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FEB/10/2004

SPECIFICATION OF PRODUCTS

TYPE : LR20

MADE IN JAPAN

FDK CORPORATION
BATTERY DIVISION
QUALITY CONTROL SECTION

H. KOBAYASHI

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(MANAGER)

1. Scope

This specification provides the certification of the quality for LR20 type Alkaline Manganese Battery (Mercury free, Made in Japan) of FDK CORPORATION.

2. General

- 2.1 Type designation : LR20
- 2.2 Nominal voltage : 1.5 V
- 2.3 Shape and dimension : Refer to attached Fig. 1
- 2.4 Typical weight : 133 g
- 2.5 Terminals : Plus = Cap terminal, Minus = Base terminal
- 2.6 Operating temperature range : $-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$ (In the state of over 40°C , within 30 days.)

3. Quality characteristics

- 3.1 Dimensions : Refer to attached Fig. 1
- 3.2 Appearance : There shall be no dirt, scratch nor deformation detrimental to practical service in appearance.
- 3.3 Electrical characteristics

(Table. 1)

Item	Characteristics		Conditions
Off-load voltage (V)	Initial	$1.50+0.15$ -0	Voltmeter : The tolerances shall be below 0.25% of Nominal voltage. Input resistance = Above 1 M Ω /V
	After storage of 12 months	$1.50+0.15$ -0.05	
On -load voltage (V)	Initial	Above. 1.40V	Voltmeter : Same as above Load resistance : $5\pm 0.025 \Omega$ Measure time : Within 1 second
	After storage of 12 months	Above. 1.37V	
Average duration of 2 Ω Continuous (hours)	Initial	Above. 12.5	Connecting a load resistance ($2\pm 0.01 \Omega$) and discharging Continuously. End point voltage : 0.9V
	After storage of 12 months	Above. 10.0	

- Note
- 1) Values in table 1 shall be measured at $20\pm 2^{\circ}\text{C}$, $65\pm 20\%$ Rh.
 - 2) The battery shall be stored at $20\pm 2^{\circ}\text{C}$, $65\pm 20\%$ Rh.
 - 3) The average value of duration shall be tested on 9 batteries.
 - 4) The load resistance shall be understood to include all resistance of external circuit, and the tolerances thereon shall be $\pm 0.5\%$.
The resistance shall not exceed the tolerances even when the resistor generates heat due to discharge.

3.4 Resistance to leakage proof

(Table. 2)

Item	Condition	Characterisitics
Over discharge	There shall be based on condition of the duration test of clause 3.3 . The examination ending time when on-load voltage became below 40% of nominal voltage for the first time.	Leakage and deformation shall not be observed With the naked eye, during the storage and duration test.
High temperture strage	The batteries stored for 30 days. at 45 ± 2 °C, below 70%Rh	

4. Inspection

4.1 Inspection lot : 1 inspection lot shall be determined by marking code on the products.

4.2 Test method and criteria of judgment : The item in table 3 should be tested, and table 3 should be applied to the criteria of judgment too.

(Table 3)

Testing item	Sampling method	Sampling quantity	Count of judgment		AQL
			A c	R e	
OFF-load voltage	MIL-STD-105D Level II single sampling normal inspection.	Using Sampling table	Using Sampling table	Using Sampling table	0.65 %
On -load voltage	Same as above.	Same as above.			1.0 %
Appearance	Same as above.	Same as above.			2.5 %
Dimension	Constant sampling	10	0	1	—
Duration time	Constant sampling	9	Note 3)		—
Leakage proof (C and D shall be reference.)	A Constant sampling	10	0	1	—
	B Constant sampling	20	0	1	—
	C MIL-STD-105D Level II single sampling normal inspection.	Using Sampling table	Using Sampling table	Using Sampling table	0.65 %
	D Constant sampling	20	1	2	—

Note 1) A=Performance of leakage proof in the case of over discharge
 B=Performance of leakage proof in the case of high temperature
 C=Leakage on arrival at warehouse (within two months after shipping)
 D=After the battery stored for 12 months at 20 ± 15 °C, 65 ± 20 %.
 2) Judgment of lot shall be made on each testing item.
 3) Acceptance / rejection in accordance with IEC publication 86-1.

- 4.3 Criteria of quality: Based on from table 1 to table 3.
- 4.4 Testing method : Based on table 1 and table 2. The vernier calliper with a minimum readable value of 0.05mm and a measuring length of not more than 200mm or apparatus at least equivalent in accuracy shall be used as the dimension measuring apparatus.
- 4.5 Treatment of rejected goods
 - 4.5.1: The rejected lot is returned to FDK in principle.
 - 4.5.2: The unusual quality and the other problem shall be discussed by each other.

5. Doubt and Revised

The problem and the revision that related to this specification shall be determined by each other.

Precaution for handling

Pay attention to next point due to safe security, because if batteries are misused or abused, electrolyte leakage, heating and explosion may result.

1. Handling precaution for safety

1-1 : If batteries are misused or abused, electrolyte leakage, heating, explosion and personal injury may result.

- a. Do not charge batteries.
- b. Place batteries correctly with regard to polarity of + and -.
- c. Do not short circuit the + and - of battery by a wire or other metals.
- d. Do not throw batteries into fire.
- e. Do not heat batteries.
- f. Do not leave or use batteries in the place of the high temperature such as car inside under blazing heat.
- g. Do not disassemble batteries.
- h. Do not deform batteries by pressurizing them or dropping them.
- i. Exhausted batteries should be immediately disposed of.

1-2 : When batteries are overdischarged, electrolyte leakage may occur causing damage to the appliance.

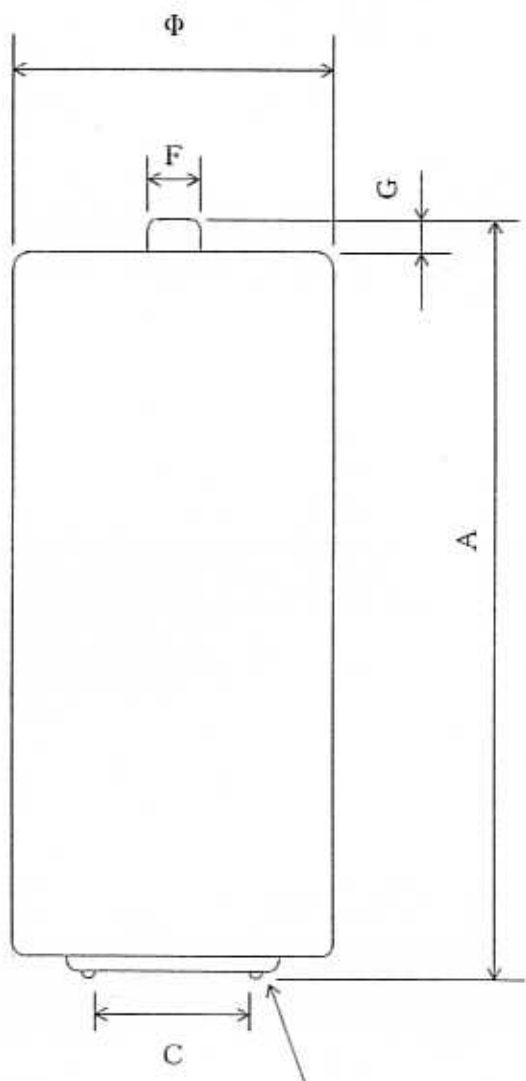
- a. Do not forgot to switch off.
- b. When the appliance is not used for long time, batteries should be removed from it.
- c. Take out the finished batteries quickly from the equipment.
- d. Do not mix batteries of different kind, manganese dry battery, alkaline battery and so on.
- e. Do not mix used batteries and new ones for use.
- f. Pay attention to leakage in overdischarged state, in the case that batteries are used as the power supply for the memory backup. (The feeble current is the system that continuous to flow even if in many cases, the power supply for the memory backup turns off the power switch.)

2. Precaution for transportation and storage

2-1 : Because there be promote of the performance deterioration, electrolyte leakage, occurrence of rust and damage.

- a. Do not do such xiolent handling that throws the packing of battery at during transportation.
- b. Do not expose batteries to the direct ray at during transportation and storage, and also do not wet batteries with rain.
- c. Keep in the place of low humidity (less than 70%RH) with normal temperature ($20 \pm 15^{\circ}\text{C}$) regarding storage of batteries.

Fig. 1 LR20 DIMENSION



	DIMENSION
* A	61.5 Max.
C	18.0 Min.
F	9.5 Max.
G	1.5 Min.
Phi	34.2 Max. 32.3 Min.

(m/m)

*Remark: Dimension A includes "Insulated projection" on anode disk.

Insulated projection (3 points)

SPECIFICATION OF PACKING

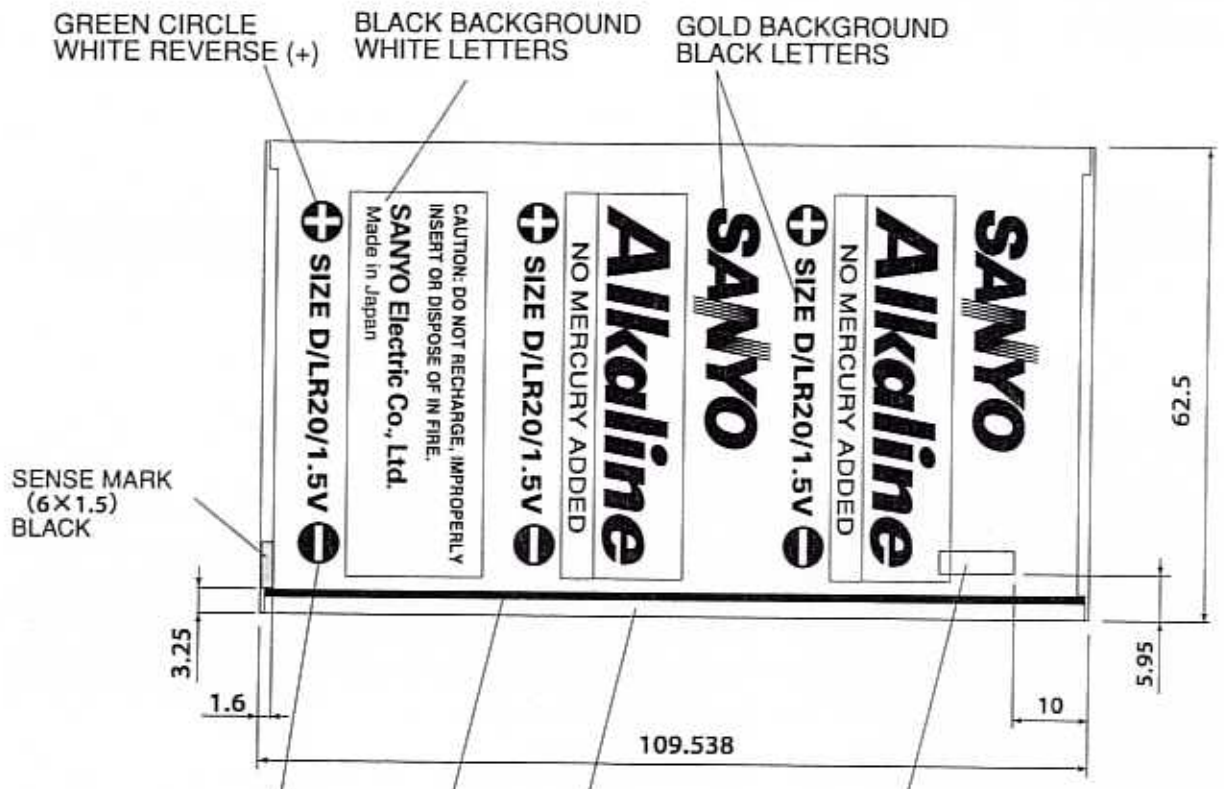
ITEM : LR20/2B (A)
(60Packs)

FDK CORPORATION
BATTERY DIVISION
PACKING ENGINEERING SECTION

Y. Ishiguro

Y. ISHIGURO
(MANAGER)

(Label Design)



BLACK CIRCLE WHITE REVERSE (-)

BLACK LINE

WHITE (70%) LINE

SPACE FOR DATE CODING (NON VARNISH) (10X3)

BLUE 3% 100%

NOTE1. 5 COLORS PRINTING

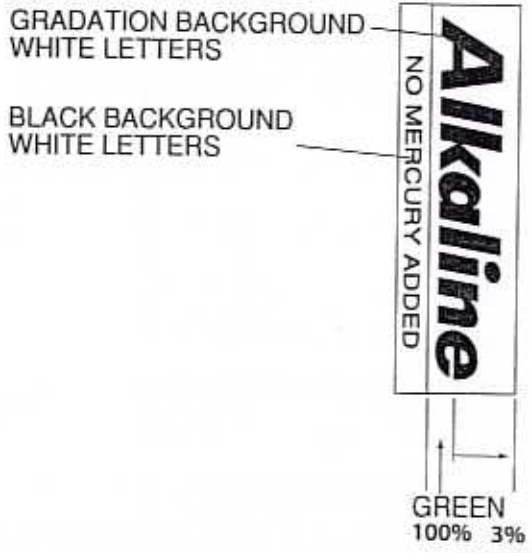
GOLD : SAME AS CURRENT ITEM

GREEN : PANTONE 3405C

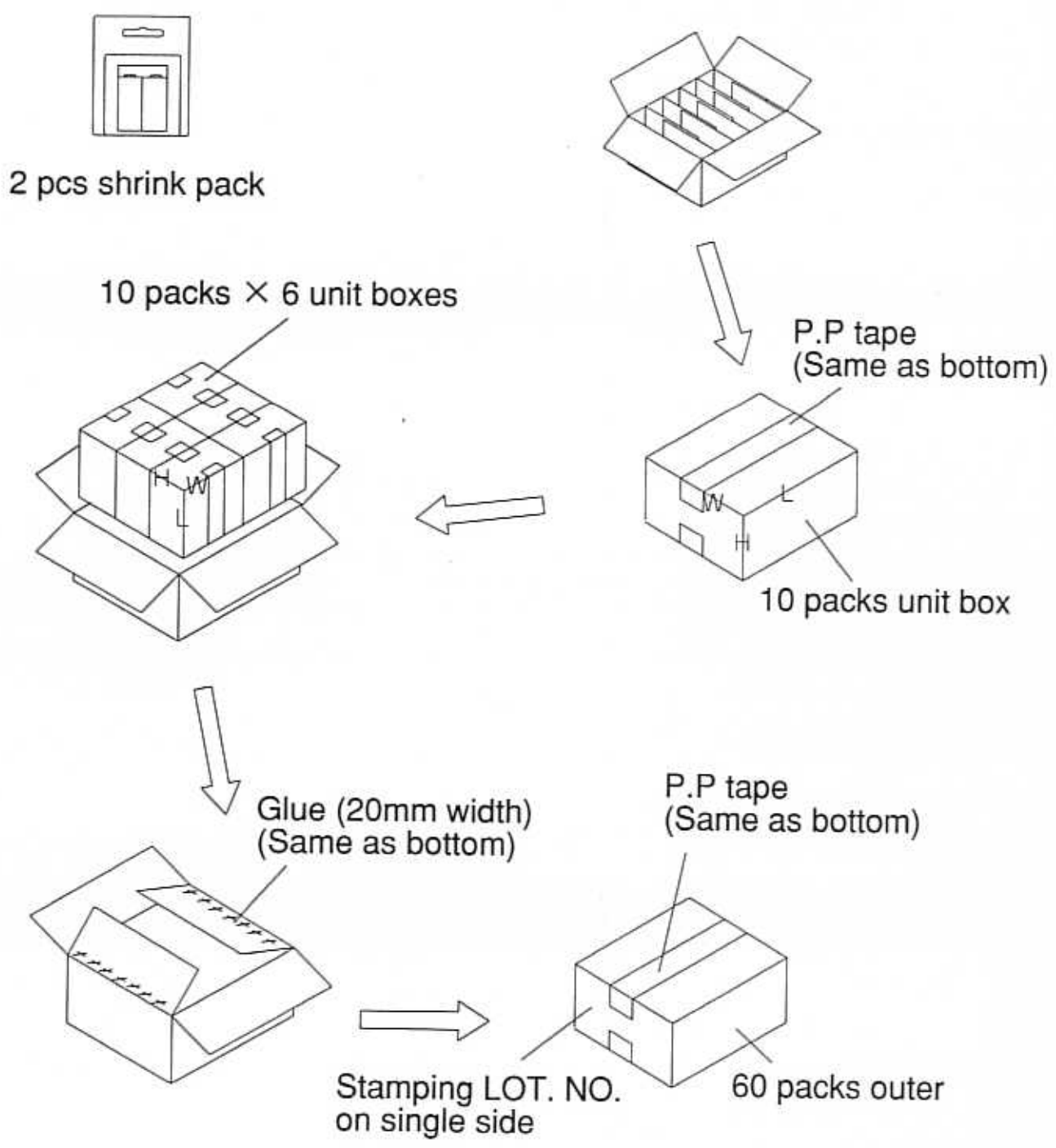
BLUE : PANTONE BLUE 072C

WHITE

BLACK



(Packing Way)

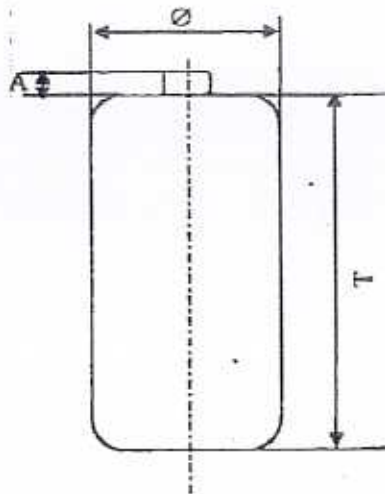


SPEKIFIKASI

**R20S (STANDARD - 0956)
MERCURY ADDED**

1. DIMENSION (SATISFY I.E.C, JIS, ANSI STANDARD)

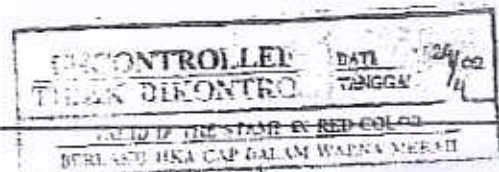
ITEM	MAX	MIN	RQL
TOTAL HEIGHT (T)	61.5 mm	59.5 mm	n = 30 , Ac = 0 , Re = 1
DIAMETER (Ø)	34.2 mm	32.2 mm	n = 30 , Ac = 0 , Re = 1
HEIGHT OF CAP (A)	----	1.5 mm	n = 30 , Ac = 0 , Re = 1



2. O.C.V. AND C.C.V. CHARACTERISTIC

STANDARD	INITIAL		1 YEAR		2 YEARS	
	MIN	AQL (%)	MIN	AQL (%)	MIN	AQL (%)
O.C.V.	1.57 V	0.65 %	1.52 V	1.00 %	1.5 V	1.5 %
C.C.V. (2 Ω)	1.41 V	0.65 %	1.33 V	1.00 %	1.27 V	1.5 %

SAMPLING METHOD : MIL - STD - 105D LEVEL II SINGLE SAMPLING
NORMAL INSPECTION



APPROVED :

REVISION : 0

DOCUMENT NO. : QAS 03 QA 074

DATE : 16/01/2002

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SPECIFICATION

R20S (STANDARD - 0956) MERCURY ADDED

3. DISCHARGE PERFORMANCE (TEMPERATURE $20 \pm 2^\circ\text{C}$, HUMIDITY $65 \pm 20\%$)

STANDARD	LOAD (Ω)	METHOD		INITIAL		1 YEAR		2 YEARS	
		DAILY PERIOD	END POINT(V)	AVE	MIN	AVE	MIN	AVE	MIN
JIS C8501-1998 86-2IEC-1996 ANSI C18.1M-1992	2.2 Ω	4MHX8	09V	310 M	280 M	280 M	250 M	185 M	150 M
JIS C8501-1998 86-2IEC-1996 ANSI C18.1M-1992	2.2 Ω	1H	08V	3.8 H	3.4 H	3.0 H	2.8 H	2.4 H	2.0 H
JIS C8501-1998 86-2IEC-1996 ANSI C18.1M-1992	3.9 Ω	1H	09V	9.5 H	8.5 H	8.2 H	7.4 H	7.4 H	5.8 H
JIS C8501-1998 86-2IEC-1996	10 Ω	4H	09V	32 H	29 H	30 H	27 H	26 H	24 H
JIS C8501-1998	20 Ω	4H	09V	83.0 H	79.0 H	80.0 H	75.0 H	72.0 H	62.0 H
SNI 04-2051-1990	4 Ω	30M	085V	870 M	805 M	810 M	750 M	620 M	570 M
-	2 Ω	24H	09V	130 M	117 M	85 M	75 M	75 M	65 M
-	4 Ω	24H	09V	390 M	360 M	320 M	290 M	290 M	250 M

INITIAL: START TEST WITHIN 1 MONTH.

4. LEAKAGE TEST :

- JIS C8501 - 1998 :
STORE AT TEMPERATURE $45 \pm 2^\circ\text{C}$ (RELATIVE HUMIDITY 70% MAX) FOR 1 MONTH,
NO LEAKAGE.
- 86-1 IEC - 1996 & JIS C8501-1998 :
DISCHARGE TO 0.6 V, NO LEAKAGE

5. APPEARANCE (INITIAL)

NO.	ITEM	AQL (%)
1	SERIOUS CORROSION ON METAL PARTS	0.65
2	DAMAGE AND DEFORMATION	0.65
3	SERIOUS PRINTING DEFECT	0.65
4	ADHERING FOREIGN MATTER	1.5
5	SCRATCH	0.65
6	LEAKAGE (INITIAL / 1 YEAR / 2 YEARS)	0.15 / 0.65 / 1.5

SAMPLING METHOD : MIL - STD - 105D LEVEL II SINGLE SAMPLING
NORMAL INSPECTION

CONTROLLED	DATE 24/02
DISCONTINUED	REASON

APPROVED :

REVISION : 0

DOCUMENT NO. : QAS 03 QA 074

DATE : 16/01/2002

DATE : 2 OF 2