

**GS YUASA
TRACTION BATTERY**

Manufacturing Batteries for Over a Century

In 2017, GS Yuasa Group celebrated its 100th anniversary.

Our range of solutions today includes batteries, power supply systems, lighting equipment, specialty equipment, and many other electrical devices. In this day and age, we are seeing many different ways to use and to store energy, and our customers have great expectations for groundbreaking products specifically tailored for applications in new energy fields, such as photovoltaic power.

We are able to leverage all our experience and all the technologies we have developed over the past 100 years and push ourselves to keep developing these cutting-edge technologies.

In this way, we hope to become a real driving force for innovation.

Our ambition is to make a valuable contribution to the lives of people all across the world, based on our company policy of “Innovation and Growth”.



GS Yuasa Traction Battery Production Sites



China

Established: 2003

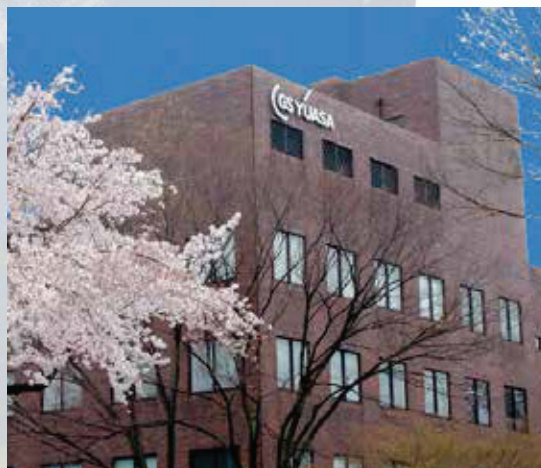
Battery Standard: JIS and DIN type



Thailand

Established: 2008

Battery Standard: JIS and DIN type



Japan

Established: 1943

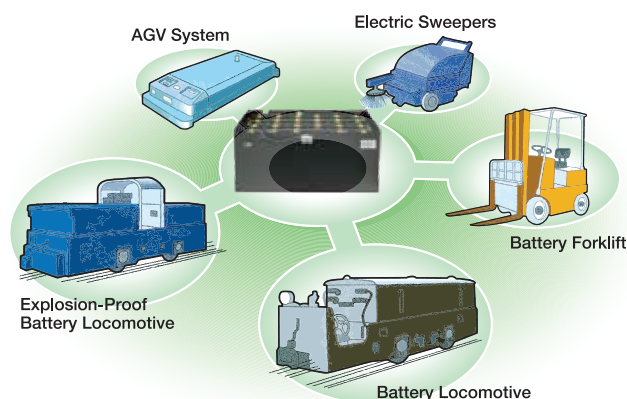
Battery Standard: JIS type

GS Yuasa Multi-Purpose Traction Battery

Traction batteries have a **wide range of applications!**

Traction batteries are used to propel battery-powered electric vehicles such as forklifts, electric golf carts, ride-on floor scrubbers, mining locomotives and a whole host of other vehicles.

Our traction batteries are some of the highest quality batteries to be found worldwide. The technology, designed by GS Yuasa, employs our original glass fiber tubes and is a unique differentiator, while still meeting our customers' more basic requirements of a long service life, stable quality and of course, easy maintenance.



GS Yuasa **product lineups.**

- ✓ **V series** -up to 1080Ah at the 5-hour rate
- ✓ **EB grand star series** -up to 160Ah at the 5-hour rate
- ✓ **GC series** -up to 200Ah at the 5-hour rate



V Series Batteries

V series batteries are GS Yuasa's best-sellers and are well known for their high performance and unsurpassed long service life.

Not only forklift manufacturers, but also battery dealers choose our products based on the specific demands of end users in the market.

GS Yuasa makes both JIS type and DIN type batteries.

GY JIS: Widely accepted by global forklift manufacturers for its quality.

GY DIN: Popular for tubular type DIN with a long cycle life.



Vent plugs are not just “caps” anymore!

Vent plugs are the caps on each individual battery cell, they are used to secure the electrolyte and replenish the distilled water.

We've made improvements by adding floats inside the plugs which indicate to our customers the current level of electrolyte.

The mechanism is very simple. If there is enough electrolyte in the cell, the indicators will pop up when the customer opens the transparent cover. But if the indicator does not appear, then the customer will need to add more water.

At GS Yuasa, we're not only trying to extend the life of our batteries but we're also trying to improve the general usability of our products.



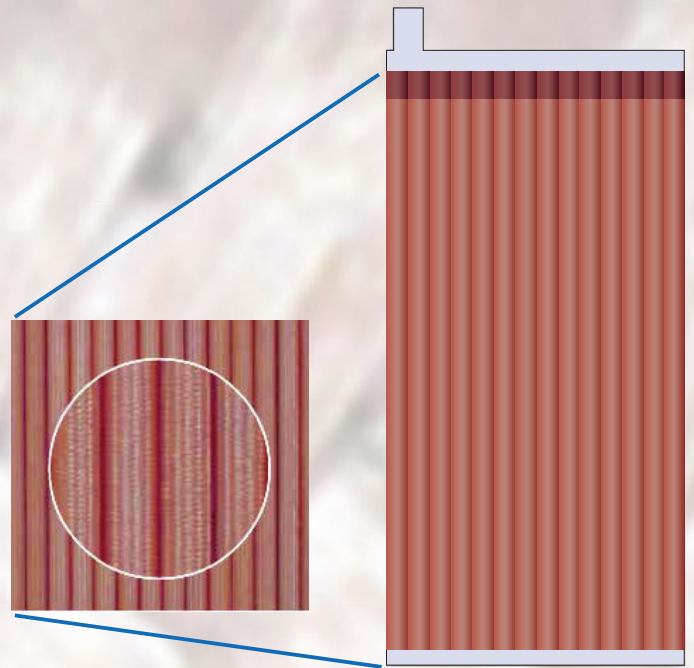
Tubular Plates Prolong Your Battery Life!

Traction batteries are used in harsh environments with extremes of high and low temperatures, and sometimes under heavy duty.

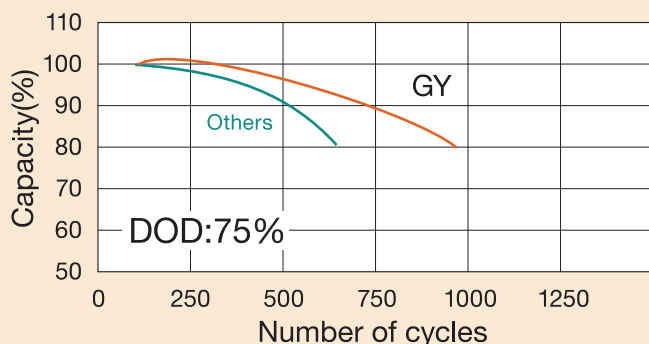
Despite this, GS Yuasa has succeeded in extending the battery life by adopting glass fiber tubes for the positive plates.

Plastic fiber was once a popular material for the positive plates. However, we now use glass fiber because this keeps the active material leakage to a minimum.

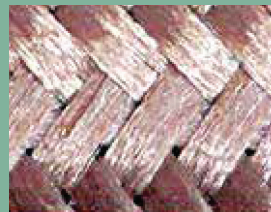
We also carried out cycle life tests on our batteries at high temperature (60°C) and confirmed that our products have a cycle life over 250 higher than other manufacturers' batteries under identical conditions.



High Temperature Cycle-Life Test Results at 60°C

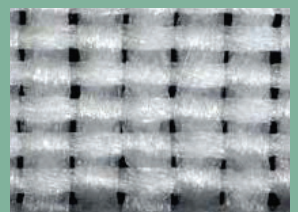


GS Yuasa Glass Fiber Tube



- Higher quality
- Less leakage

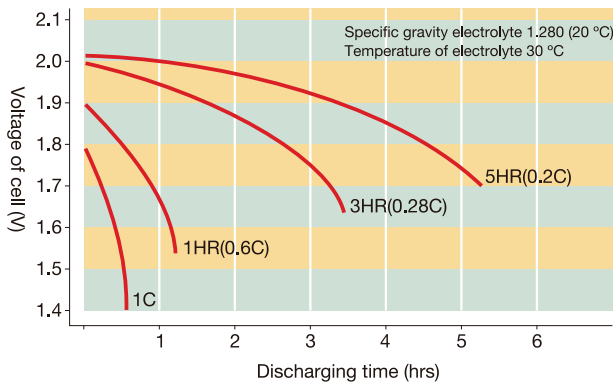
Plastic Fiber Tube



- Lower cost
- More leakage

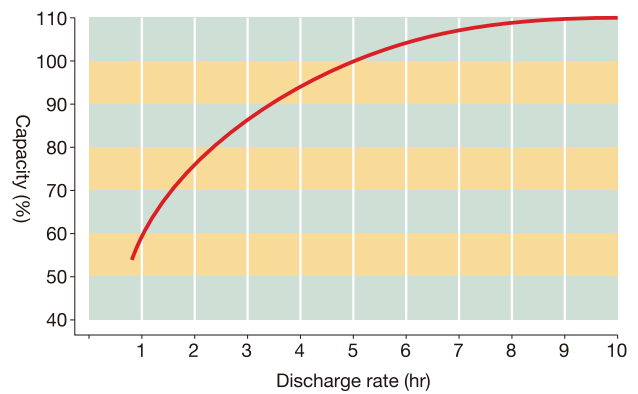
Performance and Durability

Discharge Characteristics of a Forklift Truck Storage Battery



Each hour rate (for example) Just after fully charging, Battery temperature: 30°C, Discharge rate C: Rated one.

Relationship between Discharge rate and Capacity



From the diagram above, the value of current (A) for different discharge rates of a storage battery with a 5-hour rate capacity of 400 Ah is shown below:

$$5\text{-hour rate (5 HR)} = 400\text{Ah}/5 = 80 \text{ A}$$

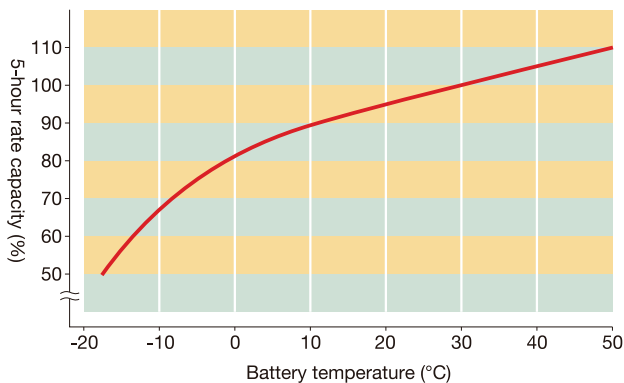
$$3\text{-hour rate (3 HR)} = 400\text{Ah} \times 0.85/3 = 113\text{A}$$

$$2\text{-hour rate (2 HR)} = 400\text{Ah} \times 0.75/2 = 150\text{A}$$

$$1\text{-hour rate (1 HR)} = 400\text{Ah} \times 0.6/1 = 240\text{A}$$

As you can see from the above description, the more often the forklift is used for lifting or the more often it's operated at high speed, the shorter the available working time of the storage battery becomes.

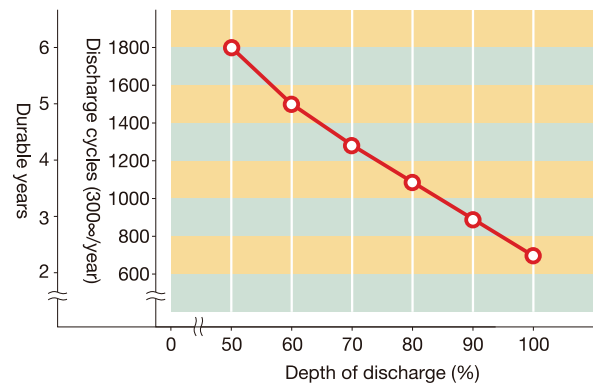
Relationship between Temperature and Battery Capacity



As you can see from the diagram above, the actual available working time of a forklift truck battery is shorter in winter than in summer. This is especially true in a refrigerated warehouse, where the actual available working time of the battery is noticeably shortened due to the high frequency of lifting (which required a great deal of electric current).

To counteract this problem, we recommend charging any battery which will be used in winter or will be used in a refrigerated warehouse to a slightly overcharged condition and to also warm up its temperature in advance (the most suitable battery temperature in this case seems to be about 30°C).

Life of a Clad-Type Storage Battery for a Forklift Truck



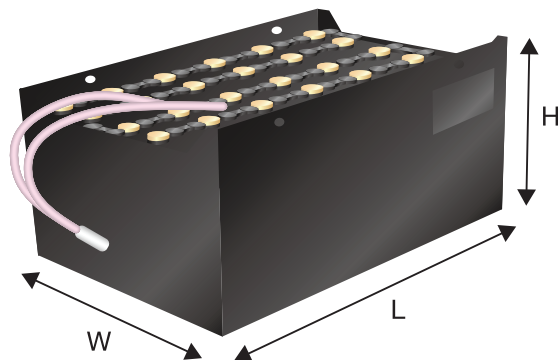
Although it depends on the specific use case and the operating conditions of each forklift truck, the life of the storage battery is in most cases described by its number of durable years of use or by the number of charging and discharging cycles it is capable of before the battery capacity decreases to between 60% and 80% of the original rating.

Although the life of a storage battery depends heavily on these conditions, it can be expected to be as long as up to about 4 years of use or up to about 1,200 charging and discharging cycles in normal use, whichever comes first.

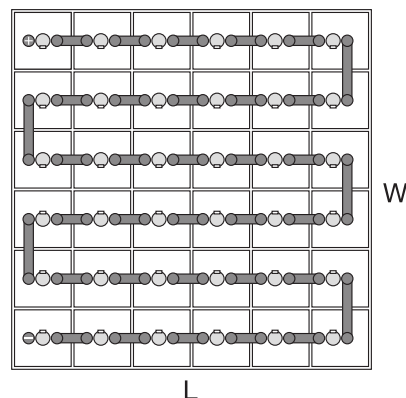
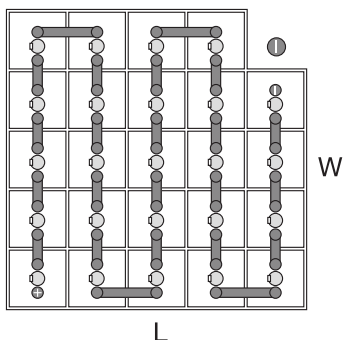
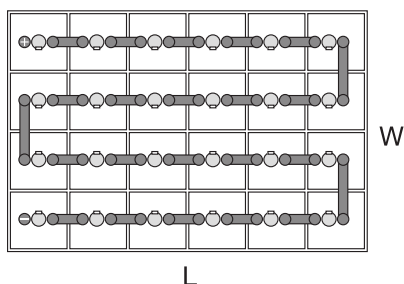
How to inquire?

The following information makes us find your solution faster!!!

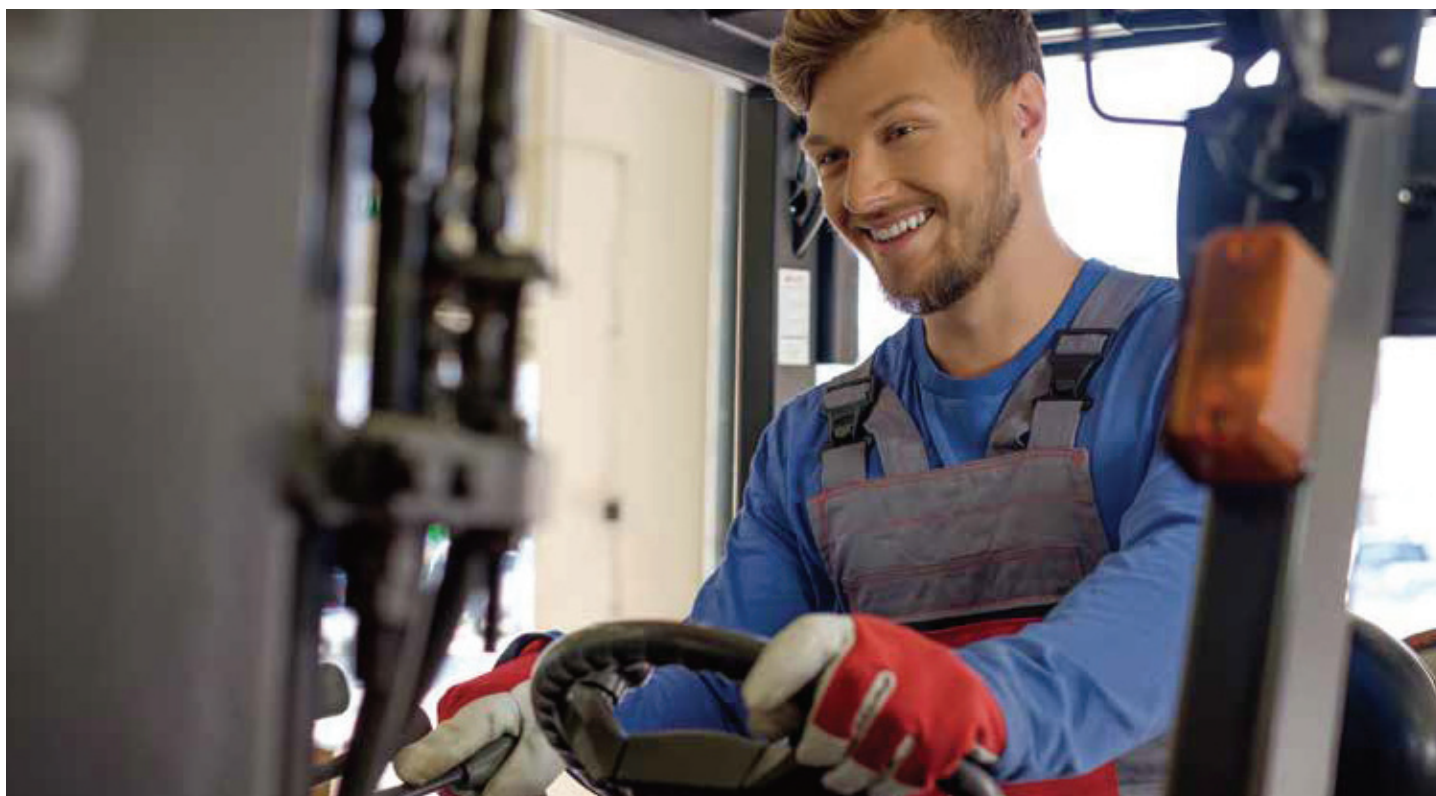
- Brand and model of your equipment
- Voltage and capacity of the assembled batteries
- Dimension of battery cells
- Size of steel trays



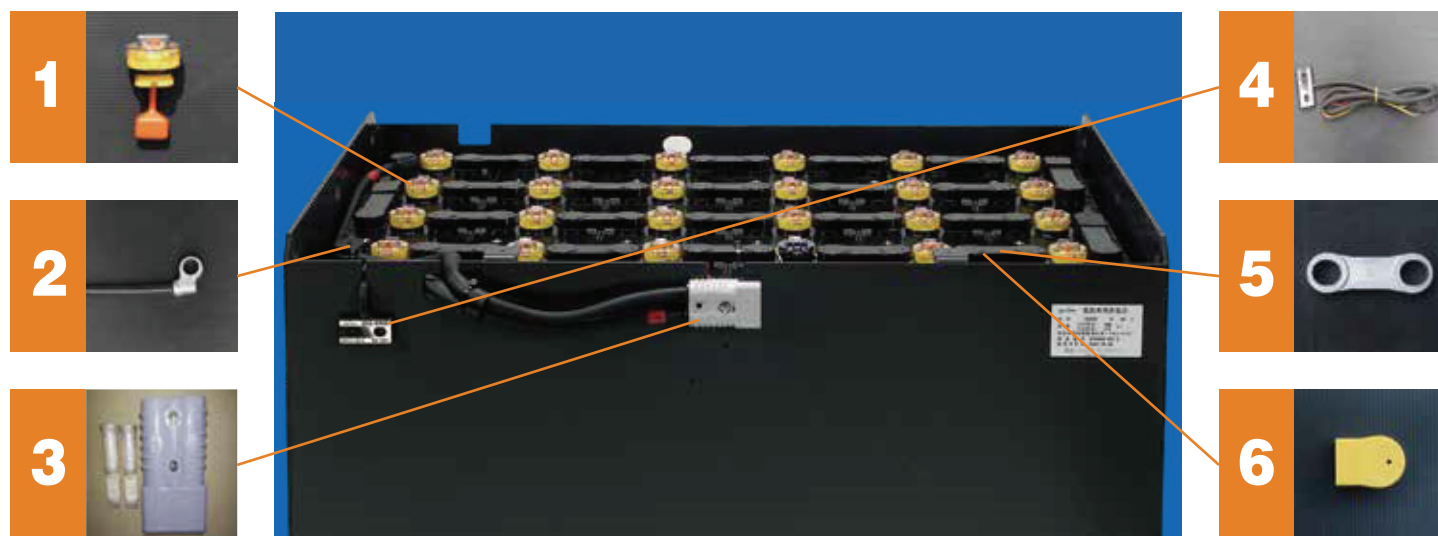
- Arrangement of cells



- Extra
- Plug type



Introduction of GS Yuasa Traction Battery Parts



- 1 Vent Plugs**
Caps of the cells and users are able to see the electrolyte level by checking the float on the plug.
- 2 Lead cables**
Cables that connect the cells and plugs.
- 3 Plugs**
Parts that connect the batteries and electric vehicles.

- 4 Level sensors**
Sensors that indicate the electrolyte level.
- 5 Connectors**
Parts used to connect the cells with each other.
*Connector in the picture is for JIS battery.
- 6 Connector Covers**
Parts used to cover the connector.



GS Yuasa Standard Auto Filling System

Tired of replenishing the distilled water yourself? Relax, that's why we have F88.

As you use a battery, the distilled water evaporates and you have to add water to each cell in order to maintain the proper level of electrolyte. To save your money, using an auto filling system would be the right choice.

The operation is very simple, you just need to connect the tubes from the water tank to the battery, and let the water flow until the indicator shows there's now enough water in the cells.

Procedure



Advantages

- **Saves money**

You can check the water level through the cap and make sure that no cells are withering away. As a result, the battery stays in a better condition.

- **Saves time and energy**

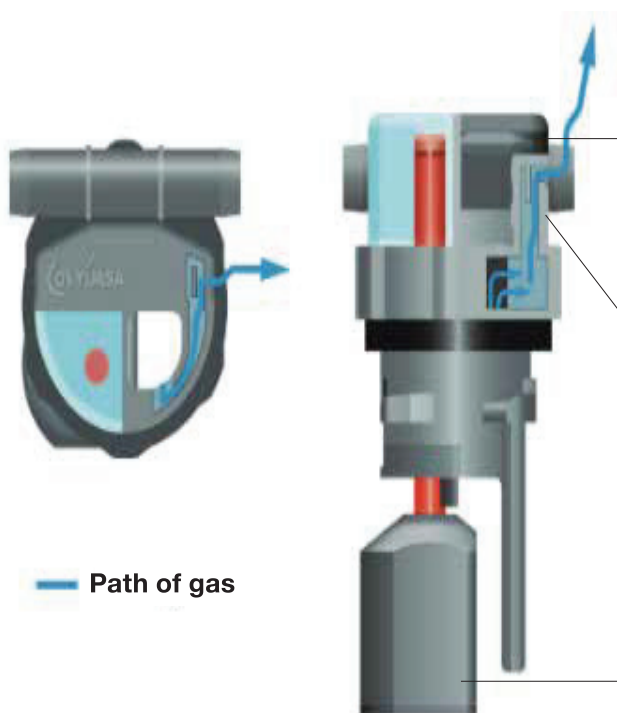
You no longer need to pour the water into each cell one by one and the filling process only takes a couple of minutes.



GS Yuasa Superior Auto Filling System

Take a close look at the **F11 (b:stop)** spec.
You won't find anything better!

F11, also known as b:stop, our battery watering system, is a new type of auto filling system. We've made the following improvements to allow high pressure filling and make it resistant to higher temperatures.



Cover

Designed to reduce the acid mist dispersion.

Plug

The construction allows high pressure filling from a tank up to 13-m high and shortens the replenishing time.

* Tank: 30 – 60 sec W/pump: 10 sec

Float

Made of Polypropylene and resistant up to 100°C, so suitable for heavy duty users.

Advantages

• Fast water injection

Complete auto-filling within 1 minute.

• User friendly design

Stops when the filling process is completed.

• Splash-proof structure

No splashing while charging. Removes the gas.

• Excellent heat performance

Through the adoption of new materials, is now resistant up to 100°C.

EB Grand Star Series

The most **omnipotent item** in our lineup.

(EB TYPE/12V)

MODEL	Nominal Capacity (Ah/5HR)	Dimensions (mm)				Acid (L)	Weight with Acid (kg)	Q'ty per Pallet
		(L)	(W)	(h)	(H)			
EB25TE	25	197	129	202	227	2.1	11.5	40
EB35TE	35	238	129	202	227	3.0	14.0	28
EB35LE/LER	35	238	129	202	237	3.0	14.0	28
EB50TE	50	260	173	202	225	3.8	20.5	20
EB50LE	50	260	173	202	236	3.8	20.5	20
EB65TE	65	305	173	205	228	4.1	24.5	18
EB65LE/LER	65	305	173	205	237	4.1	24.5	18
EB100TE/LE/LER	100	409	173	212	244	6.7	34.5	15
EB120TE/LE/LER	120	504	182	212	258	9.0	41.0	10
EB130TE/LE/LER	130	504	182	212	258	8.8	45.5	10
EB145TE/LE/LER	145	508	223	213	259	10.0	51.5	10
EB160TE/LE/LER	160	508	223	213	259	9.8	54.5	10



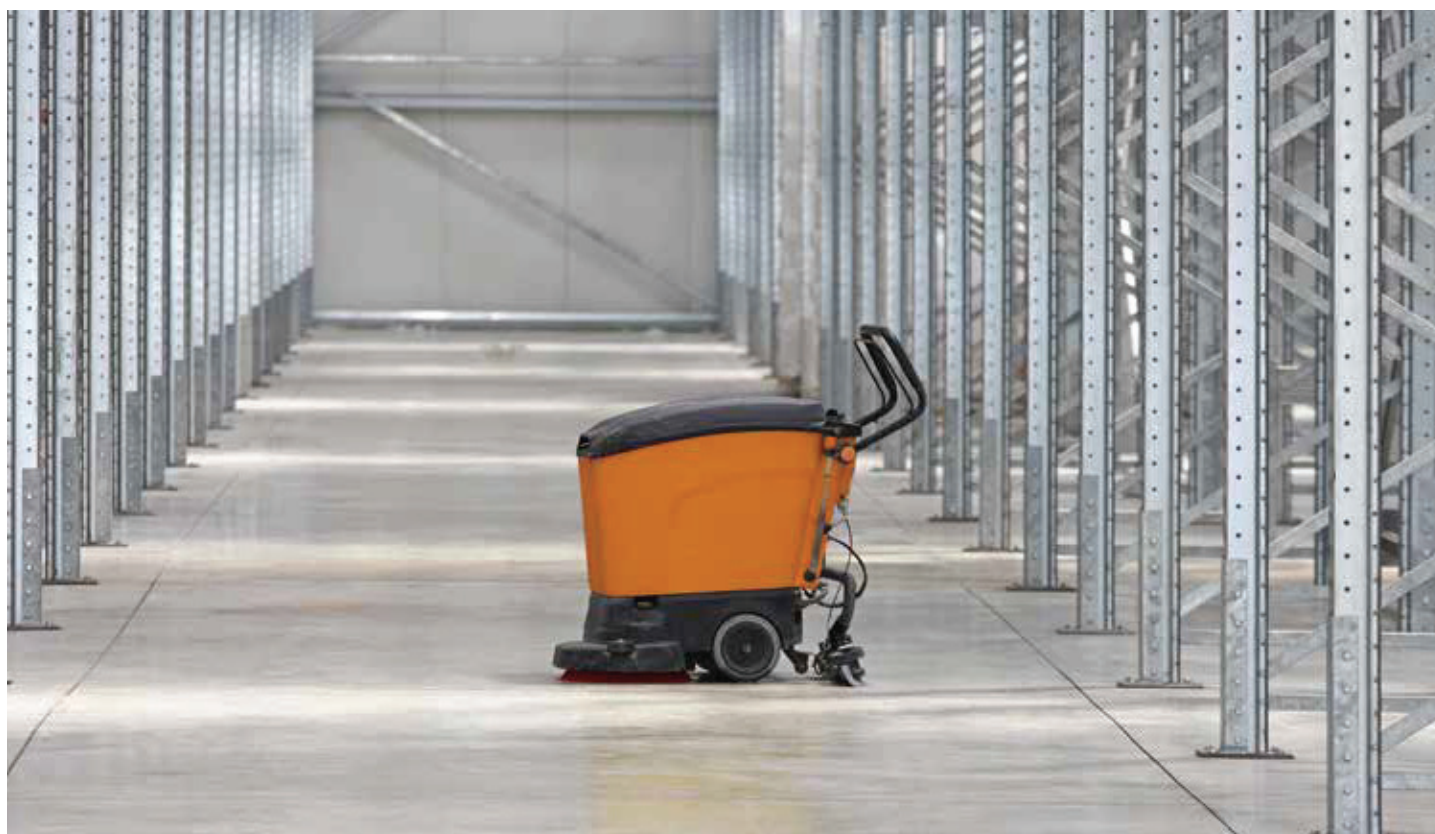
Advantages

- **Wide usage**

Sweepers and electric wheelchairs etc.

- **JIS Standard**

Made in Japan factory.



Another lineup that uses tubular plates.



Model	Voltage	Capacity (A)		Size (mm)				Battery weight with electrolyte (kg)	Amount of electrolyte (L)
		5HR	1HR	L	W	H	Total H		
GC140	6	140	84	262	181	267.5	291	30	6.9
GC200	6	200	120	262	181	267.5	291	33	6.3

Advantages

- Easy maintenance

Users can see the electrolyte level by checking the position of float. Remarkably short replenishing time.

- Long life

Like V series batteries, we apply tubular plates for GC series as well.

- Wide usage

Used for industrial equipment like Automatic Guided Vehicles in the figure below.

- JIS Standard

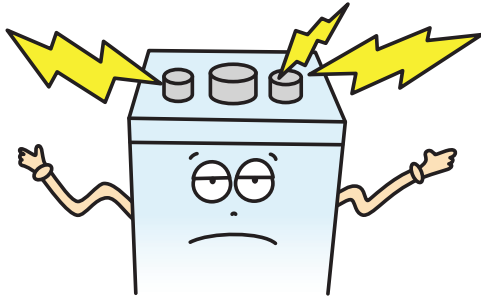
Made in Japan factory.



Cautions

1 Avoid overdischarging.

Overdischarging will shorten the life of your battery. You must avoid driving until the very last moment when your vehicle can no longer move.



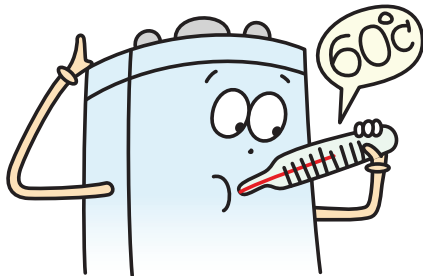
2 Avoid overcharging.

Overcharging will also shorten the life of your battery. The battery must be charged using the proper method.



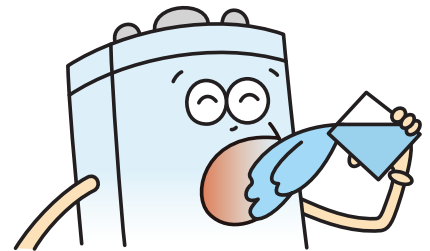
3 Avoid the battery overheating.

Always keep the temperature of the electrolyte below 60°C.



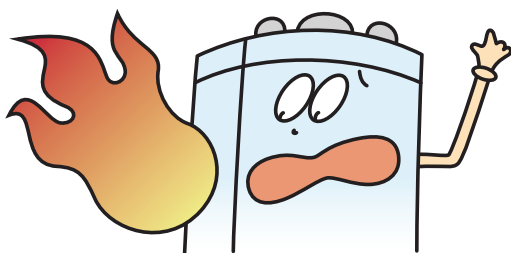
4 Keep the electrolyte level at the proper height.

The electrolyte level will gradually get lower when the battery is being used. When the electrolyte level decreases, fill up with distilled water straight away.



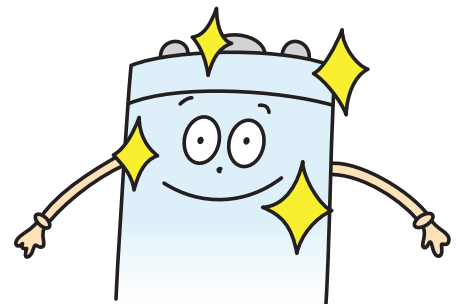
5 Fire is strictly prohibited.

Since hydrogen and oxygen are released through the vent plugs of the battery always keep the battery away from fire.



6 Keep the battery clean and dry.

Keep the outside of the battery clean and dry to prevent leakage and corrosion.



SPEC Sheet for V Series

GS YUASA TRACTION BATTERIES (JIS TYPE/2V)

	MODEL	Nominal Capacity (Ah/5HR)	Dimensions (mm)				Acid (L)	Weight with Acid (kg)
			L	W	H	TH		
Welding Type	VSA 5	180	109	158	280	311	2,5	11,0
	VSA 6	210	128	158	280	311	3,0	13,0
	VSA 7	250	148	158	280	311	3,5	15,0
	VSΒ 10	440	206	158	320	351	5,7	25,0
	VSΒ 7	310	144	158	320	351	3,9	17,5
	VSΒ 8	350	148	158	320	351	3,9	19,0
	VSC 12	550	244	158	350	381	7,8	31,0
	VSC 6	275	128	158	350	381	3,9	16,0
	VSC 8	360	144	158	350	381	4,4	19,5
	VSC 8A	385	148	158	362	393	4,5	22,0
	VSD 320	320	128	158	376	407	4,2	18,0
	VSD 360	360	128	158	376	407	4,1	19,5
	VSD 8D	390	148	158	376	407	4,8	22,5
	VSD 10AC	540	177	158	395	426	6,1	28,5
	VCD 12	600	206	158	395	426	6,4	34,0
	VSD 3A	170	60	158	395	426	1,9	9,5
	VSD 4B	225	94	158	395	426	3,2	13,0
	VSD 5A	265	94	158	395	426	3,2	15,0
	VSD 6	335	128	158	395	426	4,3	19,0
	VSD 7C	340	144	158	395	426	5,5	19,5
	VSD 8AC	435	144	158	395	426	4,8	23,0
	VSD 9AC	475	161	158	395	426	5,4	25,5
	VSF 340	340	90	158	490	521	3,7	18,5
	VSF 3A	210	60	158	490	521	2,4	12,0
	VSF 3C	225	90	158	490	521	4,1	14,5
	VSF 4	290	90	158	490	521	3,9	17,0
	VSF 5	360	109	158	490	521	4,7	20,0
	VSF 5A	350	99	158	490	521	4,0	19,5
	VSF 6A	420	109	158	490	521	4,5	22,5
	VSF 8	545	144	158	490	521	6,6	35,5
	O VSF 10A	700	177	158	490	521	7,7	36,5
	VSI 3A	240	60	158	519	550	2,5	12,5
	VSI 3D	230	78	158	519	550	3,6	14,0
	VSI 4	320	90	158	519	550	4,0	19,0
	VSI 4A	300	78	158	519	550	3,4	16,0
	VSI 4C	350	90	158	519	550	3,7	19,0
	VSI 6C	435	109	158	519	550	4,2	24,5
	VSI 7C	510	126	158	519	550	4,9	28,0
	VSI 8	635	161	158	519	550	7,4	33,0
	VSI 8C	580	142	158	519	550	5,5	32,0
	O VSI 9	720	186	158	519	550	8,8	38,0
	VSI 9C	655	158	158	519	550	6,2	36,0
	O VSI 9D	715	171	158	519	550	6,7	40,0
	O VSI 11	935	225	158	519	550	10,7	47,5
	O VSI 11C	865	206	158	519	550	8,1	47,5
	VSH 3A	315	60	158	700	731	3,4	20,0
	VSH 4	510	90	158	700	731	4,9	30,5
	VSH 4A	420	78	158	700	731	4,6	25,5
	VSH 4S	375	70	158	700	731	3,6	23,0
	VSH 5A	525	94	158	700	731	5,5	30,5
	VSH 6A	630	109	158	700	731	6,5	36,5
	VSH 7A	735	128	158	700	731	7,7	42,5
O : Double POLE								
Welding Type	VGC 225	225	90	158	350	381	2,7	14,0
	VGC 520	520	186	158	350	381	5,6	30,5
	VGD 165	165	57	158	395	426	1,9	10,0
	VGD 205	205	69	158	395	426	2,2	12,5
	VGD 255	255	81	158	395	426	2,6	15,5
	VGD 340	340	109	158	395	426	3,8	19,0
	VGD 415	415	128	158	395	426	4,3	24,0
	VGD 470	470	144	158	395	426	4,8	27,0
	VGD 575	575	177	158	395	426	6,1	33,0
	VGD 620	620	186	158	395	426	6,3	35,5
	VGD 485	485	144	158	410	441	5,1	27,5
	VGD 545	545	161	158	410	441	5,7	30,5
	VGD 565	565	177	158	410	441	6,6	32,0
	VGD 600	600	177	158	410	441	6,5	33,5
	O VGD 700	700	206	158	410	441	7,4	40,0
	VGE 245	245	75	158	447	478	2,9	15,0
	VGE 305	305	90	158	447	478	3,5	18,0
	VGE 700	700	186	158	447	478	7,2	40,5
	VGF 201	201	57	158	490	521	2,4	12,5
	VGF 220	220	60	158	490	521	2,5	13,0
	VGF 260	260	69	158	490	521	2,9	15,0
	VGF 370	370	99	158	490	521	4,4	21,0
	VGF 445	445	109	158	490	521	4,8	24,0
	VGF 530	530	128	158	490	521	5,4	30,5
	VGF 605	605	148	158	490	521	6,4	34,5
	VGF 730	730	177	158	490	521	7,6	42,0
	O VGF 785	785	186	158	490	521	7,9	45,0
	O VGF 865	865	206	158	490	521	8,9	49,5
	O VGF 935	935	225	158	490	521	9,8	53,5
	VGF 280	280	75	158	512	543	3,4	17,0
	VGI 240	240	60	158	519	550	2,6	13,5
	VGI 285	285	69	158	519	550	3,0	16,5
	VGI 370	370	90	158	519	550	4,1	21,0
	VGI 440	440	109	158	519	550	5,1	25,5
	VGI 470	470	109	158	519	550	5,0	27,5
	VGI 565	565	128	158	519	550	5,7	32,0
	VGI 645	645	148	158	519	550	6,8	36,5
	VGI 725	725	161	158	519	550	7,3	40,0
	O VGI 845	845	186	158	519	550	8,4	48,0
	O VGI 930C	930	206	158	519	550	9,4	52,0
	O VGI 1005	1005	225	158	519	550	10,4	56,5
	O VGI 1080	1080	244	158	519	550	11,4	60,5
	VCH 3C	300	60	158	700	731	3,0	18,0
	VCH 4C	400	78	158	700	731	4,1	23,0
	VCH 6C	580	109	158	700	731	5,9	33,0
	O VCH 7C	680	126	158	700	731	6,9	38,5
	O VCH 8C	770	142	158	700	731	7,7	43,5
	VCJ 11	490	94	158	700	731	5,1	28,0
	O VCJ 19	870	158	158	700	731	8,7	48,5
	O VCJ 21	950	171	158	700	731	9,3	53,0
	LCS 9	270	72	158	519	550	2,8	15,5
	VCI 2C	150	46	158	519	550	1,6	10,0
	VGL 440H	400	78	158	609	640	3,5	21,0

SPEC Sheet for V Series

GS YUASA TRACTION BATTERIES
(DIN TYPE/2V)

	MODEL	Nominal Capacity (Ah/5HR)	Dimensions (mm)				Acid (L)	Weight with Acid (kg)
			L	W	H	TH		
Welding Type	2DCJ230A (2PzS230)	230	47	198	545	575	2,3	14
	3DCJ345A (3PzS345)	345	65	198	545	575	3,3	19,5
	4DCJ460A (4PzS460)	460	83	198	545	575	4,3	26,5
	5DCJ575A (5PzS575)	575	101	198	545	575	5,2	32,5
	2DCM250A (2PzS250)	250	47	198	575	605	2,7	15
	3DCM375A (3PzS375)	375	65	198	575	605	3,9	21,5
	4DCM500A (4PzS500)	500	83	198	575	605	5	28
	5DCM625A (5PzS625)	625	101	198	575	605	6,2	34,5
	6DCM750A (6PzS750)	750	119	198	575	605	7,3	41
	2DCP280A (2PzS280)	280	47	198	685	715	2,9	18
	3DCP420A (3PzS420)	420	65	198	685	715	4,5	26
	4DCP560A (4PzS560)	560	83	198	685	715	5,7	33
	5DCP700A (5PzS700)	700	101	198	685	715	7,2	41
	2DCS310A (2PzS310)	310	47	198	720	750	3	18,5
	3DCS465A (3PzS465)	465	65	198	720	750	4,5	26,5
	4DCS620A (4PzS620)	620	83	198	720	750	6	34,5
	5DCS775A (5PzS775)	775	101	198	720	750	7,4	42,5
	6DCS930A (6PzS930)	930	119	198	720	750	8,7	51



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