DRY CELL AND STORAGE BATTERY JOINT STOCK COMPANY

PINACO

Add: 321 Tran Hung Dao St., Dist. 1, HCM City, Vietnam
Tel: (84 8) 3920 3062 - 3920 3402 * Fax: (84 8) 3920 3060 * www.pinaco.com.vn - Email: pinaco@pinaco.com.vn

TEST REPORT

1. NAME OF SAMPLE: Lead acid starter battery
2. Manufacturer & address:Dry Cell and Storage Battery Joint Stock Company (PINACO)
   321 Tran Hung Dao st., Dist. 1, Ho Chi Minh City, VIETNAM
3. Lab testing: Own lab
4. Trademark: JP
5. Type / model:

CMF 44B20L	12V	35Ah
CMF 80D26R	12V	70Ah
CMF 80D26L	12V	70Ah
CMF 105D31R	12V	90Ah
CMF 105D31L	12V	90Ah

   Period of test:Day of starting test: 10 JAN 2020; Day of ending test: 10 FEB 2020
6. Test items: 03
7. Remarks:

   Throughout this report a comma is used as the decimal separator.

Type	Items
CMF 40B20L	20 hour capacity check C_e, Reserve capacity check $C_{r,e}$, Cranking performance test – Standard temperature, Charge acceptance test, Charge retention test, Vibration resistance test, Electrolyte retention test, Cranking performance for dry-charged (or conserved-charge) batteries after activation and Dimensions of batteries.
CMF 80D26R	20 hour capacity check C_e, Reserve capacity check $C_{r,e}$, Cranking performance test – Standard temperature, Charge acceptance test, Charge retention test, Vibration resistance test, Electrolyte retention test, Cranking performance for dry-charged (or conserved-charge) batteries after activation and Dimensions of batteries.
CMF 80D26L	20 hour capacity check C_e, Reserve capacity check $C_{r,e}$, Cranking performance test – Standard temperature, Charge acceptance test, Charge retention test, Vibration resistance test, Electrolyte retention test, Cranking performance for dry-charged (or conserved-charge) batteries after activation and Dimensions of batteries.
CMF 105D31R	20 hour capacity check C_e, Reserve capacity check $C_{r,e}$, Cranking performance test – Standard temperature, Charge acceptance test, Charge retention test, Vibration resistance test, Electrolyte retention test, Cranking performance for dry-

	charged (or conserved-charge) batteries after activation and Dimensions of batteries.
CMF 105D31L	20 hour capacity check C_e, Reserve capacity check $C_{r,e}$, Cranking performance test – Standard temperature, Charge acceptance test, Charge retention test, Vibration resistance test, Electrolyte retention test, Cranking performance for dry-charged (or conserved-charge) batteries after activation and Dimensions of batteries.

8. Testing according to : IEC 60095-1 & IEC 60095-2

9. Test conclusion :

The tested items are 20 hour capacity check Ce, Reserve capacity check Cr,e, Cranking performance test – Standard temperature, Charge acceptance tests, Charge retention test.Vibration resistance test, Electrolyte retention test and Dimensions of batteries.

The results of the tested items comply with the relevant requirements of the standards.

- Photos & marking:

CMF 40B20L			
CMF 80D26R			
CMF 80D26L			

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CMF 105D31R			
CMF 105D31L			

-Testing and requirement:

IEC 60095-1:2006 and IEC 60095-2: 2009			
Cl.	Requirement – Test	Result	Verdict
	Testing and requirements		
6.1	**Identification, labeling**		P
	Batteries according to this standard shall bear the following characteristics on at least the top or one of their four sides. 1. The identification of manufacturer or supplier; 2. Class of battery: (IEC) A, B or C; 3. Nominal voltage: 12V; 4. Capacity; 5. Nominal cranking current: Icc(A); 6. Safety labeling; 7. Valve-regulated batteries shall bear special indication mentioning that the battery shall not be opened. 8. Marking of the polarity: the terminal shall be identified according to the requirements of IEC 60095-2 or IEC 60095-4	**CMF 40B20L:** 12V 35Ah; Icc=265A; "+" and "-" marks on the lid; **CMF 80D26R:** 12V 70Ah; Icc=490A; "+" and "-" marks on the lid; **CMF 80D26L:** 12V 70Ah; Icc=490A; "+" and "-" marks on the lid; **CMF 105D31R:** 12V 90Ah; Icc=655A; "+" and "-" marks on the lid; **CMF 105D31L:** 12V 90Ah; Icc=655A; "+" and "-" marks on the lid;	P
6.4	**Fastening of the battery**		P

	Where batteries are fastened to the vihicle by means of integral parts (for example bottom ledges), there shall be in compliance with the requirements of IEC 60095-2 and 60095-4		P
9.1	**20 hour capacity check C_e**		**P**
	The battery shall be placed in a water bath at a temperature of 25°C±2°C. The terminal base of the battery shall be at least 15mm but no more than 25mm above the level of the water. The battery shall be discharged with the current (calculated according to 7.1.2) kept constant at ± 2% of the nominal value until the terminal voltage falls to 10,50V±0,05V. The duration t (h) of the discharge shall be recorded The capacity Ce is as follows: $C_e = t \times I_n$ If the final battery temperature is different from 25°C±2°C the following temperature correction formula shall be used: $C_{e25°C} = C_{eT}[1-0,01(T-25)]$		
	$C_e \geq C_n$	**CMF 40B20L:** C_n = 35 Ah, C_e = 36,89 Ah; **CMF 80D26R:** C_n = 70 Ah, C_e = 77,83 Ah; **CMF 80D26L:** C_n = 70 Ah, C_e = 77,41 Ah; **CMF 105D31R:** C_n = 90 Ah, C_e = 91,69 Ah; **CMF 105D31L:** C_n = 90 Ah, C_e = 92,96 Ah;	State the value
9.2	**Reserve capacity check $C_{r,e}$**		**P**
	The battery shall be placed in a water bath at a temperature of 25°C±2°C. The terminalbase of the battery shall be at least 15mm butno more than 25mm above the level of thewater. The battery shall be discharged with		

	acurrent 25A ± 1% until the terminal voltagefalls to 10,50V±0,05V. The duration t (inminutes) of the discharge shall be recorded. The capacity Cr e is as follows: $C_{r,e}$=t(min) If the final battery temperature is differentfrom 25°C±2°C, the following temperaturecorrection formula shall be used: $C_{e25°C}=C_{r,eT}[1-0.01(T-25)]$		
	$C_{r,e} \geq C_{r,n}$	**CMF 40B20L:** $C_{r,n}$ =43 min, $C_{r,e}$ = 49 min **CMF 80D26R:** $C_{r,n}$ =103 min, $C_{r,e}$ = 136 min **CMF 80D26L:** $C_{r,n}$ =103 min, $C_{r,e}$ = 137 min **CMF 105D31R:** $C_{r,n}$ =132 min, $C_{r,e}$ = 161 min **CMF 105D31L:** $C_{r,n}$ =132 min, $C_{r,e}$ = 159 min	P
9.3	**Cranking performance test**		
9.3.1	**Cranking performance test – Standard temperature**		**P**
	Test batteries shall be stored for 24 h at a temperature of -18°C ± 1°C, followed by a discharge with a current I_{cc}±5%, either within or outside the cooling chamber After 10s discharge, the terminal voltage U_{f10s} shall be recorded. After 30s discharge, the terminalvoltage U_{f30s} shall be recorded and then thecurrent shall be cut off. After a rest of time of20s±1s,the battery shall then be discharged at $0,6I_{cc}$ until the battery voltage reaches 6V. The discharge time(t_{6V}),in seconds, shall berecorded.		
	$U_{f10s} \geq 7,5V$ $U_{f10s} \geq 7,2V$ $t_{6V} \geq 40$ (optional)	**CMF 40B20L:** U_{f10s} = 7,90V, U_{f30s} = 7,51V; **CMF 80D26R:** U_{f10s} = 8,54V, U_{f30s} = 8,34V;	P

		CMF 80D26L: U_{f10s} = 8,54V, U_{f30s} = 8,36V; **CMF 105D31R:** U_{f10s} = 7,80V, U_{f30s} = 7,48V; **CMF 105D31L:** U_{f10s} = 7,75V, U_{f30s} = 7,39V;	
9.3.2	**Cranking performance test – very cold climates**		**N/A**
	This test shall be performed only if the battery if specified for very cold climate application by the manufacturer. The test method is the same as defined above for the standard temperatures with - cooling chamber temperature =-29°C ± 1 °C ; - I_{cc} for very cold climate rated on the battery label by the manufacturer		
	U_{f10s} ≥ 7,5V U_{f10s} ≥ 7,2V t_{6V} ≥ 40 (optional)		N/A
9.4	**Charge acceptance test**		**P**
	The battery shall be placed in a water bath at a temperature of 25°C±2°C. Then the battery shall be discharged at a current I_o= C_{e10}/1 for 5h. The value Ce shall be taken as the maximum value Ce of the three previous discharges according to 9.1. Immediately after the discharge, the battery shall be cooled at a temperature of 0°C±1 °C for a minimum of 20h or until the temperature of one of the middle cells has reached 0°C±1 °C. At this temperature of 0°C, the battery shall be charged at a constant voltage of 14,40V ± 0,10V. After 10min, the charging current I_{ca} shall be recorded	CMF 40B20L: I_o = 3,5 A; CMF 80D26R: I_o = 7,0 A; CMF 80D26L: I_o = 7,0 A; CMF 105D31R: I_o = 9,0 A; CMF 105D31L: I_o = 9,0 A	
	I_{ca} ≥ 2I_o	CMF 40B20L: I_{ca} = 7,25 A;	P

		CMF 80D26R: I_{ca} = 17,02 A; CMF 80D26L: I_{ca} = 16,93 A; CMF 105D31R: I_{ca} = 19,36 A; CMF 105D31L: I_{ca} = 20,19 A;	
9.5	**Charge retention test**		**P**
	A fully-charged battery (according to 8.2), withits vent plugs firmly in place and a clean drysurface, shall be stored at 40°C ±1°Con opencircuit for a time (t) defined in 9.5 3. After this storage period, the battery shall besubmitted, without recharge, to a crankingperformance test at -18°C and a current I=0,6I_{cc}. The voltage after 30s (U_{30s}) shall be recorded		
	U_{30s} ≥ 8V	CMF 40B20L: U_{30s} = 8,67V CMF 80D26R: U_{30s} = 9,12V CMF 80D26L: U_{30s} = 9,17V CMF 105D31R: U_{30s} = 8,52V CMF 105D31L: U_{30s} = 8,49V	P
9.6	**Endurance test for batteries**		
9.6.1	**Corrosion test**		N/A
	The test shall be carried out on fully charged batteries. The sequence 9.6.1.1 to 9.6.1.8 constitutes one corrosion test unit. The whole sequence shall be repeated and the test shall be terminated when the battery voltage reaches less than 7,2V at 30s with a current of 0,6I_{cc} in cranking test at 25°C±2°C.		
	The battery voltage shall not be less than 7,2V after 4 units.		N/A
9.6.2	**Cycling test 1**		N/A
	The cycling test shall be carried out according to 9.6.2.1 to 9.6.2.4. The test shall be terminated if the battery voltage drops below 10,50V during the discharge prior to completion of the required number of cycles. When the cycling is over, the battery shall		

	be placed in a cooling chamber with (forced) air circulation at a temperature of -18°C±1°C for a minimum of 20h or until the temperature in one of the middle cells has reached -18°C±1°C. The battery shall then be discharged for 30s with a current $0,6I_{cc}$ and the terminal voltage shall be measured. It shall not be less than 7,2V. The discharge shall then be terminated.		
	The battery voltage shall not be less than 7,2V after 120 cycles		N/A
9.6.3	**Cycling test 2**		N
	The test shall be carried out on batteries that have been charged. The sequence 9.6.3.2 to 9.6.3.8 constitutes one cycling test unit. The whole sequence shall be repeated to the required number of units. The actual capacity at the end of the last unit shall be C≥0,5Cn. If the above criteia is achieved the battery shall be placed in a cooling period with acurrent of $0,6I_{cc}$ for 30s and then the terminal voltage shall be measured. It shall not be less than 7,2V.		
	The battery voltage shall not be less than 7,2V after 5 cycling test units.		N/A
9.6.4	**Cycling test 3 (applicable to vented batteries only with C_{20} from 60Ah to 220Ah)**		N/A
	The test shall be carried out on batteries that have been charged and the battery shall be placed In a water bath at a temperature of 40°C ±2°C. Then the cycling test shall be carried out according to 9.6.4.1 to 9.6.4.6 .The battery capacity can be obtained from the method described in 9.6.4.7. When the battery capacity fails to 40% or less of the battery's 20h capacity C_e, the cycling test has been completed and should be discontinued		
	The actual total number of endurance cycles shall not be less than		N/A

	$2,8*C_n+82$		
9.6.5	**Cycling test 4 (applicable to batteries with C_r from 40 min to 150 min)**		N/A
	The test shall be carried out on batteries that have been charged Throughout the wholetest period, the battery shall be placed in a water bath at a temperature of 40°C±2°C (75°C ±2°C). Then the cycling test shall be carried out according to 9.6.5.4 to 9.6.5.7. The cycling test should be considered complete when the terminal voltage at 30s(U_{30s}) of 9.6.5.6 falls to below 7,20V		
	The actual total number of endurance cycles shall not be less than $34*C_{r,n}$-581		N/A
9.7	**Water consumption test**		N/A
	This test applies only to vented batteries. The battery, after being charged according to 8.2, shall be cleaned, dried and weighed to an accuracy of ±0,05%(W1). The battery shall be placed in a water bath maintained at a temperature of 40°C ±2°C. Then the battery shall be charged at a constant voltage of 14,40V±0,05V (measured across the battery terminals) for a period of 500h. Immediately after this overcharge period, the battery shall be weighed under the same conditions as in 9.7.1 with the same scales(W2)		
	The ratio (W1-W2)/Cn shall be calculated. There is no requirement for Normal batteries. The ratio shall be less than 4g/Ah for Low water loss batteries. The ratio shall be less than 1g/Ah for Very water loss batteries.		N/A
9.8	**Vibration resistance test**		P

	The battery shall be stored for 24h at a temperature of after charging. The battery shall be fastened rigidly to the table of the vibration tester and subjected to a period of T(h)(see table 6) to a vertical vibration of a frequency of 30 Hz±2 Hz, thesevibrations being as nearly sinusoidal as possible. After a maximum of 4h after the end of the vibration, the battery shall be subjected, without recharge, to a discharge at a temperature of 25°C ±2°C with a current I=I_{cc}. The terminal voltage after 30s (U_{30s}) discharge shall be recorded.		
	$U_{30s} \geq 7,2V$	CMF 40B20L: U_{30s} = 8,79V CMF 80D26R: U_{30s} = 9,33V CMF 80D26L: U_{30s} = 9,34V CMF 105D31R: U_{30s} = 8,63V CMF 105D31L: U_{30s} = 8,66V	P
9.9	**Electrolyte retention test**		P
	After charging according to 8.2. The battery shall be stored for 4h on open circuit at a temperature of 25°C ±2°C. If necessary, the electrolyte level of each cell shall be adjusted to the maximum with purified water. The external surfaces of the battery shall be cleaned and dried. The battery shall then be tilted in each of the four directions at intervals of not less than 30s between each tilting according to 9.9.3. Throughout the tests described in clause 9.9.3, the battery must be examined for any sign of electrolyte leaking from the battery.		
	No evidence of liquid on the vent plugs, (or from the single point vent outlet)	CMF 44B20L: No evidence of electrolyte is visible on the vent plugs. CMF 80D26R: No evidence of electrolyte is visible on the vent plugs. CMF 80D26L: No evidence	P

		of electrolyte is visible on the vent plugs. CMF 105D31R: No evidence of electrolyte is visible on the vent plugs. CMF 105D31L: No evidence of electrolyte is visible on the vent plugs.	
9.10	**Cranking performance for dry-charged (or conserved-charge) batteries after activation**		N/A
	The dry-charged battery and a sufficient amount of electrolyte supplied by the manufacturer, or according to the manufacturer's specifications, shall be stored at 25°C ±2°C for at least 12h.(before filling) The battery shall be filled with its electrolyte up to the level indicated by the manufacturer. After a rest period of 20 min at the same ambient temperature, the battery shall be discharged at a current $I=I_{cc}$ for 30s. The voltage after a discharge period of 30s (U_{30s}) shall be recorded. The discharge shallthen be terminated.		
	$U_{30s} \geq 7,2V$		N/A

Dimentions of batteries and dimension and marking of terminals

7	**Main dimension of batteries**		
	The main dimension of batteries are represented by symbols as indicated on the drawing in Figure 1, page 18 This schematic drawing does not represent any design details of the top of the batteries. The dimensions corresponding to the symbols below shall be in accordance with Table I .page 22.IEC60095-2 Symbols used: b= overall width above ledges h= overall height including lid lugs and terminals,but without handles		State the value

	l: (mm)	b:(mm)	h:(mm)
CMF 40B20L	196	136	222
CMF 80D26R	258	171	224
CMF 80D26L	258	171	224
CMF 105D31R	303	171	224

	l= overall length without handles b1=width across ledges l1=length at batteries base c= maximum projection of handles, if any	CMF 105D31L	303	171	224	
8	**Dimensions and arrangement of ledges and notches**					N/A
	The shape and dimensions of ledges notchesshall be in accordance with Fig3a and 3b page 20(detail X and Yof Figure 1,page 18) The position of ledges and notches areindicated in Figure 1 and Sub-clause 6.2IEC60095-2					N/A
9	**General concerning permissible alternative fastening**					N/A
	Starter batteries having the main dimensions of standard senes of L,E and EB may.as alternatives to the standard fastening,be fixed to the vehicles either: (A) by additional lugs at the short sides, see Clause 10, (B) bymeans of a hold-down devices engaging with the upper part of the battery, connected to the support platform , see Clause 11. IEC60095-2					N/A
10	**Fastening by lugs**					N/A
10.1	**Lugs**					N/A
	Batteries for fastening at the short (see Clauses) series shall have lugs at the bottom of the short sides forming an integral part of batteries case. The shape and dimensions of the lugs shall correspond to Figure 2 and 3b IEC60095-2					N/A
10.2	**Positioning of battery**					P
	To secure correct positioning of the battery On the support, notches shall be provided in the lugs; the lug on the					P

	side of the negative terminal shall have one notch at the centre, the lugs on side of the positive terminal shall havetwo notches, the positions of which are Indicated in Figure 2, page 19. IEC60095-2 The shape and dimension of the notches shall correspond to Figures 3a and 3b, page 20. IEC60095-2		
10.3	**Supplementary dimension of batteries with fastening by lugs**		P
11	**Fastening by upper part of the case**		P
12	**Dimensions of the positive terminals**		State the value
	The tapered positive terminal shall be in accordance with Figure 28a, pages 38. IEC60095-2	ϕ: (mm) / h: (mm) CMF 40B20L: 14,68 / 18,32 CMF 80D26R: 19,44 / 17,65 CMF 80D26L: 19,43 / 17,71 CMF 105D31R: 19,45 / 17,77 CMF 105D31L: 19,45 / 17,69	
13	**Dimensions of the negative terminal**		State the value
	The tapered negative terminal shall be in accordance with Figure 28b, pages 38. IEC60095-2	ϕ: (mm) / h: (mm) CMF 40B20L: 12,98 / 18,67 CMF 80D26R: 17,78 / 17,68 CMF 80D26L: 17,74 / 17,65 CMF 105D31R: 17,70 / 17,71 CMF 105D31L: 17,71 / 17,72	
14	**Marking of the polarity of terminals**		P

	Batteries shall carry the marking of polarity, at least of the positive terminal		P
14.1	The marking of positive polarity shall take the form of the symbol "+" either on the upper surface of the positive terminal or on the lid adjacent to the positive terminal.		P
14.2	If the negative polarity is also marked, the marking shall take the form of the symbol "-" either on the upper surface of the negative terminal or on the lid adjacent to the negative terminal.		P
14.3	The symbol used for marking the terminals shall be in accordance with the symbol IEC 60417-5005 (DB: 2002-10) for the positive polarity and symbol IEC 60417-5006 (DB: 2002-10) for the negative polarity. The polarity symbols may be either indented or embossed by (0,4 ± 0,1) mm. Suggested dimensions are shown in Figure 1, page 7, IEC 60095-2		P

SIGNATURE	DONGNAI2STORAGE BATTERY ENTERPRISE VICE MANAGER CHI NHÁNH CÔNG TY CỔ PHẦN PIN ẮC QUY MIỀN NAM XÍ NGHIỆP ẮC QUY ĐỒNG NAI 2 CAO HOÀI BẮC