 10.2 \text{ V}$.
				No. 453	$C_a = 153.4 \pm (<0.1\%)$		
				No. 454	$C_a = 153.6 \pm (<0.1\%)$		

ACCREDITED TEST LABORATORY "STARBAT"

Page 3 of 6

PROTOCOL NO. 0086 / 16.05.2017

No.	Test /characteristics/	Measuring Unit	Standards/ Verified Test Methods	Sample No. as per Ref. Log	Test Results (value, uncertainty)	Test Parameter Value & Tolerance	Test Conditions
1	2	3	4	5	6	7	8
2	Service life at an operating temperature of 40°C	number of days, Ah	IEC 60896 – 21/22 cl. 6.15.	№ 452	118 days $C_{a118} = 152.6 \pm (<0.1\%)$ 236 days $C_{a236} = 150.4 \pm (<0.1\%)$ 354 days $C_{a354} = 149.7 \pm (<0.1\%)$ 472 days $C_{a472} = 147.3 \pm (<0.1\%)$ 590 days $C_{a590} = 144.6 \pm (<0.1\%)$ 708 days $C_{a708} = 143.1 \pm (<0.1\%)$ 826 days $C_{a826} = 140.3 \pm (<0.1\%)$ 944 days $C_{a944} = 138.7 \pm (<0.1\%)$ 1062 days $C_{a1062} = 136.5 \pm (<0.1\%)$ 1180 days $C_{a1180} = 128.6 \pm (<0.1\%)$ 1298 days $C_{a1298} = 118.4 \pm (<0.1\%)$	$C_a \leq 122.4$ Ah to end the test. 500 days for brief duration exposure time; 750 days for medium duration exposure time; 1100 days for long duration exposure time; 1700 days for very long duration exposure time.	Float charge the units at 40°C. Every 118 days perform a test to determine the 3 hour rated actual capacity. The test is terminated when the actual capacity is less than 0.8 C₃.

No.	Test /characteristics/	Measuring Unit	Standards/ Verified Test Methods	Sample No. as per Ref. Log	Test Results (value, uncertainty)	Test Parameter Value & Tolerance	Test Conditions	
1	2	3	4	5	6	7	8	
3	Service life at an operating temperature of 40°C	number of days, Ah	IEC 60896 – 21/22 cl. 6.15.	№ 453	118 days $C_{a118} = 151.8 \pm (<0.1\%)$ 236 days $C_{a236} = 149.5 \pm (<0.1\%)$ 354 days $C_{a354} = 149.0 \pm (<0.1\%)$ 472 days $C_{a472} = 146.7 \pm (<0.1\%)$ 590 days $C_{a590} = 143.9 \pm (<0.1\%)$ 708 days $C_{a708} = 142.7 \pm (<0.1\%)$ 826 days $C_{a826} = 139.9 \pm (<0.1\%)$ 944 days $C_{a944} = 138.5 \pm (<0.1\%)$ 1062 days $C_{a1062} = 134.7 \pm (<0.1\%)$ 1180 days $C_{a1180} = 129.6 \pm (<0.1\%)$ 1298 days $C_{a1298} = 115.4 \pm (<0.1\%)$	$C_a \leq 122.4Ah$ to end the test. 500 days for brief duration exposure time; 750 days for medium duration exposure time; 1100 days for long duration exposure time; 1700 days for very long duration exposure time.	Float charge the units at 40°C. Every 118 days perform a test to determine the 3 hour rated actual capacity. The test is terminated when the actual capacity is less than 0.8 C ₃ .	



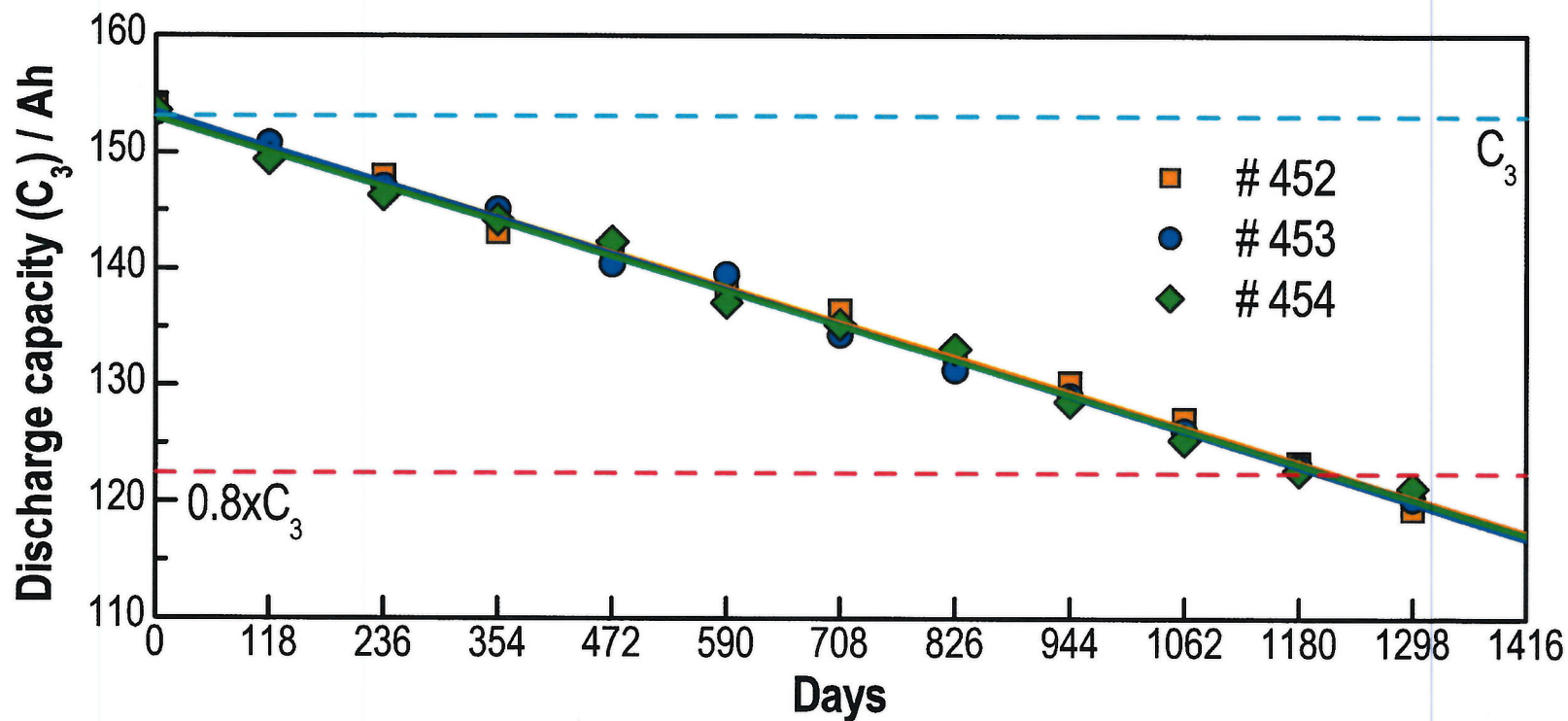
ACCREDITED TEST LABORATORY "STARBAT"



Page 5 of 6

PROTOCOL NO. 0086 / 16.05.2017

No.	Test /characteristics/	Measuring Unit	Standards/ Verified Test Methods	Sample No. as per Ref. Log	Test Results (value, uncertainty)	Test Parameter Value & Tolerance	Test Conditions
1	2	3	4	5	6	7	8
4	Service life at an operating temperature of 40°C	number of days, Ah	IEC 60896 – 21/22 cl. 6.15.	№ 454	118 days $C_{a118} = 152.2 \pm (<0.1\%)$ 236 days $C_{a236} = 150.0 \pm (<0.1\%)$ 354 days $C_{a354} = 149.1 \pm (<0.1\%)$ 472 days $C_{a472} = 146.1 \pm (<0.1\%)$ 590 days $C_{a590} = 143.6 \pm (<0.1\%)$ 708 days $C_{a708} = 142.0 \pm (<0.1\%)$ 826 days $C_{a826} = 139.2 \pm (<0.1\%)$ 944 days $C_{a944} = 138.8 \pm (<0.1\%)$ 1062 days $C_{a1062} = 136.3 \pm (<0.1\%)$ 1180 days $C_{a1180} = 127.2 \pm (<0.1\%)$ 1298 days $C_{a1298} = 116.5 \pm (<0.1\%)$	$C_a \leq 122.4$ Ah to end the test. 500 days for brief duration exposure time; 750 days for medium duration exposure time; 1100 days for long duration exposure time; 1700 days for very long duration exposure time.	Float charge the units at 40°C. Every 118 days perform a test to determine the 3 hour rated actual capacity. The test is terminated when the actual capacity is less than 0.8 C ₃ .



NOTE: The test results refer to the test samples only. Extracts of the test protocol shall not be copied without the written consent of the Accredited Test Laboratory.

Test carried out by:

/Georgiev /
/ Family name, Signature /

Accredited Test Laboratory Head:

/Lyubenov /
/ Family name, Signature, Stamp /