

BUREAU OF INDIAN STANDARDS

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Draft for Indian Standard

MULTIPURPOSE DRY BATTERIES — SPECIFICATION

(Third Revision)

ICS 29.220.10

Primary Cells and Batteries Sectional Committee, ETD 10

Last date of Comments:

08 April 2024

FOREWORD

(Formal Clauses will be added later.)

This standard was originally published in 1976 and subsequently revised in 1997 and 2018. The third revision has been undertaken to align it with the latest version of IEC 60086-2:2021.

The document has undergone significant updates, introducing the inclusion of the "6F22" cell designation, accompanied by detailed schematic drawings with dimensions for each designation. Aligning with the latest IEC 60086-2 standard, the tests under Table-7E have been updated, and a clause has been removed, with nominal voltages added to the respective table. Notably, adjustments have been made to the quantity of items for initial and delayed Life tests. References in Table-7A to 7E have been consistently updated, and specific tests like the "10 ohm tape recorder" have been discontinued, while new tests such as "5.1 Ohms Toy" and "50mA Digital Audio" have been incorporated. Additionally, values of Life under delayed dry heat conditions have been integrated across various test scenarios. The paragraph concludes with the mention of a new addition, emphasizing the dynamic evolution of the document to meet current standards and testing requirements.

This standard shall be read in conjunction with IS 6303: 2018 'Primary Batteries — General' (second revision). For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (Second Revision)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

1.1 This standard covers the requirements of dimensions and tests of zinc carbon batteries of designations R03, R6, R14, R20 and 6F22 for use in all kind of applications.

2 REFERENCES

2.1 The Indian standards listed below are necessary adjuncts to this standard.

<i>IS No.</i>	<i>Title</i>
1885 (Part 15):	Electro technical vocabulary:2008 Part 15 Primary and secondary cells and batteries (<i>second revision</i>)
6303:2018	Primary Batteries — General (<i>second revision</i>)

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1885 (Part 15) and IS 6303 shall apply.

4 DESIGNATION OF CELLS AND BATTERIES

4.1 The batteries shall be designated in accordance with 4.1.5 of IS 6303.

5 DIMENSIONS

5.1 Overall dimensions of cells/batteries and nominal voltage of R03, R6, R14, R20 and 6F22 were shown in Table 5A to 5E.

6 TERMINALS

6.1 Terminals (cap and base) arrangements shall be as per 4.1.3.2 of IS 6303.

6.2 The terminals shall provide and maintain good electrical contact with the external circuit and shall so secured in the battery that they are not displaced by insertions and withdrawals in normal use.

7 REQUIREMENTS

7.1 The performance requirements of batteries R03, R6, R14, R20 and 6F22 shall be as given in Tables 7A, 7B, 7C, 7D and 7E respectively.

NOTE — Representative applications as mentioned in Tables 7A, 7B, 7C, 7D and 7E are only test cases and do not restrict usage of battery.

7.2 The general requirements as applicable to this standard shall be as per IS 6303.

8 MARKING

8.1 The marking shall be done in accordance with 4.1.6 of IS 6303.

8.2 In addition to 8.1, the battery confirming to corresponding category Standard or High Power shall be marked as S or P respectively.

NOTE — In case of 6F22 and R03, marking of category is not applicable.

9 TESTS

9.1 General provision of 5.3 to 5.7 and 6.0 of IS 6303 shall apply.

9.2 Type tests

9.2.1 *Following shall constitute types tests.*

- Checking of dimensions and terminals, (5 and 6)
- Checking of markings, (8)
- Initial life test, (9.4)
- Delayed life test, (9.5)
- Leak test, (9.6) and
- Delayed life test under dry heat conditions (9.7).

9.2.2 Samples for Type Tests

The number of samples for each battery designation and each application required for type tests shall be as under:

Test	Number of Samples
Checking of dimensions, terminals and markings	All samples given below
Initial life test	9 pcs
Delayed life test	9 pcs

9.3 Lot Acceptance Tests

The following shall constitute the acceptance tests.

- a) Initial life test of specified lot acceptance test given in Tables 7A, 7B, 7C, 7D and 7E.
- b) Sampling, inspection, testing and acceptance quality level shall be in accordance with 7.0 of IS 6303.

9.4 INITIAL LIFE TEST

9.4.1 The test shall be carried out in accordance with 5.3 and 6.0 of IS 6303 and Tables 7A, 7B, 7C, 7D and 7E.

9.4.2 The following readings shall be taken:

- a) Initial closed-circuit voltage, and
- b) Closed circuit voltage at the end of each discharge period.

9.4.3 The test shall be continued until the closed circuit voltage of the battery falls below the appropriate end point voltage specified in Tables 1, 2, 3 and 4. The life of the battery shall include full discharge period for the day during which the voltage drops for the first time below the specified end point for the battery.

9.4.4 Batteries shall not show leakage during or at the end of the test.

9.5 DELAYED LIFE TEST

9.5.1 Test shall be done in accordance with 5.3 and 6.0 of 6303.

9.5.2 The batteries shall be stored for period as specified in Tables 7A, 7B, 7C, 7D and 7E.

9.5.3 After storage the batteries shall be tested in accordance with 9.4. The batteries shall meet the requirements specified in Tables 7A, 7B, 7C, 7D and 7E.

9.5.4 Batteries shall not show any leakage.

9.6 LEAKAGE TEST

Leak test shall be done as per 5.7 of IS 6303. No electrolyte, sealing compound or other internal component shall appear on any of the external surface of the battery.

9.7 DELAYED LIFE TEST UNDER DRY HEAT CONDITIONS

9.7.1 The batteries shall be stored in accordance with Table 4 of IS 6303.

9.7.2 After storage the batteries shall be tested for life as in 9.4. The rated life of the batteries shall be not less than the appropriate values in Tables 7A, 7B, 7C, 7D and 7E.

NOTE — The life of the batteries after delayed life test are under consideration.

9.7.3 The batteries shall not show leakage during storage, during discharge or at the end of the discharge.

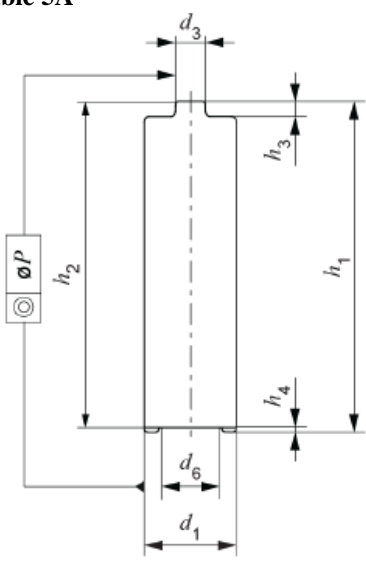
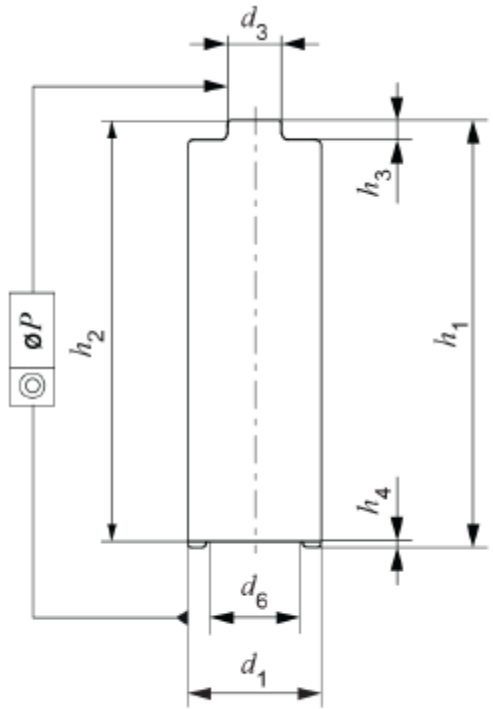
Table 5A		Dimensions		R03
 <p>Dimensional drawing: R03</p>	h_1	max.	44.5	
	h_2	min.	43.5	
	h_3	min.	0.8	
	h_4	max.	0.5	
	d_1	max.	10.5	
		min.	9.8	
	d_3	max.	3.8	
	d_6	min.	4.3	
	$\varnothing P$	max.	0.4	
	nominal voltages			
	V_n (V)			1.5
	OCV max. (V)			1.73

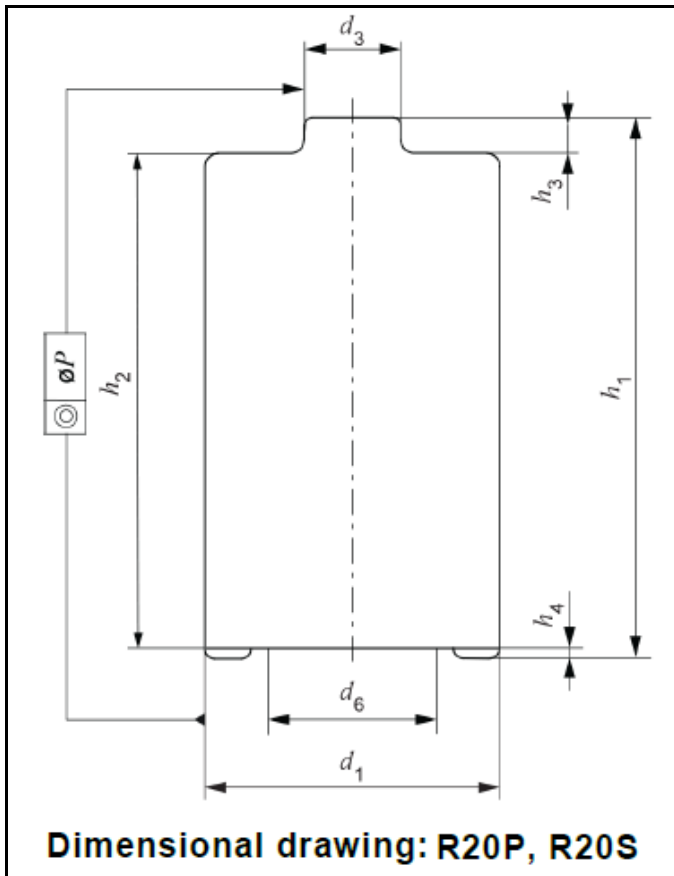
Table 5B		Dimensions		R6P, R6S
 <p>Dimensional drawing: R6P, R6S</p>	h_1	max.	50.5	
	h_2	min.	49.5	
	h_3	min.	1.0	
	h_4	max.	0.5	
	d_1	max.	14.5	
		min.	13.7 ^a	
	d_3	max.	5.5	
	d_6	min.	7.0	
	$\varnothing P$	max.	0.5	
	nominal voltages			
	V_n (V)			1.5
	OCV max. (V)			1.73

^a R6 types without a metal jacket may have a d_1 value of 13,5.

Table 5C

		Dimensions		R14P, R14S
		h_1	max.	50.0
h_2	min.	48.6		
h_3	min.	1.5		
h_4	max.	0.9		
d_1	max.	26.2		
	min.	24.9		
d_3	max.	7.5		
d_6	min.	13.0		
$\varnothing P$	max.	1.0		
nominal voltages				
V_n (V)				1.5
OCV max. (V)				1.68

Dimensional drawing: R14P, R14S



Dimensions		R20P, R20S
h_1	max.	61.5
h_2	min.	59.5
h_3	min.	1.5
h_4	max.	1.0
d_1	max.	34.2
	min.	32.3
d_3	max.	9.5
d_6	min.	18.0
$\varnothing P$	max.	1.0
nominal voltages		
Vn (V)		1.5
OCV max. (V)		1.73

Table 5E

		Dimensions		6F22
		$h1$	max.	48.5
		$h1$	min.	46.5
		$h6$	max	46.4
		$h6$	min	-
		$l1$	max.	26.5
		$l1$	min.	24.5
		$l2$	max.	17.5
		$l2$	min.	15.5
		$l3$	max.	12.95
		$l3$	min	12.45
		nominal voltages		
		V_n (V)		9.0
		OCV max. (V)		10.4

Dimensional drawing: 6F22

Table 7A Performance Requirements of Battery R03

(Clauses 7.1, 9.4.1, 9.4.3, 9.5.2 and 9.5.3)

Sl. No.	Resistance (Ω)	Discharge Schedule	End Voltage	Life - Initial	Life - After 12 months	Life - Delayed Under Dry	Representative Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	5.1	at hourly Intervals for 8 hours per for 8 hours per day	0.9	50 min	38 min	35 min	Flash light
ii)	75	4 hours per day	0.9	18 h	13.5 h	12.7 h	Radio/clock
iii)	24	15s ON, 45s OFF	1.0	4 h	3.0 h	2.8 h	Remote control
iv)	5.1	1 hour per day	0.80	30 min	23 min	21 min	Toy
v)	50 mA	1 hour per 12 hour	0.90	3 h	2.3 h	2.1 h	Digital audio
vi)	5.1	Continuous	0.9	30 min	23 min	21 min	Accelerated/Lot acceptance test

Table 7B Performance Requirements of Battery R6S (Standard) and R6P (High Power)

(Clauses 7.1, 9.4.1, 9.4.3, 9.5.2 and 9.5.3)

Sl. No.	Resistance (Ω)	Discharge Schedule	End Voltage (V)	Life - Initial	Life – After 12 months	Life – Delayed Under Dry Heat Conditions	Representative Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R6P (high power)							
i)	3.9	1 h per day	0.8	60 min	45 min	42 min	Motor/Toy
ii)	3.9	4 min beginning at hourly intervals for 8 hour per day	0.9	60 min	45 min	42 min	LED portable lighting
iii)	100 mA	1 hour per day	0.9	4.5 hours	3.4 h	3,2 h	Digital audio, Wireless gaming accessories
iv)	50 mA	1 hr ON, 7 hr OFF, 24 hr / day	1.0	11.0 h	8.3 h	7.7 h	Radio / Clock / Remote Control
v)	3.9	Continuous	0.9	50 min	38 min	35min	Accelerated/Lot acceptance test
R6S (standard)							
vi)	4.3	4 h per day	0.9	22.0 h	16.5 h	15.4h	Radio/Clock
vii)	3.9	1 h per day	0.8	45 min	34 min	31.5 min In	Toy
viii)	3.9	Continuous	0.9	30 min	23 min	21min	Accelerated/Lot acceptance test

Table 7C Performance Requirements of Battery R14S (Standard) and R14P (High Power)

(Clauses 7.1, 9.4.1, 9.4.3, 9.5.2 and 9.5.3)

Sl. No.	Resistance (Ω)	Discharge Schedule	End Voltage (V)	Life - Initial	Life – After 12 months	Life – Delayed Under Dry Heat Conditions	Representative Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R14P (high power)							
i)	3.9	4 min beginning at hourly intervals for 8 h per day	0.9	270 min	203 min	190 mineration	Portable lighting
iii)	3.9	1 h per day	0.8	3.0 h	2.3 h	2.1h	To y
iv)	3.9	Continuous	0.9	120 min	90 min	84 min	Accelerated/Lot acceptance test
R14S (standard)							
v)	3.9	4 min beginning at hourly intervals for 8 h per day	0.9	120 min	90 min	84 min	Portable lighting
vi)	3.9	1 h per day	0.8	90 min	68 min	63min	To y
vii)	3.9	Continuous	0.9	60 min	45 min	42min	Accelerated/Lot acceptance test

Table 7D Performance Requirements of Battery R20S (Standard) and R20P (High Power)

(Clauses 7.1, 9.4.1, 9.4.3, 9.5.2 and 9.5.3)

Sl. No.	Resistance (Ω)	Discharge Schedule	End Voltage (V)	Life - Initial	Life – After 12 months	Life – Delayed Under Dry Heat Conditions	Representative Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R20P (high power)							
i)	2.2	4 min beginning at hourly intervals for 8 h per day	0.9	250 min	188 min	175 min	Portable lighting
ii)	1 0	4 hour per day	0.9	18.0 h	13.5 h	12.7 h	Radio
iii)	2.2	1 hour per day	0.8	3.5 h	2.6 h	2.5h	To y
iv)	3.9	Continuous	0.9	240 min	180 min	170min	Accelerated/Lot acceptance test
R20S (standard)							
v)	2.2	4 min beginning at hourly intervals for 8 h per day	0.9	100 min	75 min	70min	Portable lighting
vi)	1 0	4 h per day	0.9	15.0 h	111.2 h	10.5h	Radio
vii)	2.2	1 h per day	0.8	2.0 h	1.5 h	1.4h	To y
viii)	3.9	Continuous	0.9	160 min	120 min	115min	Accelerated/Lot acceptance test

Table 7E Performance Requirements of Battery 6F22

(Clauses 7.1, 9.4.1, 9.4.3, 9.5.2 and 9.5.3)

Sl. No.	Resistance (Ω)	Discharge Schedule	End Voltage	Life - Initial	Life – After 12 months	Life – Delayed Under Dry Heat Conditions	Representative Applications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	270	One hour per day	5.4	7.0 h	5.3 h	5.3 h	Toy
ii)	620	2 hour per day	5.4	24 h	18.0 h	18.0 h	Clock radio
iii)	Background 10 kΩ Pulse 0.62 kΩ	1 sec On, 3599 sec Off for 24 h per day	7.5	8 days	6 days	6 days	Smoke detector