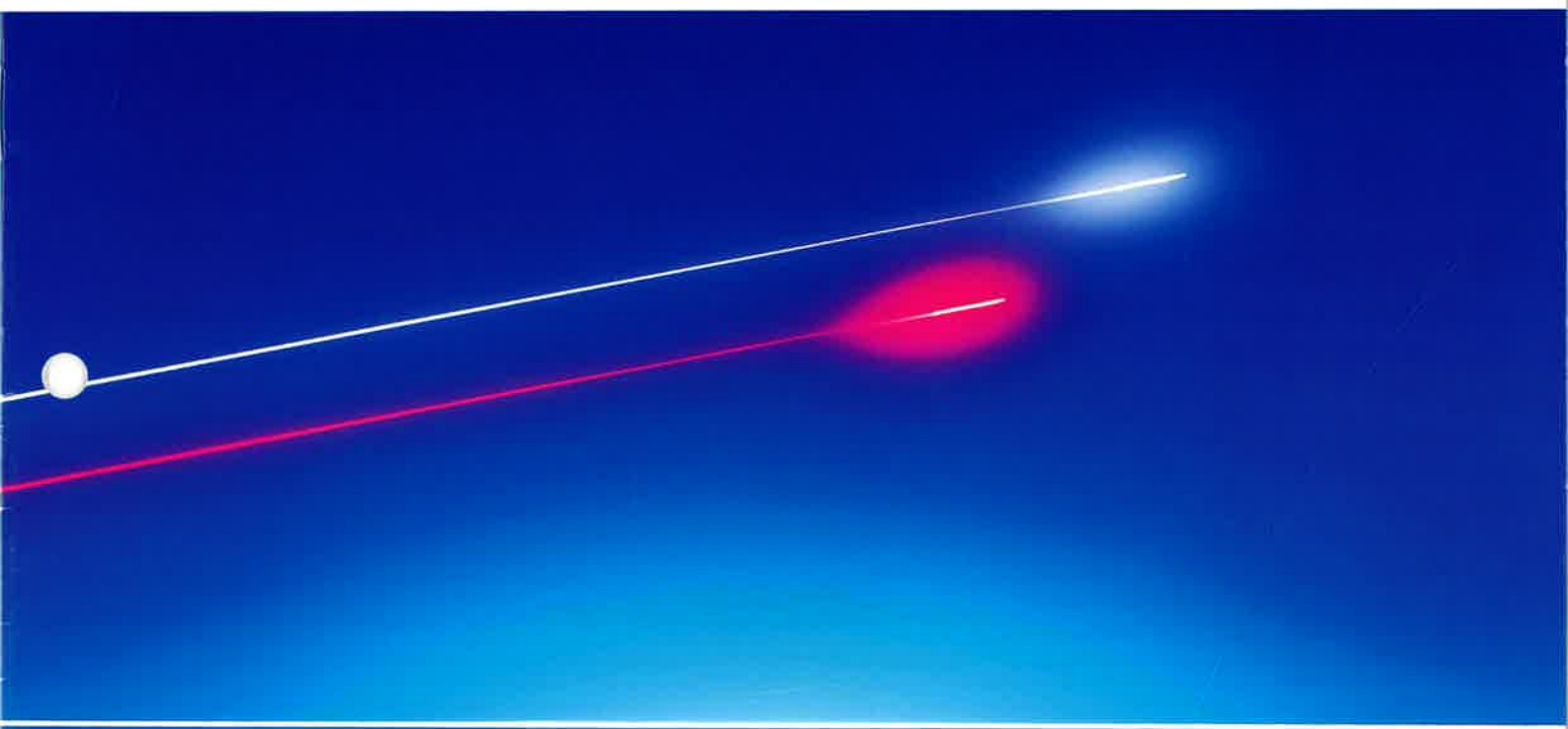
KOBE

KOBE Small-sized Valve Regulated Lead-Acid Batteries

〈HIPAC〉 LHM／HP／HF／HV／HC Series

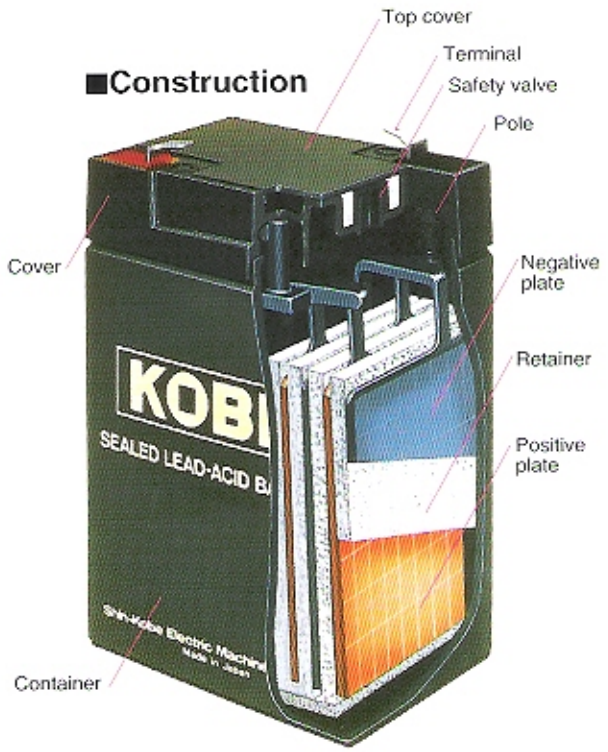


In 1959, Shin-Kobe Electric Machinery Co., Ltd., developed a small-sized Valve Regulated Lead-Acid (VRLA) battery as a power supply unit for signal lamps, and throughout its manufacturing history this product has developed a good reputation.
Since then we have been conducting a series of enhancements to adapt to the changing times and technologies and now our VRLA battery can be found in portable TVs, video cameras, and UPSs. Named the <High Pack>, the product is widely used as a high-performance power supply unit.
Because of its "compactness and high discharge performance," "ease of handling and maintenance," and other features as compared to conventional liquid-type lead-acid batteries, <High Pack> is active as a leading-edge technology for UPSs and standby storage. Especially within the fields of communication and as main power supply units for portable equipment.
The Nabari Factory, a plant producing small-sized VRLA lead-acid batteries, obtained certification under ISO 9001 in June 1995 and designs, develops, and manufactures lead-acid batteries under a quality control system determined by accreditation standards. In October 1997, the company obtained accreditation as per ISO 14001 (environmental management system). Since then, the company has set eco-friendliness as its important theme and has engaged in production accordingly.

ISO 9001
JQA-0893

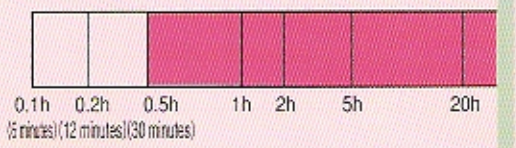
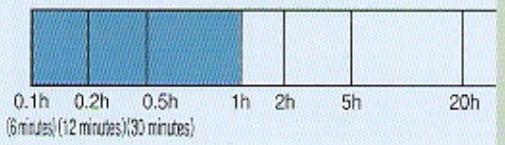
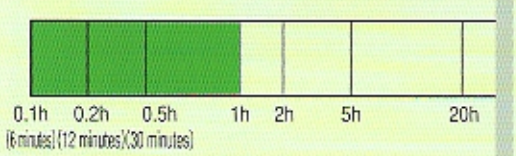
EC97J1106

■Construction



Line-up of small-sized VRLA batteries

	Series	Capacity (Ah:20HR)	Voltage (V)	Service life
General-purpose type	Long-life LHM series	15、24、38、65	12	Note 1) Approx. 13 years
	Standard HP series	10	6	Note 1) Approx. 3 years or approx. 200 cycles Note 2)
		6.5、15、24、38、65	12	
High-rate discharge type	Long-life HF series	7、12、17、28、44	12	Note 1) Approx. 5 years
	Standard HV series	7、12、17、28、44	12	Note 1) Approx. 3 years
Cycle service	Cycle service HC series	24、38	12	Note 2) Approx. 400 cycles

Standard load time (recommended value)	Features	Uses	Certification, JIS, and UL (Note 3)
	●High-rate discharge valve regulated lead-acid battery. ●The battery container and lid is made of flame-retardant resin (UL 94V-0). ●The standard load time is within 1 hour. ●It is a long-life battery for stand-by use.	●UPS ●Disaster prevention ●security systems	(Note 4) ●Certified storage battery equipment, certification No. 97C73 ●As per JIS C 8702 ●UL-rated product
	●It is of the standard type and comes in many models. There is a variety of models with many different capacities. It gives equipment designers much latitude. ●It is compactly designed and allows equipment to be economically designed.	●CATV and UPS ●Disaster prevention and security systems ●Solar power generation system ●Lighting equipment ●Toys	(Note 4) ●Certified storage battery equipment, certification No. 97C24 ●As per JIS C 8702 ●UL-rated product
	●High-rate discharge storage battery designed for UPS use. It achieves 9-10 minutes in 3C discharge time. ●The trickle life is 5 years, some 1.7 times as long as that of the HP type. ●The battery casing and cover is made of flame-retardant resin	●UPS ●Disaster prevention and security systems	●As per JIS C 8702 ●UL-rated product
	●High-rate discharge storage battery designed for UPS use. It achieves 9-10 minutes in 3C discharge time. ●The trickle life is 3 years, the same as the HP type.	●UPS ●Disaster prevention and security systems	●As per JIS C 8702 ●UL-rated product
	●Designed for cycle service. The cycle life is 400 cycles, twice as long as that of the HP type. ●The capacity efficiency is 20% higher than the liquid-type battery (EB type).	●Motor-driven wheelchairs ●Unattended transportation vehicles ●Industrial cleaners ●Solar power generation systems ●Portable measuring equipment	●As per JIS C 8702

Note 1) The trickle life expectancy based on the results of an accelerated life test conducted in-house with the temperature kept constant at 25°C.
Note 2) The cycle rate is based on the following: The test temperature is 25°C, discharge is 0.25CA up to 1.70V/cell (100% discharge). Charge is 2.45V/cell constant-voltage charge, and 110% of the discharge rate. The life judgment is based on JIS C 8702.
Note 3) For certified batteries, see the specification table for the particular series.
Note 4) The certification numbers of storage battery equipment are renewed every three years. Check the newest ones.

In this catalog, "C" represents the value (C20) of 20-hour-rate rated capacity. In the case of HP15-12W, for example, C (=C20) = 15.

General-purpose type Long-life LHM series

Features

It is long-life storage battery for stand by use.

The battery casing and cover is made of flame-retardant resin (UL 94V-0).

It is accredited by the Storage Battery Equipment Certification Committee and the UL.

It is used for disaster-prevention equipment. For the certified varieties, see the specification table.

The standard load time is 0.5-20 hours.

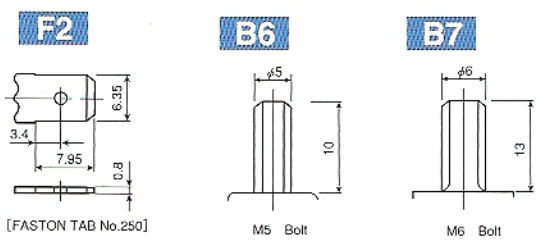
Main uses

Telecommunication system, CATV, UPS, emergency lighting, fire alarm equipment, prevention and security systems, etc.

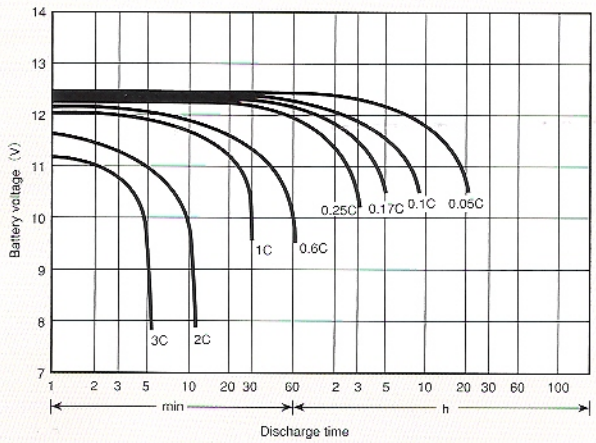
■Specifications

Battery type			LHM-15-12	LHM-24-12	LHM-38-12	LHM-65-12
Nominal voltage		V	12	12	12	12
Capacity 25℃ (77°F)	20HR(0.05C) 1.75V/cell	Ah	15	24	38	65
	10HR(0.1C) 1.75V/cell	Ah	14	22	35	60
	5HR(0.17C) 1.75V/cell	Ah	13	20	32	55
	1HR(0.6C) 1.60V/cell	Ah	9	14	23	39
	1C 1.60V/cell	Ah	7.5	12	19	32
Dimensions	Overall height ±2 (0.08)	mm (inch)	167 (6.57)	125 (4.92)	170 (6.69)	175 (6.89)
	Casing height ±2 (0.08)	mm (inch)	167 (6.57)	125 (4.92)	170 (6.69)	175 (6.89)
	Length ±1 (0.04)	mm (inch)	181 (7.13)	166 (6.54)	197 (7.76)	350 (13.8)
	Width ±1 (0.04)	mm (inch)	76 (2.99)	175 (6.89)	165 (6.50)	166 (6.54)
Weight (Approx.)		kg (lb.)	6.4 (14.1)	11 (24.2)	16 (35.2)	25 (55)
Terminal shape		—	F2	B6	B6	B7
Flame retardant container/lid UL-Laboratories rating		—	UL 94V-0			
Internal resistance at 25℃ (Approx.)		mΩ	13	10	8	6
Max. discharge current 5s		A	90	144	228	390
Constant voltage charge 25℃ (77°F)	Charge voltage	V	13.65±0.15 Temp. coefficient −20mV/℃ (−11mV/°F)			
	Max. charge current	A	4.5	7.2	11	19
Service temp. range	Charge	℃ (F)	0 to 50			
	Discharge	℃ (F)	−15 to 50			
	Storage	℃ (F)	−15 to 40			
UL approved		—	○			

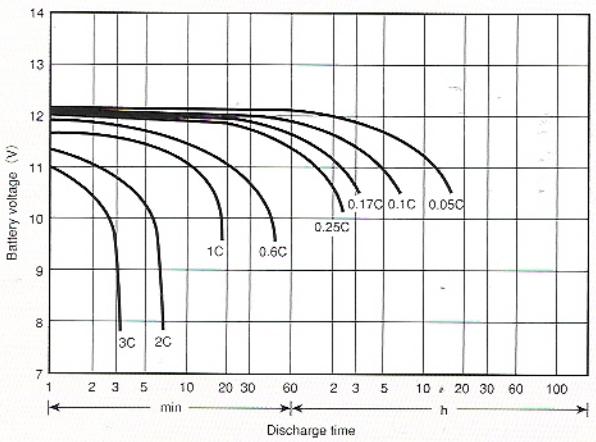
■Terminal shapes



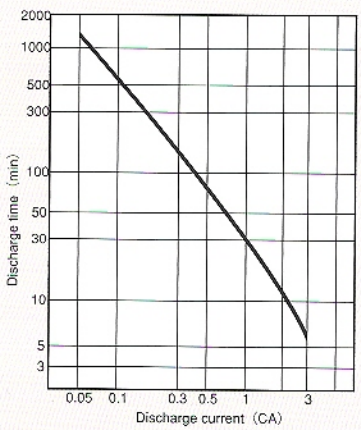
Examples of discharge characteristics (25℃) LHM24-12



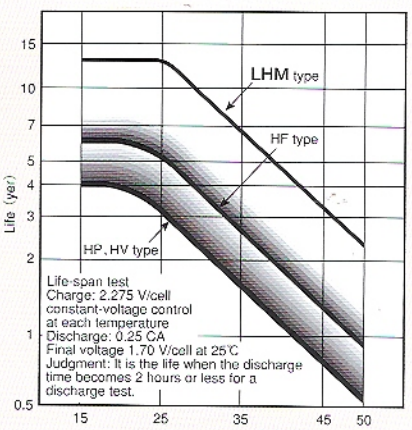
Examples of discharge characteristics (0℃) LHM24-12



Typical characteristics of discharge current and discharge time (at 25℃)

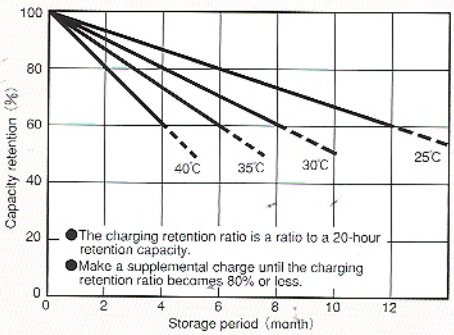


Examples of cycle service lifespan characteristics



●The life-span characteristics vary depending on discharge conditions and charge conditions.

Examples of capacity preservation characteristics



Battery charging method of LHM/HF/HV/HP Series

Battery charges must be conducted appropriately in order to fully take advantage of the performance of our VRLA batteries. The batteries must be charged by a constant-voltage method with current restriction (a constant-current and constant-voltage charging method).

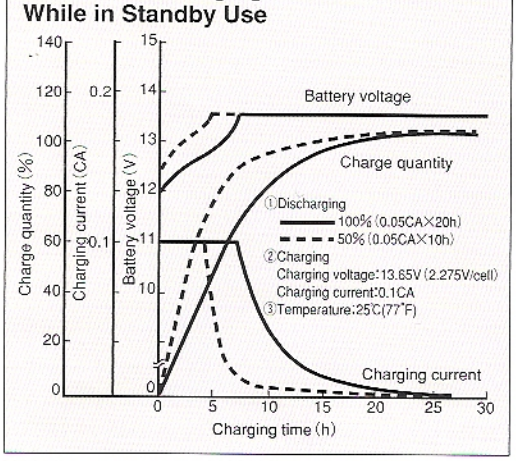
Set the charge voltage at 2.275 V ±0.025 V/cell when the surrounding temperature is 25℃. Be sure to adjust the voltage charge according to the surrounding ambient temperature. Set the temperature adjustment coefficient to a negative value (-3.3mV/℃/cell) so that a higher temperature is accompanied by a lower charge voltage. However, when charging the battery in the range of 5 to 35℃ (average: 25℃), the temperature adjustment is not required. In order to recover a battery's capacity, the charge ampere hour must be 105% or more of the discharge ampere hour. The level of charge current is related to the desired charge time for full recovery. In order to recover battery capacity within 24 hours, set the charge current to 0.1 CA or more. However, to avoid accidents and undesirable effects to battery life, keep the charge current at no higher than 0.3 CA.

■Charging Periods Conditions

Charging method	Charge voltage 25℃ (V/cell)	Temperature adjustment coefficient for voltage (mV/℃/cell)	Maximum charge current (CA)	Charge time 0.1 CA-20(h) 25℃-0.1 CA		Temperature (℃)
				50% discharge	100% discharge	
Constant voltage, constant current charge (with current restriction)	2.275±0.025	−3.3	0.3	18	24	0 to 40

Note: The charge time is the approximate time for recovering 90 to 100% of the discharge quantity. When charging after the batteries have been left at a high temperature over a long period or when the batteries are connected in series, the batteries may not recover up to their 90 to 100% capacities. This is so even when charged under the same conditions as described in the above table. For details, call our company.

Example of Charging Characteristics While in Standby Use



General-purpose type Standard HP series

Features

It is of the standard type. It comes in many models.

There is a choice of different models with 6V and 12V in voltage and 1.2-65Ah in capacity. This gives equipment designers latitude.

It is accredited by the Storage Battery Equipment Certification Committee and the UL.

It is used for disaster-prevention equipment. For the certified varieties, see the specification table.

It can be used not only for stand-by use but also for cycle service as well.

The trickle life expectancy is about 3 years (25℃, 0.25CA discharge).
The cycle life expectancy is about 200 cycles (25℃, 0.25CA, 100% discharge).

The standard load time is 0.5-20 hours.

Main uses

●Stand-by use
CATV, UPS, emergency lighting, fire alarm equipment, disaster prevention and security systems, etc.

●Cycle service
Portable equipment, transportation equipment, toys, lighting equipment, solar power generation systems, etc.

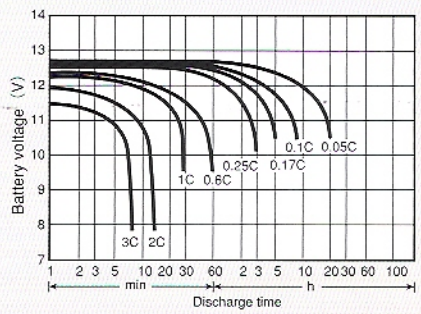
■Specifications

Battery type			HP6.5-12 (12P65)	HP15-12A (12P150)	HP24-12 (12P240)	HP24-12A (12P24A)	HP38-12 (12P380)	HP65-12 (12P650)
Nominal voltage		V	12	12	12	12	12	12
Capacity 25℃ (77°F)	20HR (0.05C) 1.75V/cell	Ah	6.5	15	24	24	38	65
	10HR (0.1C) 1.75V/cell	Ah	6.0	14	22	22	35	60
	5HR (0.17C) 1.75V/cell	Ah	5.5	13	20	20	32	55
	1HR (0.6C) 1.60V/cell	Ah	3.9	9	14	14	23	39
	1C 1.60V/cell	Ah	3.3	7.5	12	12	19	32
Dimensions	Overall height ±2 (0.08)	mm (inch)	100 (3.94)	167 (6.57)	125 (4.92)	175 (6.89)	170 (6.69)	174 (6.85)
	Casing height ±2 (0.08)	mm (inch)	64 (3.70)	167 (6.57)	125 (4.92)	175 (6.89)	170 (6.69)	174 (6.85)
	Length ±1 (0.04)	mm (inch)	151 (5.94)	181 (7.13)	166 (6.54)	166 (6.54)	197 (7.76)	350 (13.8)
	Width ±1 (0.04)	mm (inch)	65 (2.56)	76 (2.99)	175 (6.89)	125 (4.92)	165 (6.50)	166 (6.54)
Weight (Approx.)		kg (lb.)	2.7 (6.0)	6.1 (13.4)	9.0 (19.9)	9.4 (20.9)	15 (33.1)	22 (48.5)
Terminal shape		—	F1 (F2)	B1	B1	B1	B2	B3
Flame retardant container/lid UL-Laboratory rating		—	UL 94V-0	UL 94HB				
Internal resistance at 25℃ (Approx.)		mΩ	22	15	10	10	8	8
Max. discharge current 5s		A	98	255	360	360	400	500
Constant voltage charge 25℃ (77°F)	Voltage for standby use	V	13.65±0.15 Temp. coefficient −20mV/℃ (−11mV/°F)					
	Voltage for cycle use	V	14.70±0.30 Temp. coefficient −30mV/℃ (−17mV/°F)					
	Max. charge current	A	2.0	4.5	7.2	7.2	11	19
Service temp. range	Charge	℃ (F)	0 to 40 (32 to 104)					
	Discharge	℃ (F)	−15 to 50 (5 to 122)					
	Storage	℃ (F)	−15 to 40 (5 to 104)					
UL approved		—	No. MH15705					

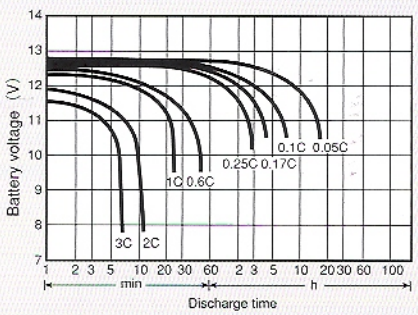
Note 1) The type in parenthesis is a type name under JIS (JIS C 8702).
Note 2) The specification in parenthesis in the table is optional specification.

	HP10-6 (6P100)
	6
	10
	6.3
	8.5
	6.0
	5.0
	100 (3.94)
	94 (3.70)
	151 (5.94)
	508 (1.97)
	1.9 (4.2)
	F1
	UL 94HB
	10
	150
	6.825±0.075 Temp. coefficient −10mV/℃ (−5.5mV/°F)
	7.35±0.15 Temp. coefficient −15mV/℃ (−8.3mV/°F)
	3.0
	0 to 40
	−15 to 50
	−15 to 40
	○

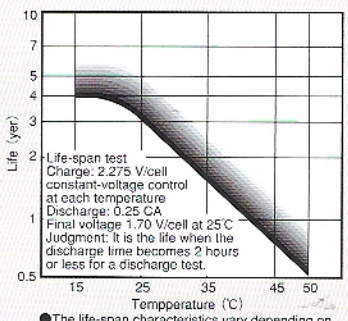
Examples of various discharge characteristics (25℃) HP24-12



Examples of various discharge characteristics (0℃) HP24-12

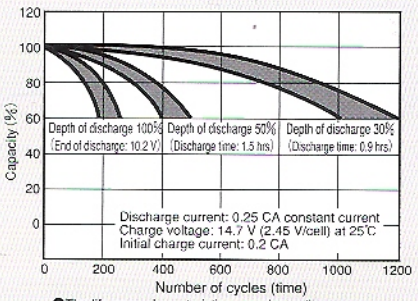


Examples of trickle charge lifespan characteristics



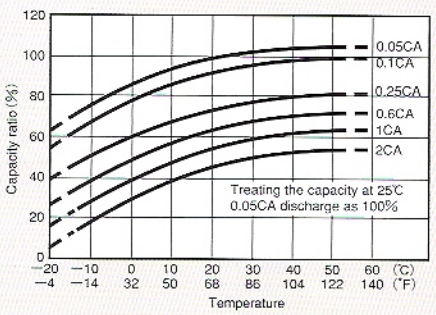
●The life-span characteristics vary depending on discharge conditions and charge conditions.

Examples of cycle service lifespan characteristics

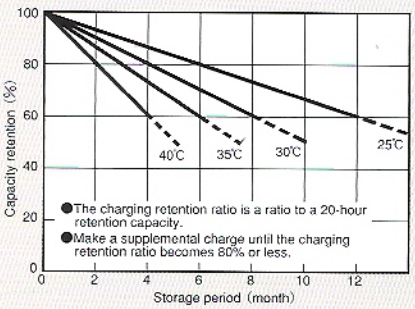


●The life-span characteristics vary depending on discharge conditions and charge conditions.

Example of relation between temperature & capacity

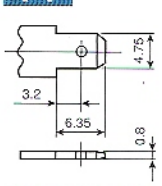


Examples of charge retention characteristics



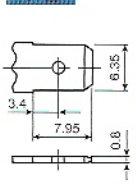
■Terminal shapes

F1



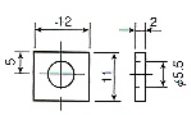
[FASTON TAB No.187]

F2



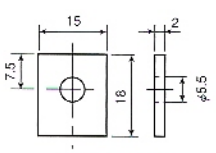
[FASTON TAB No.250]

B1



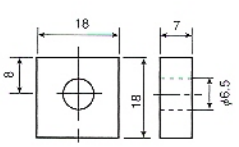
M5 Bolt and nut

B2



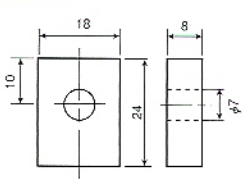
M5 Bolt and nut

B3



M6 Bolt and nut

B4



M6 Bolt and nut

High-rate discharge type Long-life HF series

High-rate discharge type Standard HV series

Features

■HF series • HV series

It is a long-life storage battery for high-rate discharge.
It achieves a capacity 10-20% larger than the HP series and achieves 9-10 minutes in 3C discharge time.
The standard load time is 0.1-1 hour.

■HF series

The trickle life expectancy
The trickle life expectancy is about 5 years (25℃, 0.25CA discharge), some 1.7 times as high as the HP and HV series.

The battery casing and cover is made of flame-retardant resin (UL 94V-0).

■HV series

The trickle life expectancy The trickle life expectancy is about 5 years (25℃, 0.25CA discharge), some 1.7 times as high as the HP and HV series.

Main uses

UPS, disaster prevention and security systems, etc.

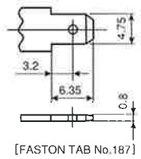
■Specifications

Battery type			HF7-12 / HV7-12	HF12-12 / HV12-12	HF17-12A / HV17-12A	HF28-12A / HV28-12A	HF44-12 / HV44-12
Nominal voltage		V	12	12	12	12	12
Capacity 25℃ (77°F)	20HR(0.05C) 1.75V/cell	Ah	7.0	12	17	28	44
	10HR(0.1C) 1.75V/cell	Ah	6.5	11	15	25	40
	5HR(0.17C) 1.75V/cell	Ah	6.0	10	14.5	24	37.5
	1HR(0.6C) 1.60V/cell	Ah	4.9	8.4	12	19.5	31
	1C 1.60V/cell	Ah	4.7	8.0	11.5	18.5	29.5
	3C 1.30V/cell	Ah	3.5	6.0	7.6	12.6	19.8
Dimensions	Overall height ±2(0.08)	mm (inch)	100 (3.94)	100 (3.94)	167 (6.57)	175 (6.89)	170 (6.69)
	Casing height ±2(0.08)	mm (inch)	94 (3.70)	94 (3.70)	167 (6.57)	175 (6.89)	170 (6.69)
	Length ±1(0.04)	mm (inch)	151 (5.94)	151 (5.94)	181 (7.13)	166 (6.54)	197 (7.76)
	Width ±1(0.04)	mm (inch)	65 (2.56)	98 (3.86)	76 (2.99)	125 (4.92)	165 (6.50)
Weight (Approx.)		kg (lb.)	2.7 (5.94)	4.3 (9.46)	6.4 (14.1)	9.4 (20.7)	15 (33)
Terminal shape		—	F2 (F1)	F2	B1	B1	B2
Flame retardant container / lid UL-Laboratory rating		—	UL 94V-0		HF:UL 94V-0/HV:UL94HB		
Internal resistance at 25℃ (Approx.)		mΩ	22	16	15	10	8
Max. discharge current 5s		A	105	180	255	360	400
Float charg 25℃(77°F)	Charge voltage	V	13.65±0.15 Temp. coefficient −20mV/℃ (−11mV/°F)				
	Max. charge current	A	2.1	3.6	5.1	8.4	13
Service temp. range	Charge	℃ (F)	0 to 40 (32 to 104)				
	Discharge	℃ (F)	−15 to 50 (5 to 122)				
	Storage	℃ (F)	−15 to 40 (5 to 104)				
UL approved		—	No. MH15705				

Note 1) The specification in parenthesis in the table is an optional specification.

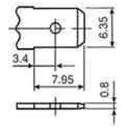
■Terminal shapes

F1



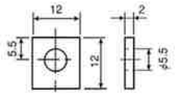
[FASTON TAB No.187]

F2



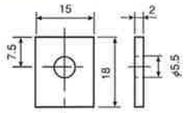
[FASTON TAB No.250]

B1



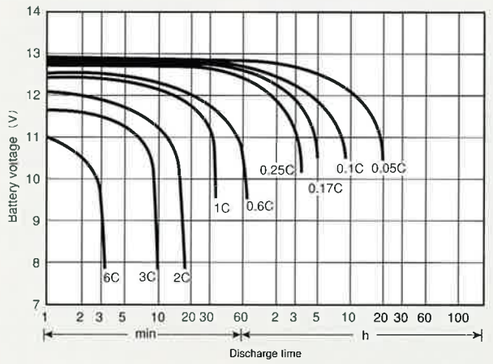
M5 Bolt and nut

B2

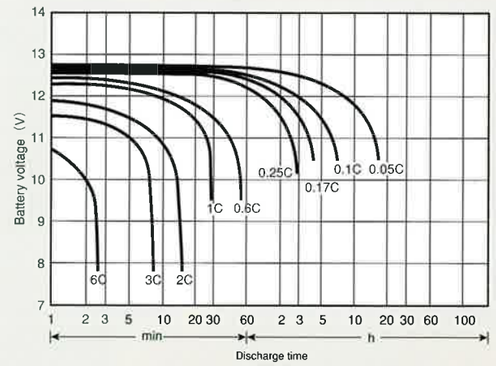


M5 Bolt and nut

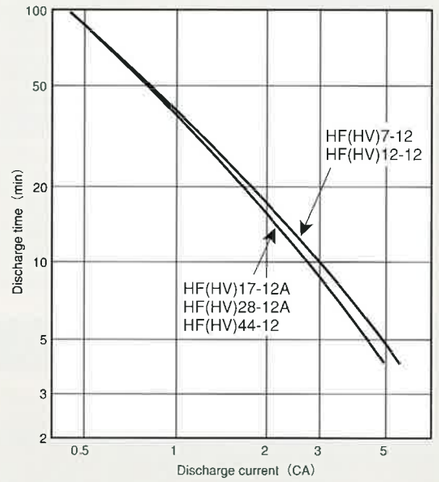
Examples of discharge characteristics at various rates (at 25℃)



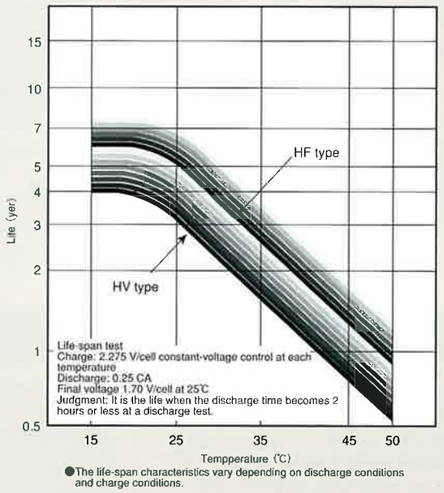
Examples of discharge characteristics at various rates (at 0℃)



Typical characteristics of discharge current and discharge time (at 25℃)

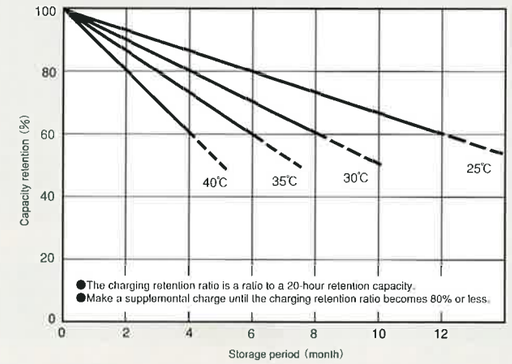


Examples of trickle charge lifespan characteristics



●The life-span characteristics vary depending on discharge conditions and charge condilions.

Examples of charge retention characteristics



●The charging retention ratio is a ratio to a 20-hour retention capacity.
●Make a supplemental charge until the charging retention ratio becomes 80% or less.

Cycle use

HC series

Features

It is a cycle service storage battery.

It is a storage battery designed for cycle service. The cycle life expectancy is about 400 cycles (25℃, 0.25CA 100% discharge), about twice as long as the HP series.

Compact design.

The volume energy density was about 20% inproved than that of flooded type batteries.

Main uses

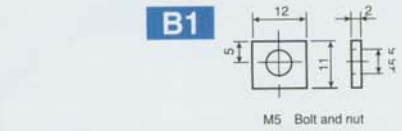
Electro motive wheelchairs, unattended transportation vehicles, industrial cleaners, solar power generation systems, portable equipment etc.

■Specifications

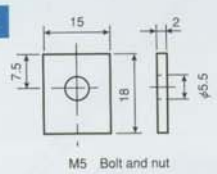
Battery type			HC24-12	HC38-12
Nominal voltage		V	12	12
Capacity 25℃ (77°F)	20HR(0.05C) 1.75V/cell	Ah	24	38
	10HR(0.1C) 1.75V/cell	Ah	22	35
	5HR(0.17C) 1.75V/cell	Ah	20	32
	1HR(0.6C) 1.60V/cell	Ah	14	23
	1C 1.60V/cell	Ah	12	19
Dimensions	Overall height ±2 (0.08)	mm (inch)	125 (4.92)	170 (6.69)
	Casing height ±2 (0.08)	mm (inch)	125 (4.92)	170 (6.69)
	Length ±1 (0.04)	mm (inch)	166 (6.54)	197 (7.76)
	Width ±1 (0.04)	mm (inch)	175 (6.89)	165 (6.54)
Weight (Approx.)		kg (lb.)	9.0 (19.9)	15 (33.1)
Terminal shape		—	B1	B2
Flame retardant container/lid UL-Laboratory rating		—	UL94HB	
Internal resistance at 25℃ (Approx.)		mΩ	10	8
Max. discharge current 5s		A	360	400
Service temp. range	Charge	℃ (F)	0 to 40 (32 to 104)	
	Discharge	℃ (F)	−15 to 50 (5 to 122)	
	Storage	℃ (F)	−15 to 40 (5 to 104)	

■Terminal shapes

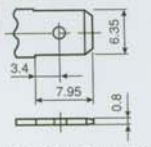
B1



B2



F2



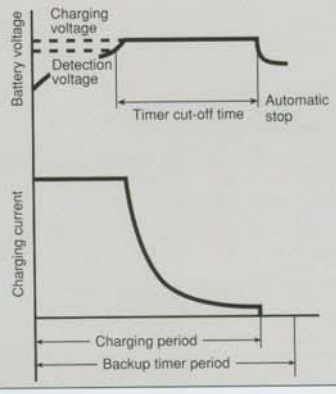
Battery charging method of HC Series

In order to use the life of a battery fully, insufficient charging and over-charging must be avoided. As an effective measure, start the cut-off timer when the battery voltage becomes a set value and automatically cut the charge after a certain period of time has passed. Depending on the ambient temperature, the charge voltage may require correction. Set the temperature adjustment coefficient to a negative value (-3.3mV/℃/cell) so that a higher temperature is accompanied by a lower charge voltage. However, when charging the battery in the range of 5 to 35℃ (average: 25℃), temperature adjustment is not required.

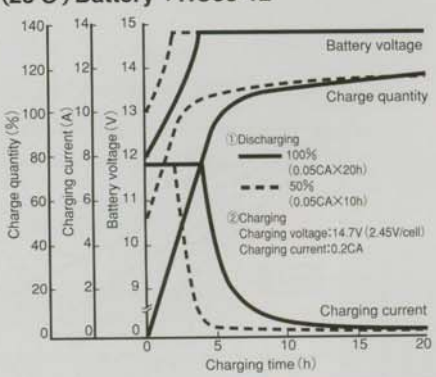
The charging time can be controlled by changing the initial charging current and voltage. The table below shows the relationship between the charging time and charging conditions. In case of five hour charging a large initial charge current is required. For safety and protection, we recommend the use of a 6-hour standby timer circuit. The battery charge shall be completed when the charge quantity becomes 110%.

■Constant Current Constant Voltage Charging

Charging



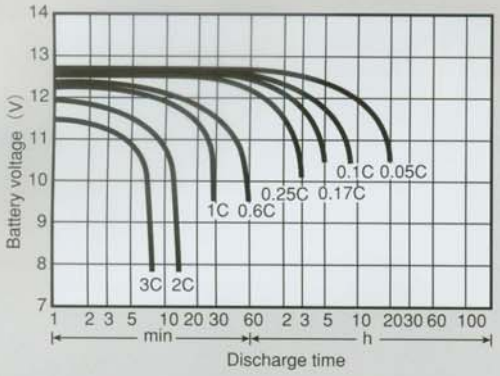
Examples of Charging Characteristics (25℃) Battery : HC38-12



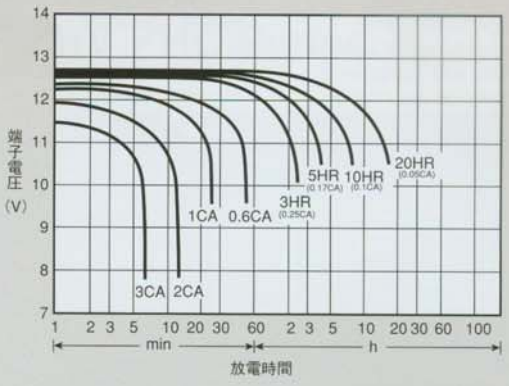
■Charging Periods Conditions

Charging time (DOD 100%) (h)	Inital charging current (A)	Charge voltage 25℃ (V/cell)	Detective voltage 25℃ (V/cell)	Cut off timer (h)	Temp. coefficient (mV/℃/cell)	Temperature (℃)	Appropriate charging amount (%)
15	0.1C	2.45	2.40	8	−5	0 to 40	0 to 40
10	0.2C	2.45	2.40	6			
5	0.4C	2.50	2.45	3			

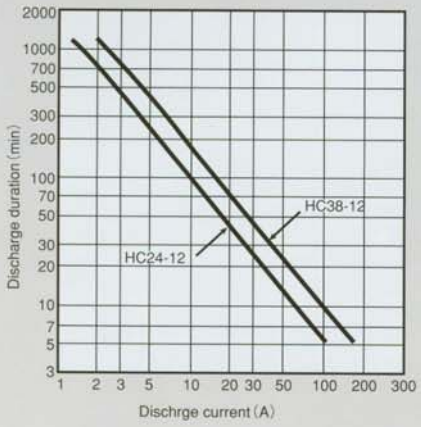
Examples of discharge characteristics (25℃) HC24-12



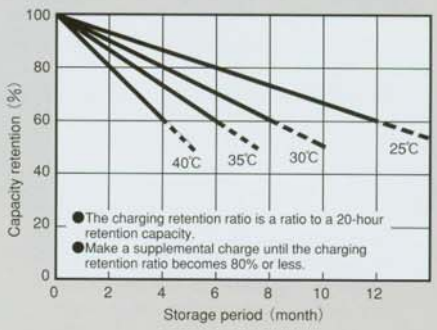
Examples of discharge characteristics (0℃) HC24-12



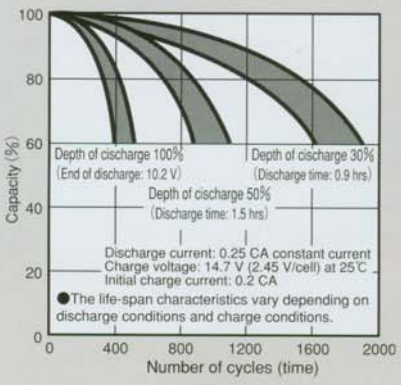
Discharge duration vs. Discharge current characteristics



Examples of capacity preservation characteristics

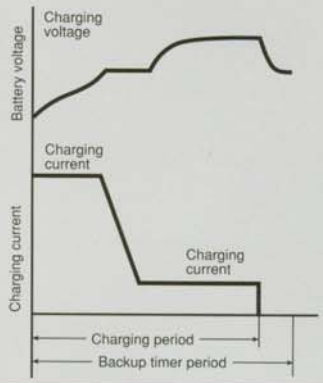


Examples of cycle service lifespan characteristics

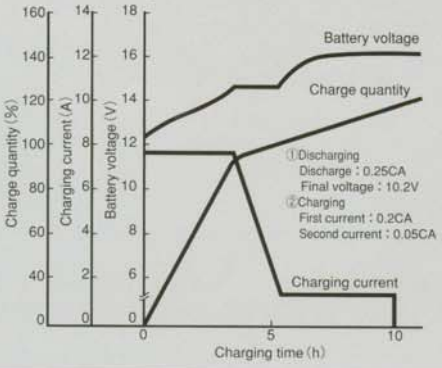


■2-Step Constant Current Charging

Charging



Examples of Charging Characteristics (25℃) Battery : HC38-12



■Charging Periods Conditions

Charging time (DOD 100%) (h)	Inital charging current (A)	Switching voltage (V/cell)	Charging current at second step (A)	Switching voltage temperature coefficient (mV/℃/cell)	Tempe-rature (℃)	Appropriate charging amount (%)
15	0.1C	2.45	0.05C	−5	0 to 40	110 to 130
10	0.2C					
8	0.3C					