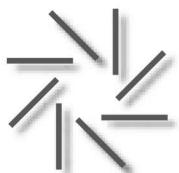


# ALKALINE STATIONARY BATTERY

**QKC QSC QFD QFG**



# CONTENT

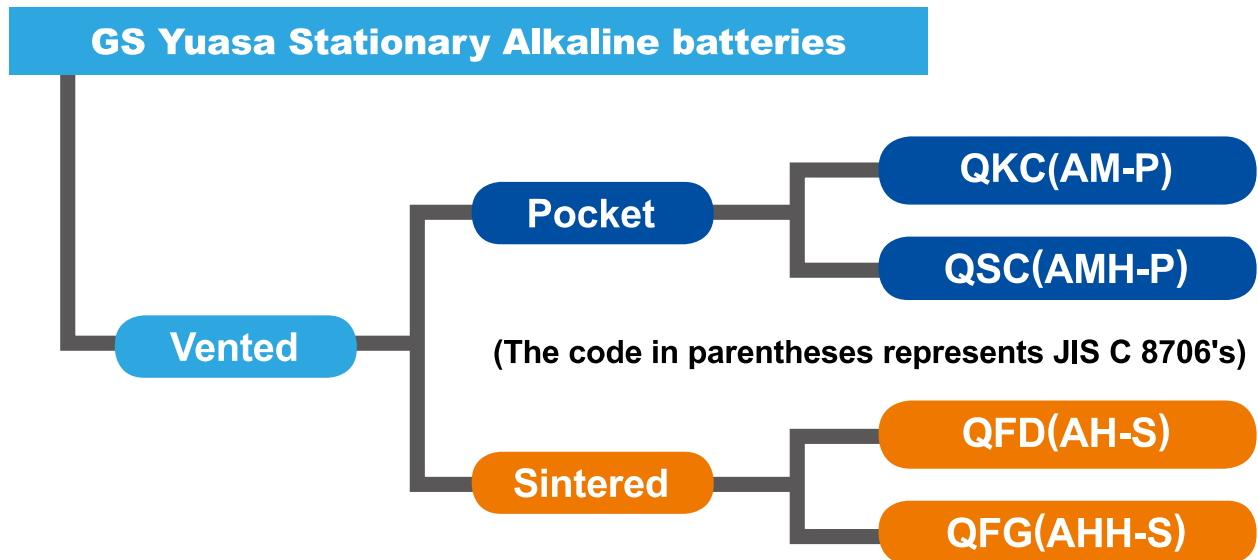
Table of Contents .....	1
Classification by Battery Type .....	2
Classification by Application .....	2
Structure .....	3
Features of GS Yuasa's Alkaline batteries .....	4
Constant Current and Constant Voltage Charge (Floating Charge System) .....	6
Discharge Characteristics for Alkaline batteries .....	7- 8
Specification of Pocket type (QKC, QSC) .....	9-10
Specification of Sintered type (QFD, QFG) .....	11-12
Comparison between Pocket type & Sintered type .....	13
Safety precautions .....	14

# 1. Classification by Battery Type

## Types of Alkaline batteries

Alkaline batteries are classified according to structure, characteristics, etc. as shown in Table 1.

**Table 1: Classification by Battery Type**



# 2. Classification by Application

GS Yuasa's stationary alkaline batteries are classified according to application (example) as shown in Table 2.

**Table 2: Classification By Application for Alkaline battery**

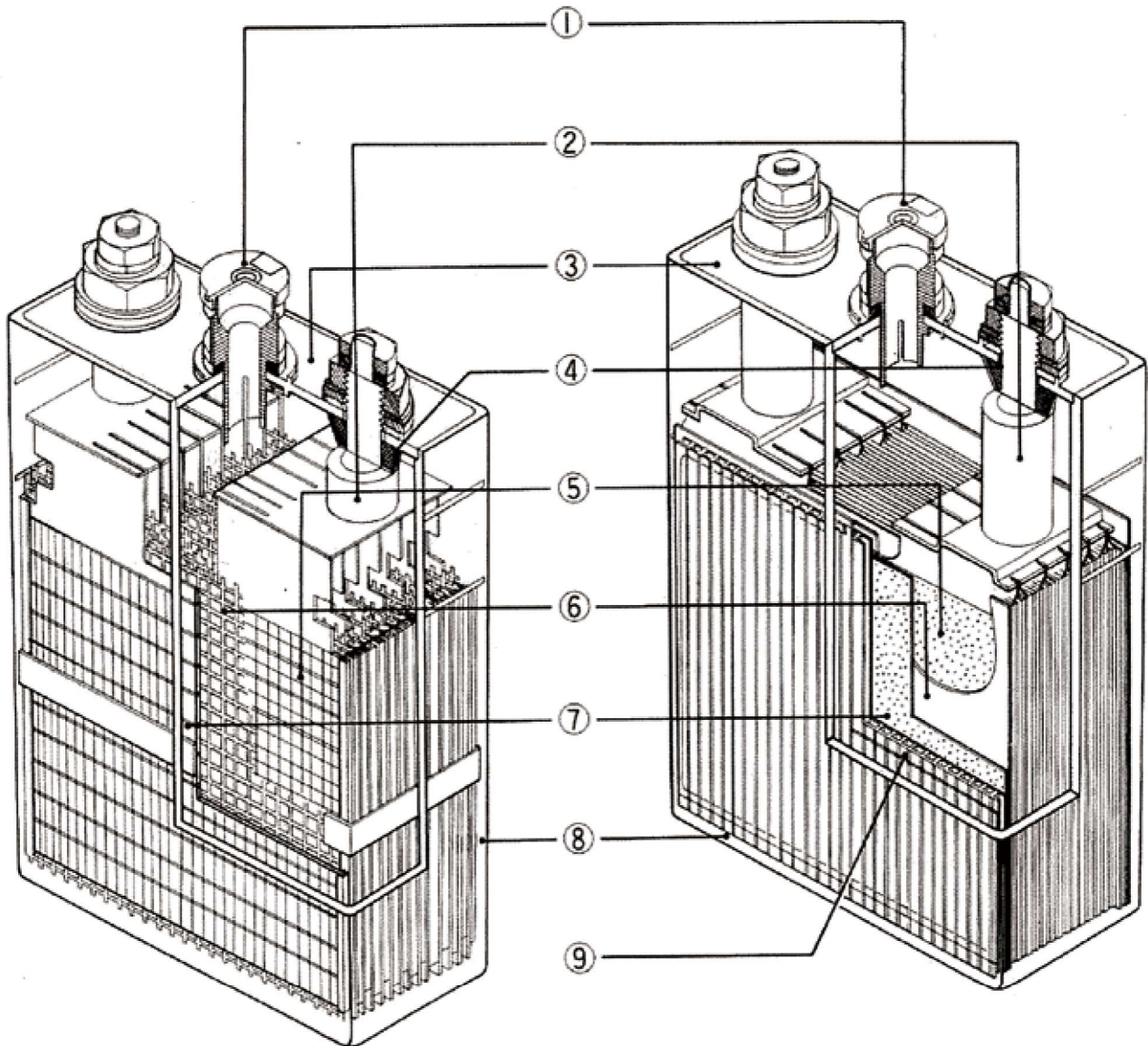
Classification	GS Yuasa type	JIS type (IEC)	Load hold time					
			15	30	60	100	150	200min
Pocket	QKC	AM-P (KL)						UPS, emergency power source for trains, lighting for trains, ships, telecommunication, transportable equipment, solar cells.
	QSC	AMH-P (KM)						UPS, battery equipment based on Building Standard Law, engine starting, power station/substation operation & control.
Sintered	QFD	AH-S (KH)						UPS, engine starting, equipment operation, battery equipment based on Building Standard Law and Fire Defense Law.
	QFG	AHH-S (KX)						UPS, engine starting, other high rate discharge direct current power supply

### 3. Structure

The structure of alkaline batteries is exemplified in the figure below.

Pocket Type

Sintered Type



**Table5:Main Parts of Alkaline batteries**

No.	Names of Parts
1	Vent plug
2	Pole
3	Lid
4	Packing
5	Negative plate
6	Separator
7	Positive plate
8	Battery container
9	Spacer

**Table 3: Structure of Alkaline batteries**

Main Parts		Type	Pocket Type Battery (QKC, QSC)	Sintered Type Battery (QFD, QFG)
		Cell	Plate	
Battery Container			The battery container is made of alkali-resistant synthetic resins, making the inside of the battery visible. Furthermore, two reference lines for electrolyte level such as MAX. and MIN. are marked on the surface of the container to facilitate maintenance. The container and the lid are bonded and equipped with vent plugs.	
Separator			Made of high quality synthetic resins and excellently alkali-resistant, not generating any material harmful to the battery.	
Electrolyte			Aqueous solution, mainly potassium hydroxide, contains no material harmful to the battery. The standard specific gravity is 1.20 (20°C)	
Group of Batteries			Small capacity cells are taped into a group of batteries.	

### 4.Features of GS Yuasa's Alkaline Batteries

(1). Long Service Life (Pocket type & Sintered type)

Our batteries are produced under strict quality control with high quality components for all parts including plates, making our batteries long-lived. Furthermore, even after long-term storage our batteries deliver sufficient performance.

Service temperature	Design life	
25°C	20 years	(Design life means expected average tenure of use. Not guaranteed performance)
40°C	15 years	

(2). Over discharge/Overcharge-Proof Batteries (Pocket type & Sintered type)

Even if over discharged or overcharged by mistake, our battery are never degraded like lead acid batteries.

(3). High Performance and No Memory Effect (Pocket type & Sintered type)

Our batteries have no memory effect, which causes capacity fading due to two-stage discharge voltage, and thus show high performance.

(4). Superior Characteristics against High and Low Temperatures (Pocket type & Sintered type)

Superior characteristics can be achieved at a wide range of temperatures from -20°C to 45°C.

(5). No Electrolyte Replacement (Pocket type & Sintered type)

Under normal use conditions, electrolyte replacement is unnecessary up to the end of service life.

(6). Excellent Characteristics for Large Current Discharge (Sintered type)

Our batteries are excellent in the characteristics for large current discharge with low internal resistance using high performance plates.

(7). Superior Charge Efficiency (Sintered type)

Our batteries are superior in charge efficiency and can recover their original capacity through charging to 120% of the discharge.

**Table 4: Basic Specifications of Alkaline batteries**

Type of Battery		Alkaline batteries			
Type of Plate		Pocket		Sintered	
Type	GS Yuasa Type	QKC	QSC	QFD	QFG
	JIS Type	AM-P	AMH-P	AH-S	AHH-P
	IEC Type	KL	KM	KH	KX
Capacity (Ah)	Range	30-1000	20-1000	20-1200	20-1000
	Rating	5 hour rate			1 hour rate
Voltage	Nominal	1.2 V/cell			
	Floating	1.44 V/cell	1.42 V/cell	1.36 V/cell	
	Equalizing	1.58 V/cell	1.58 V/cell	1.47 V/cell	
Main Configuration	Positive Plate	Pocket		Sintered	
	Negative Plate	Pocket		Sintered	
	Separator	Synthetic resin			
	Electrolyte	Potassium hydroxide			
	Specific Electrolyte Gravity	1.20 (20°C)			
	Battery Container	Synthetic resin			
Average design Life		20 years at 25°C			
Maximum Discharge Current (A) (5 seconds)		6 C	10 C	15 C	20 C

(Note) 1. "C" means the value of battery capacity.



## 5.Constant Current and Constant Voltage Charge (Floating Charge System)

### (1). Application of Constant Current charge

Constant current charge is mainly used in initial charge, activation, capacity test, etc.

This method is suitable for short time charge and facilitates determination of amount of charge.

### (2). Application of Constant Voltage Charge (Floating Charge System)

Floating charge system is a widely used charging method. This is now a generally available system as a DC power supply, in which the batteries are connected in parallel with the rectifier and load.

### (3). Amount of charge and charge characteristics

The standard amount of charge is based on Table 5.

An alkaline battery that has discharged the rated capacity is charged at a standard current of 0.2C (5-hour rate) for 7 hours in the case of pocket type and for 6 hours in the case of sintered type.

The values of appropriate charge current and predetermined charge voltage are shown in Table 6.

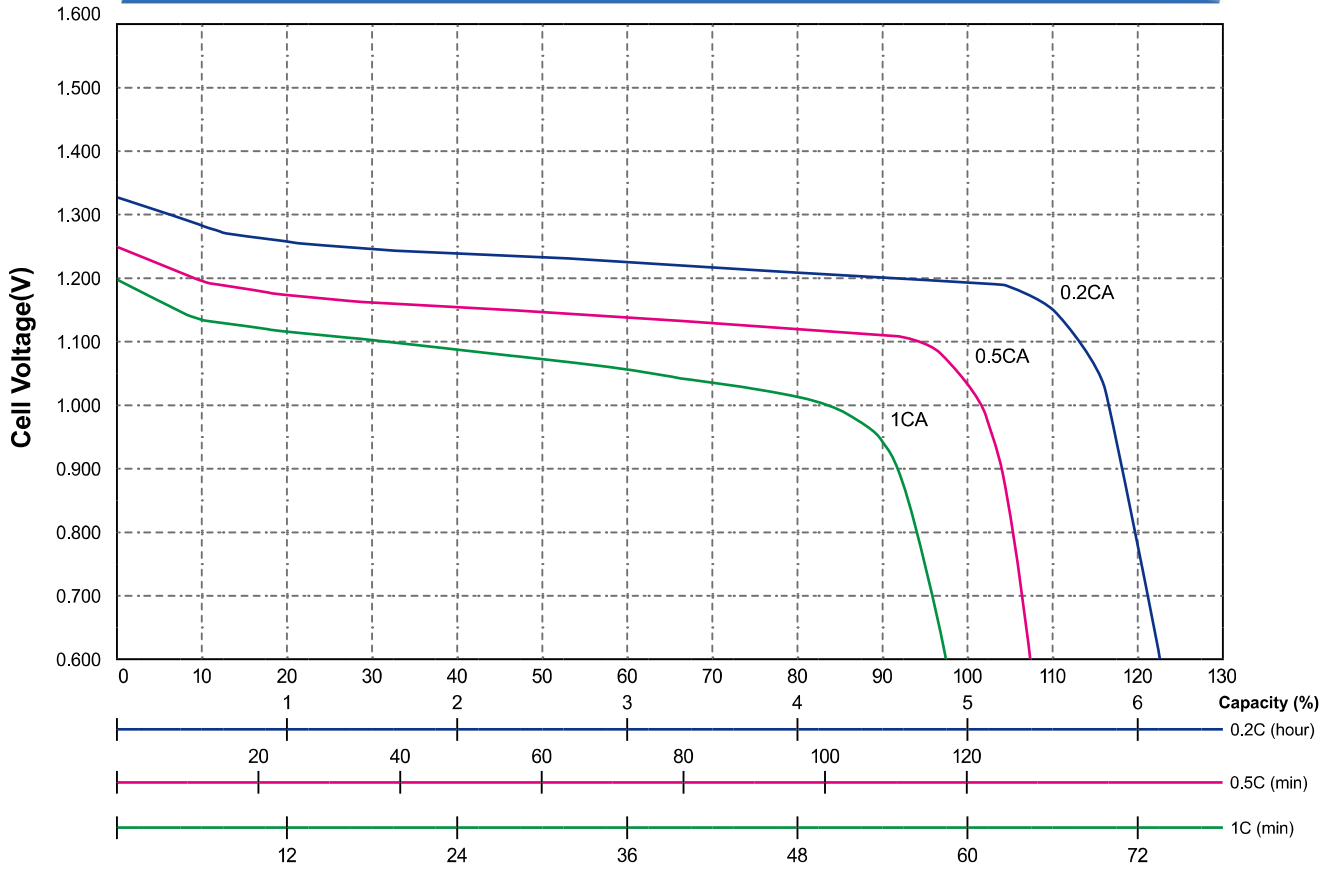
**Table 5: Amount of charge for alkaline batteries**

Type	Amount of charge
Pocket type	140%
Sintered type	120%

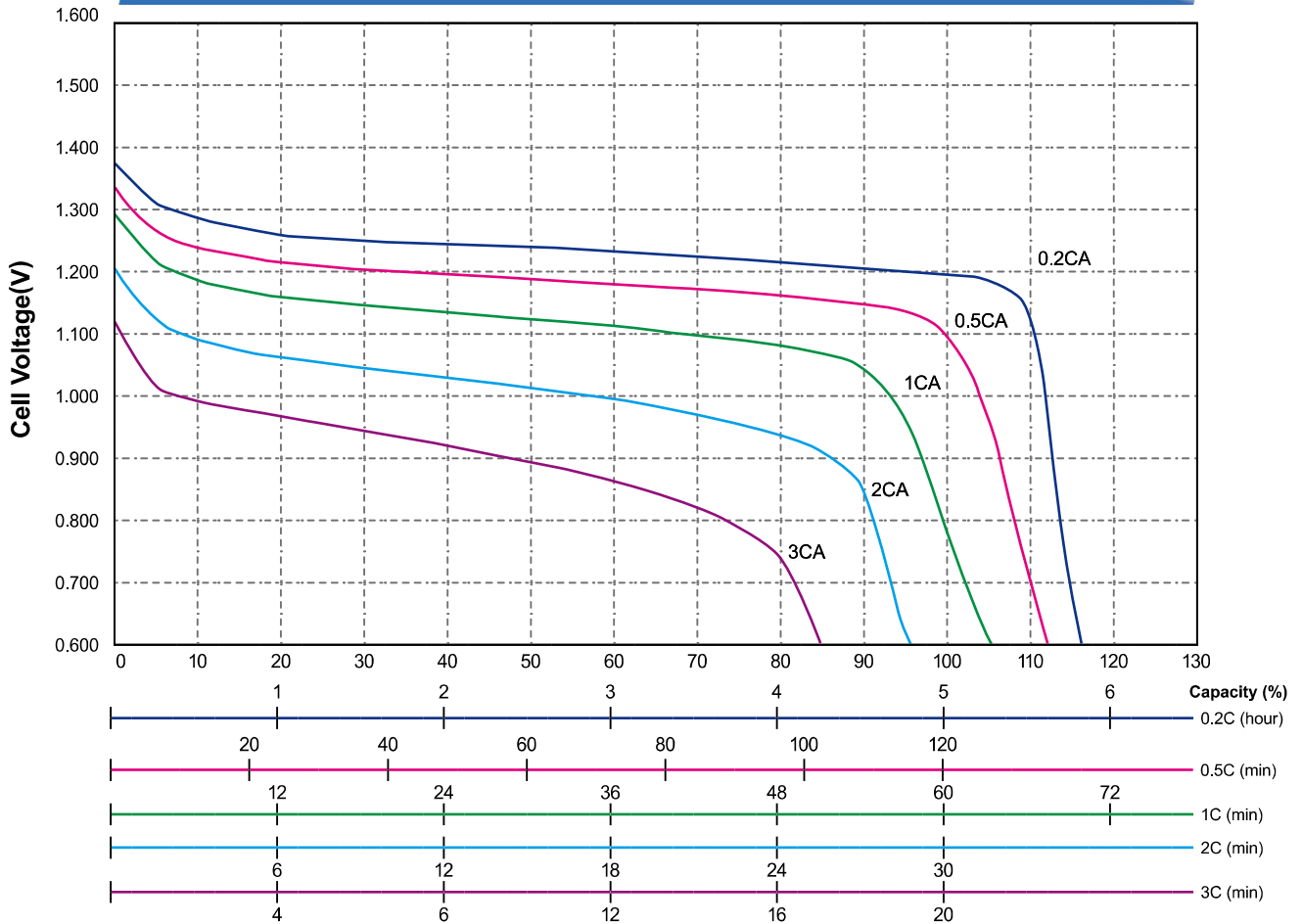
**Table 6: Values of appropriate charge current and predetermined charge voltage for constant current and voltage charge (floating charge system)**

Class	Charge current (A) (Until the set voltage is reached)	Values of predetermined charge voltage (V/cell)			
		Pocket type		Sintered type	
		Floating	Recovering/Equalizing	Floating	Recovering/Equalizing
Maximum value	0.5C				
Standard value	0.1C-0.2C	1.44 (QKC) 1.42 (QSC)	1.58	1.36	1.47
Minimum value	0.05C				

**Graph1. Pocket type:QKC (AM-P) Discharge (25°C)**

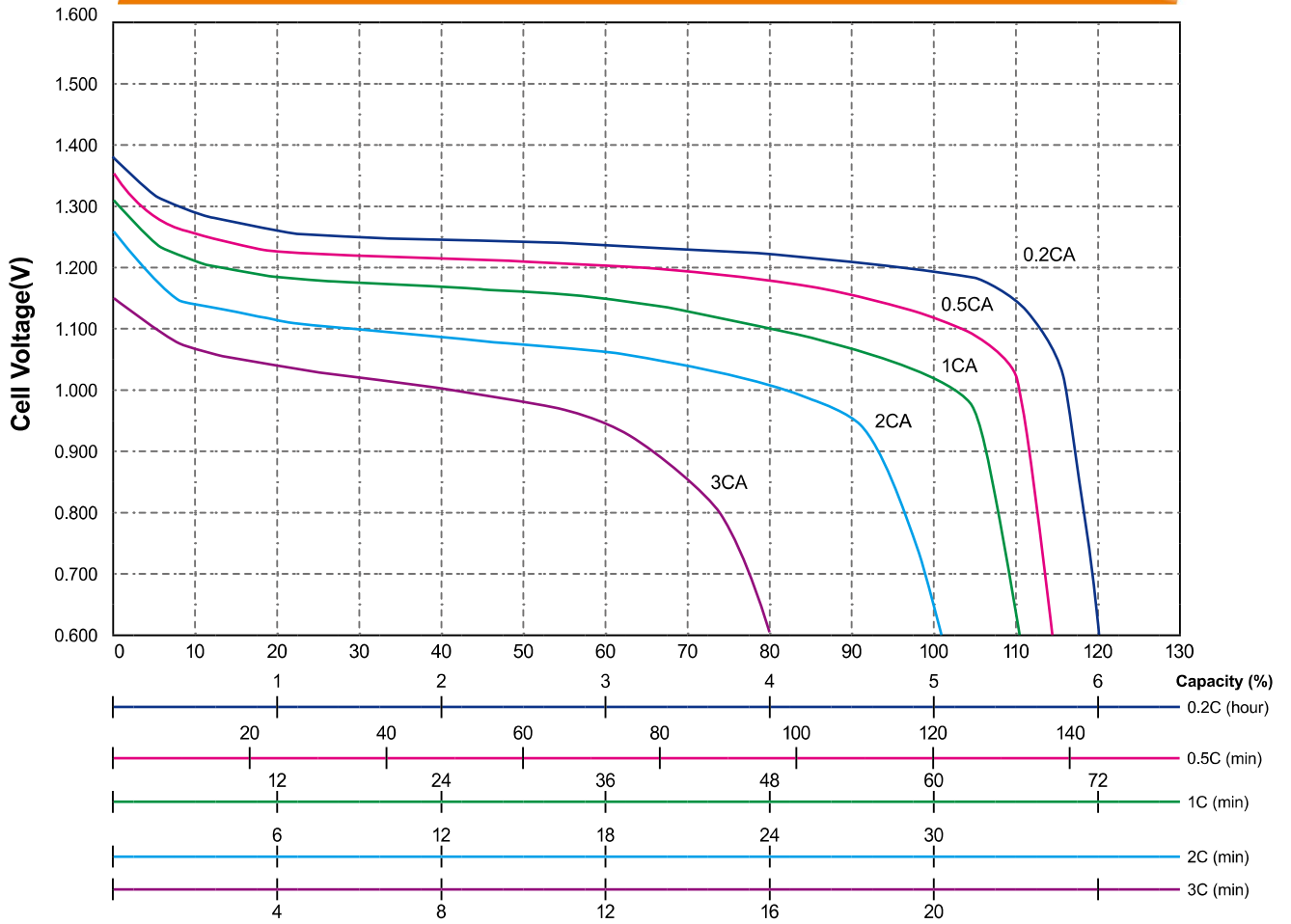


**Graph2. Pocket type:QSC (AMH-P) Discharge (25°C)**

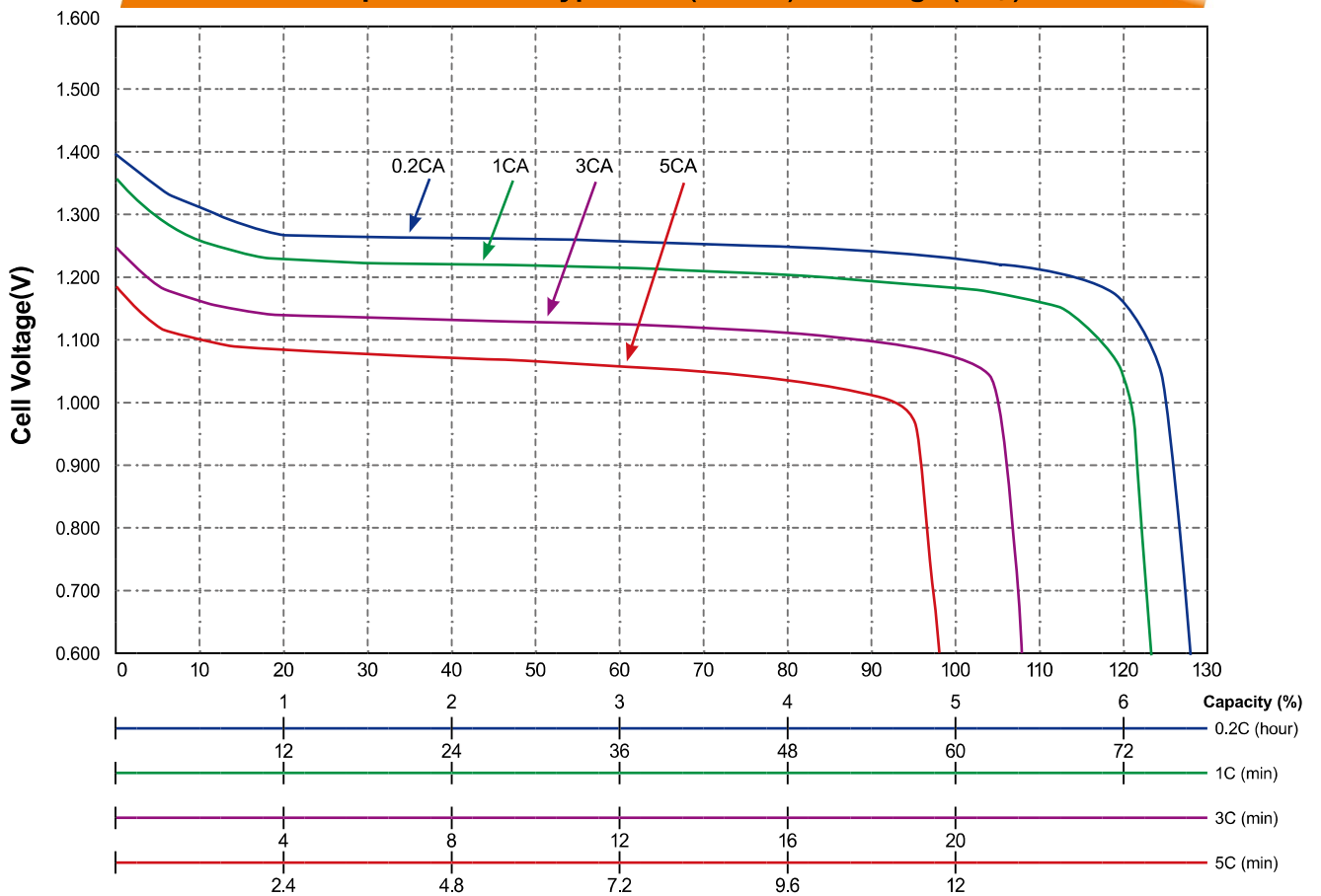




**Graph3. Sintered type:QFD (AH-S) Discharge (25°C)**



**Graph4. Sintered type:QFG (AHH-S) Discharge (25°C)**



## Specification of Pocket Type : QKC(AM-P)

### Capacity, Dimensions and Weight

GS Yuasa Type	JIS type (IEC KH)	Rated Capacity (Ah) 5HR	Weight per Cell with Electrolyte (kg)	Approx. Volume of Electrolyte (litre)	Overall Dimensions(mm)				
					Height	Width	Length		
							Cell	Taped cell group	
5cells	6cells								
QKC 30D	AM 30P	30	2.8	0.90	276	143	52	260	312
QKC 40D	AM 40P	40	2.9	0.80	276	143	52	260	312
QKC 50D	AM 50P	50	3.0	0.70	276	143	52	260	312
QKC 60D	AM 60P	60	4.1	1.2	276	143	75.5	378	453
QKC 80D	AM 80P	80	4.5	1.1	276	143	75.5	378	453
QKC 100D	AM 100P	100	6.0	1.5	276	145	100	-	-
QKC 120D	AM 120P	120	9.0	3.4	365	170	120	-	-
QKC 150D	AM 150P	150	9.5	3.2	365	170	120	-	-
QKC 200D	AM 200P	200	10.0	2.8	365	170	120	-	-
QKC 250D	AM 250P	250	15.4	5.4	365	170	195	-	-
QKC 300D	AM 300P	300	17.4	5.0	365	170	195	-	-
QKC 350D	AM 350P	350	18.4	4.6	365	170	195	-	-
QKC 400D	AM 400P	400	25.3	8.2	365	170	285	-	-
QKC 450D	AM 450P	450	26.3	7.8	365	170	285	-	-
QKC 500D	AM 500P	500	27.8	7.0	365	170	285	-	-
QKC 600D	AM 600P	600	36.0	10.3	365	170	390	-	-
QKC 700D	AM 700P	700	37.5	9.5	365	170	390	-	-
QKC 800D	AM 800P	800	39.0	8.7	365	170	390	-	-
QKC 900D	AM 900P	900	48.0	13.0	365	170	515	-	-
QKC 1000D	AM 1000P	1000	50.0	12.0	365	170	515	-	-

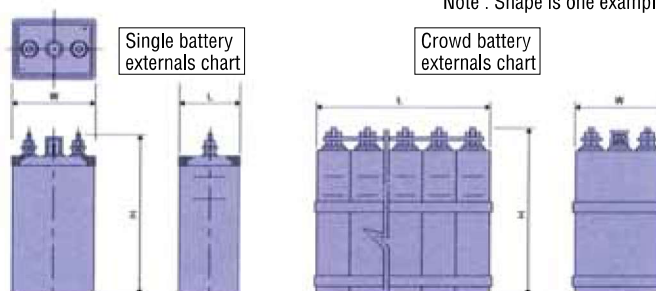
## Specification of Pocket Type : QSC(AMH-P)

### Capacity, Dimensions and Weight

GS Yuasa Type	JIS type (IEC KH)	Rated Capacity (Ah) 5HR	Weight per Cell with Electrolyte (kg)	Approx. Volume of Electrolyte (litre)	Overall Dimensions(mm)				
					Height	Width	Length		
							Cell	Taped cell group	
								5cells	6cells
QSC 20C	AMH 20P	20	2.8	0.83	276	143	52	260	312
QSC 30C	AMH 30P	30	3.0	0.76	276	143	52	260	312
QSC 40C	AMH 40P	40	3.1	0.72	276	143	52	260	312
QSC 50C	AMH 50P	50	4.4	1.30	276	143	75.5	378	453
QSC 60C	AMH 60P	60	4.7	1.15	276	143	75.5	378	453
QSC 80C	AMH 80P	80	6.0	1.60	276	145	100	-	-
QSC 100C	AMH 100P	100	10.5	3.6	365	170	120	-	-
QSC 120C	AMH 120P	120	10.8	3.5	365	170	120	-	-
QSC 150C	AMH 150P	150	11.3	3.3	365	170	120	-	-
QSC 200C	AMH 200P	200	17.3	6.1	360	170	195	-	-
QSC 250C	AMH 250P	250	18.3	5.8	360	170	195	-	-
QSC 300C	AMH 300P	300	19.0	5.3	360	170	195	-	-
QSC 350C	AMH 350P	350	26.5	9.1	365	170	285	-	-
QSC 400C	AMH 400P	400	27.7	8.6	365	170	285	-	-
QSC 450C	AMH 450P	450	28.6	8.2	365	170	285	-	-
QSC 500C	AMH 500P	500	37.7	12.0	365	170	390	-	-
QSC 600C	AMH 600P	600	39.1	11.3	365	170	390	-	-
QSC 700C	AMH 700P	700	48.3	15.8	365	170	515	-	-
QSC 800C	AMH 800P	800	50.1	15.0	365	170	515	-	-
QSC 900C	AMH 900P	900	52.0	14.2	365	170	515	-	-
QSC 1000C	AMH 1000P	1000	53.8	13.4	365	170	515	-	-

Common and externals charts (poket type)

Note : Shape is one example



## Specification of Sintered Type : QFD(AH-S)

### Capacity, Dimensions and Weight

GS Yuasa Type	JIS type (IEC KH)	Rated Capacity (Ah) 5HR	Weight per Cell with Electrolyte (kg)	Approx. Volume of Electrolyte (litre)	Overall Dimensions(mm)				
					Height	Width	Length		
							Cell	Taped cell group	
5cells	6cells								
QFD 20A	AH 20S	20	2.8	0.91	276	143	52	260	312
QFD 30A	AH 30S	30	3.0	0.85	276	143	52	260	312
QFD 40A	AH 40S	40	3.2	0.83	276	143	52	260	312
QFD 50A	AH 50S	50	3.4	0.77	276	143	52	260	312
QFD 60A	AH 60S	60	3.6	0.71	276	143	52	260	312
QFD 80B	AH 80S	80	4.0	0.65	276	143	52	260	312
QFD 100A	AH 100S	100	5.4	1.1	276	143	75.5	378	453
QFD 120B	AH 120S	120	5.9	1.0	276	143	75.5	378	453
QFD 150A	AH 150S	150	7.0	1.4	276	145	100	-	-
QFD 200A	AH 200S	200	12.4	3.0	360	170	120	-	-
QFD 250A	AH 250S	250	13.2	2.8	360	170	120	-	-
QFD 300A	AH 300S	300	18.6	5.5	360	170	195	-	-
QFD 350A	AH 350S	350	19.4	5.3	360	170	195	-	-
QFD 400A	AH 400S	400	20.2	5.0	360	170	195	-	-
QFD 450B	AH 450S	450	20.9	4.8	360	170	195	-	-
QFD 500A	AH 500S	500	28.8	8.1	365	170	285	-	-
QFD 600A	AH 600S	600	37.9	11.6	365	170	390	-	-
QFD 700A	AH 700S	700	39.5	11.1	365	170	390	-	-
QFD 800A	AH 800S	800	41.2	10.5	365	170	390	-	-
QFD 900B	AH 900S	900	42.8	10.3	365	170	390	-	-
QFD 1000A	AH 1000S	1000	55.0	14.4	365	170	515	-	-
QFD 1200A	AH 1200S	1200	59.5	13.2	365	170	515	-	-

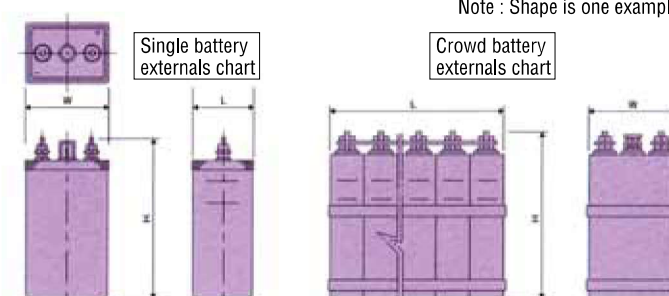
## Specification of Sintered Type : QFG(AHH-S)

### Capacity, Dimensions and Weight

GS Yuasa Type	JIS type (IEC KH)	Rated Capacity (Ah) 1HR	Weight per Cell with Electrolyte (kg)	Approx. Volume of Electrolyte (litre)	Overall Dimensions(mm)				
					Height	Width	Length		
							Cell	Taped cell group	
								5cells	6cells
QFG 20	AHH 20S	20	2.9	0.84	276	143	52	260	312
QFG 30	AHH 30S	30	3.2	0.81	276	143	52	260	312
QFG 40	AHH 40S	40	3.3	0.77	276	143	52	260	312
QFG 50	AHH 50S	50	3.5	0.74	276	143	52	260	312
QFG 60	AHH 60S	60	3.7	0.70	276	143	52	260	312
QFG 80	AHH 80S	80	5.0	1.1	276	143	75.5	378	453
QFG 100	AHH 100S	100	5.5	1.0	276	143	75.5	378	453
QFG 120	AHH 120S	120	12.1	3.2	365	170	120	-	-
QFG 150	AHH 150S	150	12.5	3.1	365	170	120	-	-
QFG 200	AHH 200S	200	13.3	2.9	365	170	120	-	-
QFG 250	AHH 250S	250	19.2	5.5	365	170	195	-	-
QFG 300	AHH 300S	300	20.1	5.3	365	170	195	-	-
QFG 350	AHH 350S	350	21.0	5.1	365	170	195	-	-
QFG 400A	AHH 400S	400	30.0	7.7	365	170	285	-	-
QFG 450A	AHH 450S	450	31.0	7.5	365	170	285	-	-
QFG 500A	AHH 500S	500	32.0	7.3	365	170	285	-	-
QFG 600A	AHH 600S	600	41.7	10.3	365	170	390	-	-
QFG 700A	AHH 700S	700	43.4	9.9	365	170	390	-	-
QFG 800A	AHH 800S	800	57.6	13.7	365	170	515	-	-
QFG 900A	AHH 900S	900	59.4	13.3	365	170	515	-	-
QFG 1000A	AHH 1000S	1000	64.8	12.0	365	170	515	-	-

Common and externals charts (sintered type)

Note : Shape is one example



### Comparison between Pocket type & Sintered type GS Yuasa Alkaline Battery

	Pocket type Alkaline Battery(QKC,QSC)	Sintered type Alkaline Battery(QFD,QFG)	Remarks
Main Applications	Emergency Lighting & power Telecommunications, UPS Standby Power Supply	<b>UPS, Engine starting, Standby Power supply, Emergency Lighting &amp; Power</b>	Pocket type:for medium & low rate Sintered type:for high rate discharge
High Rate Discharge	Inferior to Sintered type	◎ <b>Excellent</b>	Refer to the Graph 1 to 4
Charge Efficiency	Inferior to Sintered type Necessary charge amount to full capacity: 140%	◎ <b>Excellent</b> <b>Necessary charge amount to full capacity: 120%</b>	
Water Refilling Frequency	Inferior to Sintered type	◎ <b>Excellent</b>	Incase of sintered type, the frequency is half of that of pocket type.
Necessity for Electrolyte change	No necessity under any use conditions	<b>No necessity under any use conditions</b>	
Service life at 25℃	20 years under standards use conditions	20 years under standards use conditions	Both have long service life
Resistance to Memory Effect	No memory effect	No memory effect	Both do not show memory effect
Resistance to Overcharge & Overdischarge	Very Strong	Very Strong	Both have very strong resistance to overcharge & overdischarge.
Color of Container	Transparent	Tranceparent	Both are quite easy to observe inside the container.
Quality reliability	Very high quality	Very high quality	Both are made in the factory in Japan authorized by ISO9001 & ISO14001. (No.JQA-1690, JQA-EM-6438)



## ■ Safety precautions ■

- ▲ Be sure to read through the instruction manual before using the battery.
- ▲ Keep the instruction manual near at hand for future reference.

### ⚠ Danger

- The battery may generate hydrogen gas, thus causing a risk of ignition or explosion. Be sure to ventilate the chamber where the battery is used so that the hydrogen gas concentration is kept at 0.8% or lower.
- Do not install the storage battery in a sealed, gas-tight enclosure, near a fire or source of sparks. Violation of this rule may result in the generation of hydrogen gas from the storage battery, causing a risk of fire or explosion. Provide an appropriate ventilation opening on the top of the battery enclosure or appropriate room ventilation to avoid the hydrogen concentrations greater than 0.8% in air.
- The battery contains potassium hydroxide solution. If the battery is damaged and electrolyte is spilt on to skin or clothes, immediately wash it off with large amount of water. If it gets into the eyes, wash thoroughly with eye-wash solution or clean tap water and immediately seek medical treatment.
- Do not short-circuit the (+) terminal and (-) terminal of the battery with a metallic objects, such as wires. Do not allow tools, such as wrenches or spanners, to touch parts of the battery having different voltages. Otherwise, burns, leakage of electrolyte, heating, or explosion may result.
- Use insulated tools, such as torque wrenches or spanners, when working on the cells of battery. Be sure to use insulation processed tools.
- Do not clean the battery with dry cloth or a duster. Only use a water wetted cloth. Otherwise, static electricity may build up, thus resulting in an explosion. Never use cleaning products or solvents. These can cause cracking of the cell or battery container. Resulting in leakage of electrolyte, caustic burns, fire or explosion.
- Be sure to use a charger appropriate to the battery, or charge it while observing charging conditions specified by us. Otherwise, the battery may not be charged fully, or leakage of electrolyte, heating, explosion, performance deterioration or decrease of service life may result.
- Wear Personal Protective Equipment (PPE), such as safety glasses, protective apron and gloves and rubber soled safety shoes when working with the batteries and/or electrolyte. The electrolyte (potassium hydroxide solution) will cause severe burns when in contact with the skin and may cause loss of sight if in contact with the eyes. The electrolyte is very corrosive and must be cleaned up immediately in case of spillages. If electrolyte spills, or leaks from a battery, onto the rack or shelving there is a risk of electric shock; never touch the rack of shelving with bare hands.
- Do not drop, disassemble, modify or damage the battery in any way. Otherwise, it becomes dangerous; leakage of electrolyte can occur, causing personal injury, burns, loss of sight, fire or explosion. Please consult us for recommendations about the replacement and disposal of End-of-Life batteries.
- Please contact us if you find the vent plug have been damaged or battery container leak. It might cause a fire and/or the electric shock by the leak.
- If the battery becomes swollen due to heat, or there is a failure of the sealing allowing electrolyte to leak, please turn off the power immediately and contact us. There is a risk of fire and/or electric shock if the battery remains in use.
- Do not use the battery if abnormal phenomenon such as corrosion of terminals, liquid leakage, or deformation of the battery container is observed. Otherwise, leakage of electrolyte, fire or explosion may result.

### ⚠ Warning

- Do not disassemble, modify, or damage the battery. Otherwise, leakage of electrolyte, fire, or explosion may result.
- Be sure to replace the battery before the replacement period specified in the instruction manual or when the equipment expires. Otherwise, leakage of electrolyte, fire, or explosion may result.
- Be sure to check the polarity (+ / -) when making connections. Reverse polarity connection may result in fire or damage to the charger.
- Do not use the battery near heat generating components or equipment. Otherwise, leakage of electrolyte, fire, or explosion may result.

### ⚠ Caution

- Observe the following service temperature range of the battery. Otherwise, performance deteriorating, reduction of service life, damage or deformation of the battery may result.

Discharge: -20 to +45°C    Charge: -20 to +45°C

- Do not use the battery near heating sources such as transformers, or use, store the battery in a high temperature environment near heaters or fires or in intense direct sunlight..
- Do not wet or immerse the battery in water or seawater. Otherwise, damage of the battery, electrical shock, fire, or corrosion of the terminals or connecting boards may result.
- Do not use the battery in a place subjected to a lot of dust. Otherwise, short circuit of the battery may result. (If it is used in a dusty place, be sure to clean the battery terminal and the area of lid between them periodically.)
- Install the battery according to the relevant local fire law, or other regulations, if any.
- Be sure to perform periodic inspections of the battery at intervals specified by the local fire law or other regulations. Correct any items that do not confirm to the description in the instruction manual.
- The containers of the storage battery are made of resin. Therefore, note that the adherence of solvent or oil (organic solvent, gasoline, kerosene, or benzene, etceteras) damages the containers.

## Request of Cooperation of Recycling

Used Alkaline stationary batteries can be recycled. Do not scrap used storage batteries with general waste, but bring them to a place specified by government law. Please contact our sales company for the details. When returning storage batteries, insulate terminals with adhesive tapes. Electric energy still remains in used storage batteries, insufficient insulation of terminals may result in explosion or fire.

- Please read the manual of the product concerned when you use it.
- The design and the specification might be changed without previous notice.  
Please confirm it to our company when you order.
- The content of this catalog is as of Sept, 2010.

**GS YUASA...CLEAN ENEGY FOR THE WORLD**



JQA-EM6438  
ISO14001  
Certification



JQA-1690  
ISO9001  
Certification

### GS Yuasa International Ltd.

1-7-13, Shiba-koen, Minato-ku, Tokyo 105-0011, Japan  
TEL: +81-3-5402-5716 FAX: +81-3-5402-5706  
<http://www.gs-yuasa.com/gyin/en>

Authorized Distributor



### Infinitier Company Ltd.

Room 601 Bupa Centre, 141 Connaught Road West,  
Hong Kong • Tel: +852 28571793 • Fax: +852 28571079  
<http://www.infinitier.com.hk>

Cat.No. IN 31-03 AL RY

Printed in Japan