

USER MANUAL

S19



Electrically powered scooter
Class A (EN 12184)



HEARTWAY

HEARTWAY MEDICAL PRODUCTS CO., LTD.

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Part Number: 70030279

PUBLISHED: November 16th, 2012

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SAFETY INSTRUCTION

◆ General



Always use a seat belt, and keep your feet on the scooter all the time.



Never operate the scooter while you are under the influence of alcohol.



Never use electronic radio transmitters such as walkie-talkies, or cellular phones.



Make sure that there are no obstacles behind you while reserving your scooter.



Do not make a sharp turn or a sudden stop while riding your scooter.



Do not rider your scooter in traffic.

 <p>Do not attempt to climb curbs greater than limitation show on Technical Specification</p>	 <p>Do not leave your hands and legs off the scooter when driving.</p>
 <p>Do not rider your scooter during snow in order to avoid accident on slippery road.</p>	 <p>Do not allow unsupervised children to play near this equipment while the batteries are charging.</p>

◆ **Warning – Don't operate your scooter for the first time without completely reading and understanding this user manual.**

1. Don't operate scooter on public streets and roadways. Be aware that it may be difficult for traffic to see you when you are seated on the scooter. Obey all local pedestrian traffic rules. Wait until your path is clear of traffic, and then proceed with extreme cautions.
2. To prevent injury to yourself or others, always ensure that the power is switched off when getting on or off of the scooter.
3. Always check that the drive wheels are engaged (drive mode) before driving. Do not switch off the power when the scooter is still moving forward. This will bring the chair to an extremely abrupt stop.
4. Do not use this product or any available optional equipment without first completely reading and understanding these instructions. If you are unable to understand the warnings, cautions or instructions, contact a healthcare professional, the dealers or technical supports before attempting to use this equipment, otherwise, injury or damage may occur.
5. There are certain situations, including some medical conditions, where the scooter user will need to practice operating the scooter in the presence of a trained attendant. A trained attendant can be defined as a family member or care professional especially trained in assisting a scooter user in various daily living

activities. Consult with your physician if you are taking any medication that may affect your ability to operate your scooter safely.

6. Do not attempt to lift or move a power scooter by any of its removable parts including the armrests, seats or shrouds. Personal injury and damage to the power chair may result.
7. Never try to use your scooter beyond its limitations as described in this manual.
8. Please do not sit on your scooter while it is in a moving vehicle.
9. Keep your hands away from the wheels (tires) while driving scooters. Be aware that loose fitting clothing can become caught in the drive tires.
10. Consult your physician if you are taking prescribed medication or if you have any certain physical limitations. Some medications and limitations may impair your ability to operate scooters in a safe manner.
11. Be aware when the drive mode is unlocked or locked.
12. Don't remove anti-tipper if there is any-tipper equipped with the scooter.
13. Contact with tools can cause electrical shock and do not connect an extension cord to the AC/DC converter or the battery charger.
14. Do not attempt to lift or move your scooter by any of its removal parts, such as the armrests, seats, or shroud.
15. When climbing an incline, don't drive at an angle up the face of the incline. Drive your scooter straight up the incline. This greatly reduces the possibility of a tip or a fall.
16. Don't climb a slope steeper than the scooter's limitation.
17. Don't attempt to have your scooter proceed backward down any step, curb or other obstacle. This may cause the scooter to fall or tip.
18. Always reduce your speed and maintain a stable center of gravity when cornering sharply. Don't corner sharply when driving scooters at higher speeds.
19. Operating in rain, snow, salt, mist conditions and on icy or slippery surfaces may have an adverse affect on the electrical system.
20. Never sit on your scooter when it is being used in connection with any type of lift or elevation product. Your scooter is not designed with such use in mind and any damage or injury incurred from such use is not the responsibility of Heartway.
21. Surfaces of the power scooter that can come into direct contact with the occupant's skin and/or assistant's skin during normal use and that are within occupant reach shall not exceed 41 °C. The motor surface can reach temperatures greater than 41°C after driving. Do not touch these parts when disassembling the scooter or wait until the motor is cooled down.
22. The programming of the controller shall only be carried out by personnel, which is authorized by his manufacturer. A wrong programming can result in safety hazards for the occupant!
23. If the power scooter is switched off while driving on the horizontal at maximum speed at 7 km/h, it will come to a stop with the maximum stopping distance of 1.2 m. Please consider this distance when driving.
24. Drive-wheel needs to be switched to engaged-mode while transporting the power scooter with a car or airplane.
25. Surface temperatures can increase when exposed to external sources of heat.

◆ **Modifications**

Heartway Medical Product has designed and engineered power scooters to provide maximum utility. However, under no circumstances should you modify, add, remove, or disable any part or function of your power scooter. Personal injury and damage to the power chair may result.

1. Do not modify your power scooter in any way not authorized by Heartway. Do not use accessories if they have not been tested or approved for Heartway products.
2. Get to know the feel of your power scooter and its capabilities. Heartway recommends that you perform a safety check before each use to make sure your scooter operates safely.

◆ **Inspections prior to using your power scooter:**

1. If equipped with pneumatic tires, please check for proper tire inflations.
2. Please check all electrical connections and make sure they are tight and not corroded.
3. Please check all harness connections and make sure they are secured properly.
4. Please check the brakes.

◆ **Weight limitation.**

1. Please refer to the specifications table for weight capacity information. Power scooter is rated for a maximum weight capacity.
2. Stay within the specified weight capacity for your scooter. Exceeding the weight capacity voids your warranty. Heartway will not be held responsible for injuries or property damage resulting from failure to observe weight limitations.
3. Don't carry passengers on scooters. Carrying passengers on scooter may affect the center of gravity, resulting in a tip or a fall.

◆ **Tire inflation**

1. If your scooter is equipped with pneumatic tires, it is necessary to check the air pressure at least one time a week.
2. Proper inflation pressures will prolong the life your tires and ensure the smooth operation while riding.
3. Do not under-inflate or over-inflate your tires. It is critically important that 30-25 psi (2-2.4bar) tire pressure be maintained in pneumatic tires at all times.
4. Inflating your tires from an unregulated air source could over-inflate them, resulting in a burs tire.

◆ **Temperature**

1. Some of the parts of the power scooter are susceptible to change in temperature. The controller can only operate in temperature that ranges between **-25°C ~ 50°C**.
2. At extreme low temperatures, the batteries may freeze, and your power scooter may not be able to operate. In extreme high temperatures, it may operate at slower speeds due to a safety feature of the controller that prevents damage to the motors and other electrical components.

ELECTROMAGNETIC INTERFERENCE (EMI)

The rapid development of electronics, especially in the area of communications, has saturated our environment with electromagnetic (EM) radio waves that are emitted by television, radio and communication signals. These EM wave are invisible and their strength increases as one approach the source. All electrical conductors act as antennas to the EM signals and, to varying degrees, all power wheelchairs and scooters are susceptible to electromagnetic interference (EMI). The interference could result in abnormal, unintentional movement and/or erratic control of the vehicle. The United States Food and drug Administration (FDA) suggests that the following statement be incorporated to the user's manual for all power scooter like the **S19**. Power scooters may as susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy emitted from sources such as radio stations, TV stations, amateur radio (HAN) transmitter, two-way radios, cellular phones and alarm systems of shops. The interference (from radio wave sources) can cause the power scooter to release its brakes, move by itself or move in unintended directions. It can also permanently damage the powered scooter's control system. The intensity of the EM energy can be measured in volts per meter (V/m). Each powered scooter can resist EMI up to a certain intensity. This is called "immunity level". The higher the immunity level the greater the protection. At this time, current technology is capable of providing at least 20 V/m of immunity level, which would provide useful protection against common sources of radiated EMI.

Following the warnings listed below should reduce the chance of unintended brake release or powered scooter movement that could result in serious injury:

1. Do not turn on hand-held personal communication devices such as citizens band (CB) radios and cellular phones while the powered scooter is turned on.
2. Be aware of nearby transmitters such as radio or TV stations and try to avoid coming close to them.
3. If unintended movement or brake release occurs, turn the powered scooter off as soon as it is safe.
4. Be aware that adding accessories or components, or modifying the powered scooter, may make it more susceptible to interference from radio wave sources (Note: It is difficult to evaluate the effect on the overall immunity of the powered scooter).
5. Report all incidents of unintended movement or brake release to the powered scooter manufacturer, and note whether there is a radio wave source nearby.

TURN OFF YOUR POWERED SCOOTER AS SOON AS POSSIBLE WHEN EXPERIENCING THE FOLLOWING:

- Unintentional scooter movements
- Unintended or uncontrollable direction.
- Unexpected brake release

The FDA has written to the manufacturers of power scooters asking them to test new products to be sure they provide a reasonable degree of immunity against EMI. The FDA requires that a powered wheelchair should have an immunity level at least 20 V/m, which provides a reasonable degree of protection against more common sources of EMI. The higher the immunity level the greater the protection. Your powered scooter has an immunity level of 20 V/m which should protect against common sources of EMI. Warning: The scooter itself can disturb the performance of the electromagnetic fields such as emitted by alarm systems of shops.

TECHNICAL SPECIFICATIONS



MODEL	S19
WEIGHT CAPACITY	115kgs(250 lbs)
SEAT: TYPE/SIZE	16" Fish-on
DRIVE WHEEL	200mmx50mm(8"x2")
FRONT CASTER (WHEEL)	180mmx40mm(7"x1.6")
REAR CASTER (ANTI-TIPPER)	Option
MAX SPEED	4MPH (6.5KP/H)
BATTERY SPECIFICATIONS	Li-Battery: 24V 11.5Ah Li-Polymer (14.5 option) Lead-Acid: 12V 12AH X 2
BATTERY RANGE	20km
CHARGER TYPE	2.5Amp,110/240 Volt,Li-ION Charger (4Amp option)
CONTROLLER TYPE	S-DRIVE 45Amp (S-DRIVE 70Amp option)
MOTOR TYPE	4-Pole 270W
WEIGHT: W/ BATTERY	27.3kgs(60 lbs)
WEIGHT: W/O BATTERY	24kgs(53 lbs)
TURNING RADIUS	820mm
SUSPENSION	Front Suspension
LENGTH	930mm
WIDTH	485mm
HEIGHT	945mm
Folded Size	750mm*485mm*450mm
SEAT DEPTH	330mm
BACK HEIGHT	360mm
WHEEL BASE	695mm
GROUND CLEARANCE	60mm
Maximum Safe Slope	6 Degree
LEG ROOM	420mm

ADJUSTMENT

It is very easy to assemble your S19 scooter. Please follow the procedure below.

S19 power scooter has aluminum alloy body and can be easily folded to fit in the car for transportation. It also has easy to use controls and adjustable tiller positioning.

- ⇒ Distinctive stylish lightweight scooter.
- ⇒ Easy to use controls.
- ⇒ Adjustable tiller positioning.
- ⇒ Easy to remove the battery pack.
- ⇒ Dismantles for transporting in a car.

See the following four steps to fold the scooter



Pull the red bar



Unfold the chair



Pull down the tiller to fold the scooter.
Push the tiller softly until the tiller locks.



Completed

How to Un-Fold the Scooter

- Lean the folded scooter on the floor resting on the rear wheel
- Pull the red lever on the side of the scooter and begin unfolding it from the tiller.
- Make sure to open the tiller until the two front wheels touch the ground and you hear a click indicating sound that the scooter is locked in the pen position.
- Unfold the scooter backrest. Make sure the free-wheel lever is in the engaged position.
- Sit on the scooter and adjust your desired height making sure the adjustment knob is locked into position.
- Insert the key and turn it to power the scooter.
- Begin using your scooter and enjoy your ride!

OPERATION OF CONTROL PANEL

The power scooter is simple to operate. However, we recommend that you read carefully the following instructions to become familiarized with your new vehicle.

A Word of Caution:

Before you turn the power on, always be aware of the environment that surrounds you to select your desired speed. For indoor environments we recommend that you select the slowest speed setting. For outdoor operation of this vehicle we recommend that you select a speed that is comfortable for you to control it safely.

The following steps are required to operate your vehicle safely with the controller.



Button functions

1. **Battery Indicator:** When your scooter is switched on, the needle on the meter will move across the scale from the left 'red' sector towards the 'green' sector, indicating the state of charge in your batteries. As the power is used up in your batteries, the needle will slowly towards the 'red' sector indicating the state of charge at that precise time. When the needle is fully over to the right, the batteries are fully charged. When the needle falls towards the red sector, your batteries are losing power, but you will still have power to spare. When the needle falls into the red sector, your batteries are low in power and need to be recharged. It is wise to recharge your batteries when the needle enters the red zone (see Batteries and Battery Charging section of this manual).
2. **High/Low Speed Adjustment:** This allows you to pre-select your desired speed. The adjuster is proportional to speed and can be set anywhere between minimum and maximum. Turn the adjuster knob counter-clockwise to minimum for a very gentle operation, and clockwise towards maximum to increase your speed.

3. Power ON/OFF Light: The light will turn on if you insert the key. The light will turn off if you take out the key.
4. Horn button: Press this button to sound the horn.(Easy operation for left hand or right hand)

Driving:

A) Controller ON/OFF Switch

Insert the key to power on the scooter (Remove the key to power off). Swing the finger lever control forward or backward to control the driving direction of the scooter (The finger lever control is located at both sides of the controller and the returning of the finger lever control to its neutral position,(center), will reduce the speed and stop the vehicle by automatically applying the electro-magnetic brakes.



Finger Lever Control/Maximum Force Applied on Lever is 4N

B) Speed Control

Turn the adjuster knob clockwise towards maximum to increase your speed, and counter-clockwise toward minimum to slow down your speed.

C) Finger Lever Control

The finger lever control can also control the speed of your vehicle. The deeper you press on the finger lever (forward / backward), the faster the vehicle will go.

Notes:

- ⇒ After inserting the key into controller ON/OFF port, the light of power ON/OFF will turn on for a few seconds during self-checking process.
- ⇒ When the vehicle is in operation, the surface of the charger will become slightly warm.
- ⇒ In case of emergency, let go of the finger lever control and the vehicle will come to a stop.

Control Panel Display

1. The control panel display is a multifunction visual display. It can provide a lot of information of the vehicle. When the needle falls into the red sector, your batteries are low on power and need to be recharged. It is

wise to recharge your batteries when the needle enters the red zone. The remaining battery needle only goes lower when using the battery, regardless the battery voltage. The remaining battery meter needle goes higher only when recharging battery in progress.

2. System will power off when the battery voltage is lower than 21.0V.
3. System will be automatically power-off when the vehicle is not in use over 30 minutes. You need to remove the key and insert the key to restart the scooter.

Free-Wheeling:

1. The motors are designed to engage the electromagnetic brakes when the vehicle is not in use or when the power is OFF. They also have a manual feature that allows them to “free-wheel” so the scooter can be moved without turning it on. Free-wheeling is accomplished by adjusting the free-wheeling levers to the free-wheeling position.
2. Engaging in freewheel mode will have the function as parking brake.



Free- Wheeling Lever/ Maximum required hand-arm force on the lever is 19 N for engaging and 35 N for disengaging

Warning !

- ⇒ Never free-wheel your power scooter on a slope.
- ⇒ Never free-wheel the motors while operating your vehicle.
- ⇒ Always remember to engage the motors before turning the power ON.

Electromagnetic Brakes:

Your power scooter comes with Electromagnetic Brakes., i.e. an automatic magnetic disc safety brake which is also known as Fail-Safe brake. The electro-magnetic Brakes are automatic and work when the power scooter is ON but in a steady state (i.e. Wigwag is released to the neutral position), even when the scooter is on a slope. The Electromagnetic Brakes will also be set whenever the power scooter is OFF, but the motor levers are in the engaged (vertical) position.

Parking brake:

There is an automatic parking brake function included in the electromagnetic brake. The scooter will stop when the motor is engaged and the power switch is off or when the power switch is on and the wigwag is in the

neutral position. If the scooter is in the free wheel mode (motor is disengaged), you can use the manual parking brake function by moving the engaging/disengaging lever back into the engaged position by an attendant.

Thermal Protection:

Your power scooter controller is equipped with a safety system called thermal rollback. A built-in circuit monitors the temperature of the controller and motor. In case of excessive heat of the controller and motor, the controller will cut-off the power to allow the electrical components to cool down. Although your power scooter will resume its normal speed when the temperature returns to a safe level, we recommend to wait for 5 minutes before restarting to allow the components to cool down.

BATTERY & CHARGING INSTRUCTION

Battery Specification (Lithium Battery)

Battery Type RT-705-1W



Specifications

Nominal Voltage	24 V
Nominal Capacity	11,500 mAh
Charging Current	2,000 mA
Charging Time	5-6 hrs
Ambient	Charge 0°C to +45°C (+32°F to 113°F)
	Discharge -20°C to +65°C (-4°F to 140°F)
Temperature Storage	≤ 30°C (86°F)
Weight	Max. 2 kg
Length*Width*Height	191*78*114 mm

Rated Specifications

1. Rated Charge: Constant Current 2,000mA and Constant Voltage 29.4V for 5-6 hrs at 25°C
2. Rated Discharge: Constant 11.5A discharge until 18.9V at 25°C
3. Rated Capacity: 11.5Ah(Typ.), 10.3Ah(Min.)
4. Shipping Voltage: 25V (Approximate state of charge 45%)

Safety Protection Functions

1. Safety Valve
Allowing controlled release of pressure in the event of excessive internal gas build up.
2. Electrical Disconnect
Device is non-resetting. It prevents excessive overcharge.
3. Meltable Separator
Prevent thermal runaway due to external short.
4. Over charge circuit controller built in battery unit.
O.V.P. = 29.6V
5. Over Temperature circuit controller built in battery unit.
O.T.P. = 45°C for charge
O.T.P. = 70°C for discharge
6. Over discharge circuit controller built in battery unit.
L.V.P. = 18.9V
7. Current limit circuit controller built in battery unit.
O.C.P. = 5A for charging
O.C.P. = 30A for discharging
8. Short circuit protected
S.C.P. = 60A

Performance

1. Cycle Life
700 cycles. Min. capacity 70% at constant 11.5A discharge with 18.9V end off voltage, under 25°C.

Safety Standards (cell)

1. UL 1642
2. UN 38.3

Connector

1. 上勝 3+0 Pin for discharging
2. 110 Type 3Pin for charging

RT-705-1W Li-Ion Battery Module User's Manual

For your safety and proper use of battery module, carefully read user's manual and safety instructions before using battery module.

Due to transportation laws, DoD (Depth of Discharge) of Li-Ion battery module must be under 50%. Before using battery module for the first time, one must fully charged battery module using dedicated charger.

RT-705-1W Battery Module Specification:

1. Nominal voltage: DC 24V.
2. Nominal capacity: 11.5Ah.
3. Operation voltage range: DC18.9V~29.4V.
4. Maximum discharge current : 30A.
5. Dimension: 191mm (L) x 78mm (W) x 114mm (H).
6. Weight (approx.): Max 2kg.
7. Operation ambient: -20°C ~ +65°C.

RT-705-1W Battery Module Accessories:

1. Charger x1

Model: HP-1202B

Specification: Input: 100-240Vac; Output: 29.4V2A

2. Power Cord x1

Specification: 1.8m USA power cord.

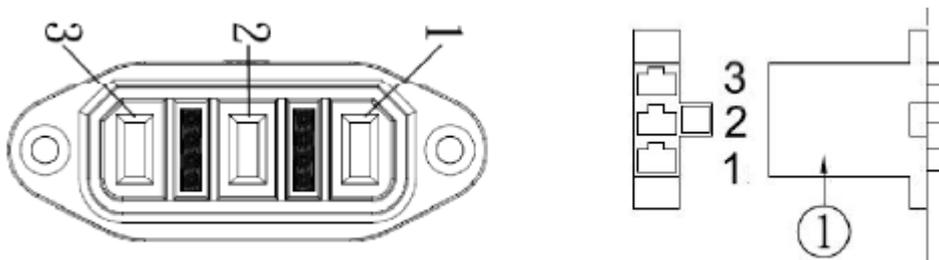
3. User's Manual x1

RT-705-1W Battery Module Certification:

1. RT-705-1W battery module has obtained UN38.3 certification.

Instructions of using RT-705-1W Battery Module:

1. Connector specifications:



1. Output connector: Sun Shen 3+0pin, DC power connector.
2. Charge connector: 110-Type 3pin, DC charge connector.

Caution: Do not modify connector terminals and/or wires, any changes might cause failure of battery module or battery chargers.

Caution: Do not short the terminals and/or wires with other objects, especially metals.

2. Charging RT-705-1W battery module:

1. The RT-705-1W battery module can only be charged using dedicated charger provided, HP-1202B. Do not charged battery with any other chargers.

The charging time for a fully discharged battery module is about 5-6 hours (using 29.4V/2A charger).

2. Before using battery module for the first time, fully charged battery module with the charger.
3. Before charging the battery, plug AC power cord to the main electricity. The LED indicator should display RED light. Connect the output supply of the charger to the charging dock; the charging process will start automatically. The LED indicator should display ORANGE light. When charging process is finished, the LED indicator should display GREEN light for a fully charged battery module.

Caution: Do not charge a fully charged battery module over 24 hours.

3. Using the RT-705-1W battery module:

1. RT-705-1W battery module is designed for power wheel use only. Do not use battery module on any other equipment or beyond specification.
2. Before using the module, please firmly fasten the module to the power wheel in the proper direction and make sure the connectors and plugs are firmly locked in the correct direction.
3. When not riding, turn off main power switch of the power wheel for your safety and can also lengthen the life of the battery module.

Caution: *When not using battery for an extended period, remove it from the power wheel, fully charged, and store in a place with low humidity and low temperature.*

Recommend storage condition: below 30°C

! Danger

1. Do not disassemble or modify battery module.
2. Do not short circuit the (+) and (-) terminals with any other metals.
3. Do not place battery in a device with the (+) and (-) in the wrong way around.
4. Do not put battery module in bags or together with metal objects such as necklaces, hairpins, coins, or screws. Do not store batteries with such objects.
5. Do not use, leave battery module to fire or inside of a car where temperature may be above 60°C. Also do not charge / discharge in such conditions
6. Do not heat or throw old, failure battery module into a fire. Please send back to local distributor for recycling.
7. Do not hit with a hammer (or any solid objects), step on, throw or drop to cause strong shock. Strong shock could damage battery cells and battery management system.
8. Do not immerse, throw, and wet battery module in water/ seawater.
9. When charging the battery module, use dedicated chargers and follow the specified conditions
10. Use battery module only in the specified equipment.
11. For your own safety, before disassembling battery module from e-scooters, do turn off main power switch on the battery module.

During use, charge, or storage

12. Stop charging the battery if charging is not completed within the specified time.
13. Stop using the battery if abnormal heat, odor, discoloration, deformation or abnormal condition is detected.

! Caution

1. Store battery modules out of reach of children under 8 years old.
2. If younger children use the battery module, their guardians should explain the proper handling.
3. Before using battery module, be sure to read the user's manual and cautions on handling thoroughly.
4. Thoroughly read the user's manual of the charger before charging the battery.
5. For information on installing and removing from equipment, thoroughly read the user's manual for the specific equipment.
6. Batteries have life cycles. If the time that the battery powers equipment becomes much shorter than usual, the battery life is at an end. Replace the battery with a new one.
7. Remove a battery whose life cycle has expired from equipment immediately.
8. When not using battery for an extended period, remove it from the scooter, fully charged, switch off main power, and store in a place with low humidity and low temperature.
9. While the battery is charged, used and stored, keep it away from objects or materials with static electric charges.
10. If the terminals of the battery become dirty, wipe with a dry clothe before using the battery.
11. **Battery module can be used within the following temperature ranges.**

Do not exceed these ranges.

1. Charge temperature range : 0°C to 45°C
 2. Discharge temperature range : -20°C to 65°C
- (When using equipment)**

Lead-Acid Battery

We recommend that you use deep-cycle batteries that are sealed and maintenance free for your power scooter. Both sealed lead-acid (SLA) and gel cell are deep-cycle batteries and are similar in performance. Deep-cycle batteries are specifically designed to provide power, drain down, and then accept a relatively quick recharge. Lead-acid batteries should be charged as often as possible.

Specification of the battery that we recommend for S19 is

Type:	Deep –cycle sealed lead-acid or gel cell
Size:	12AH
Voltage:	12V each
Amp Hours:	12 amp hours

Depending on the use, terrain and driving conditions, the batteries will provide a range of 13 km of travel. However, even if the power scooter is not in use, we recommend that the batteries are charged periodically.

Note: Do not use any automotive batteries. They are not designed to handle a long, deep discharge and also are unsafe for use in power scooter. The useful life of a battery is quite often a reflection of the care it receives.

BATTERY CHARGER

The battery charger takes the standard wall outlet voltage (alternating current) and converts it into DC voltage (direct current). The batteries use direct current to run your power scooter. When the batteries are fully charged, the amperage from the charger is almost at zero. This is how the charger maintains a charge but does not overcharge the battery.

Note 1: The batteries cannot be charged if they were discharged to nearly zero voltage.

Note 2: The powered scooter meet the requirement of ISO 7176-14:2008 and ISO 7176-21:2003.

Note 3: Only use the battery charger type 4C24050A which was provided by the scooter supplier. The use of any different type of charger can be hazardous and need the approval of the manufacturer.

CHARGING INSTRUCTIONS

To recharge the batteries, follow the steps below:

- ⇒ Place your power scooter close to a standard electrical wall outlet.
- ⇒ Remove your key to turn the power OFF
- ⇒ Slide the charger port door open.
- ⇒ Plug the XLR connector of the charger to the charger port.
- ⇒ Plug the other end of power cord into a standard wall outlet.
- ⇒ When charging is completed, battery capacity indicator is shown.
- ⇒ Disconnect the charger power cord from the wall outlet when the batteries are fully charged.

Recharge battery only when the key is in off position. When indicator is in low status, this confirms the battery needs recharging.

Note:

- ⇒ Always charge your batteries in well ventilated areas.
- ⇒ The charger is intended for indoor use only. Protect from moisture.
- ⇒ For maximum performance, it is recommended that you replace both batteries at the same time if the batteries are weak.
- ⇒ If the vehicle will not be used for a long period of time, arrange to have the batteries recharged at least once every month to avoid deterioration of the batteries.

According to the battery type and condition of the batteries, they usually can be fully charged in 4-10 hours. This will be indicated when the status light in the battery charger side panel turns green. Charging the battery longer than necessary will not harm the battery. We recommend that you charge the batteries for 8 to 10 hours after daily use.

BATTERY INDICATOR

A battery indicator is to provide information about the travelling range remaining.

Indicator	Travelling Range Remaining
Full	13 km Traveling Range Remaining
Green Area	7~13 km Travelling Range Remaining
Yellow Area	4~7 km Travelling Range Remaining
Red Area	1~4 km Travelling Range Remaining
End	0 Kilometer

MAINTENANCE & REPAIR

Your power scooter is designed for minimal maintenance. However, like any motorized vehicle it requires routine maintenance. To keep your S19 for years of trouble-free operation, we recommend you follow the following maintenance checks as scheduled.

DAILY CHECKS

1. Visual check on the conditions of tires.
2. Inspect the battery condition meter on the controller to determine if batteries need to be charged.

MONTHLY CHECKS

1. Visually inspect the controller harnesses. Make sure that they are not frayed, cut or have any exposed wires.

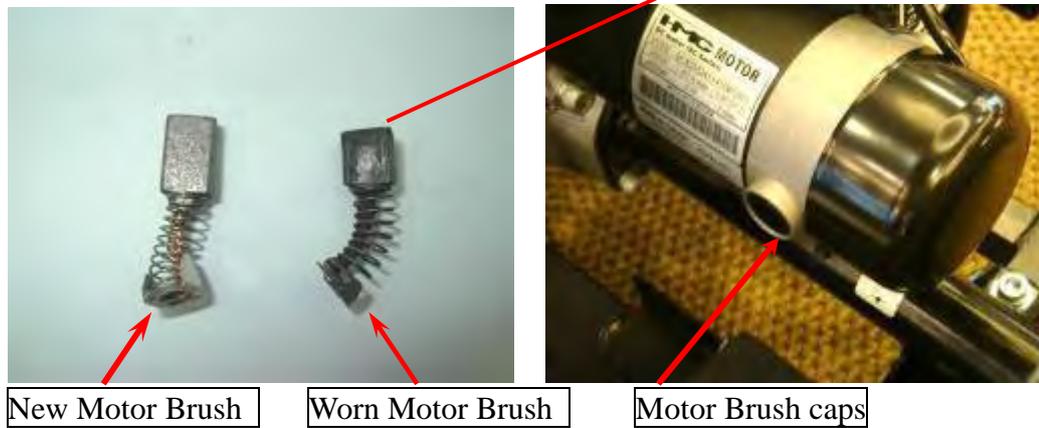
SEMI-ANNUAL CHECKS

1. Check the motor brushes. We recommended that your authorized dealer inspect the brushes every six months or sooner if your power scooter is not operating smoothly. If inspection determines excessive wear on the brushes, they must be replaced or motor damage will result.

Warning! Failure to maintain the brushes could void the power scooter warranty.

To inspect or replace the motor brushes:

- Unscrew the motor brush caps.
- Remove the brushes.
- Inspect the brushes for wear.
- Replace the brushes if necessary.



Inspect the state of the battery terminals every six months. Make sure that they are not corroded and the connections are tight. Periodically apply a thin film of petroleum jelly on the surface of terminals to guard against corrosion.

CHECKS:

- Make sure to keep the controller clean while protecting it from rain or water. Never hose off your power scooter or place it in direct contact with water.
- Keep wheels free from lint, hair, sand and carpet fibers.
- Visually inspect the tire tread. If less than 1mm (1/32”), please have your tires replaced by your local dealer.
- All upholstery can be washed with warm water and mild soap. Occasionally check the seat and back for sagging, cuts and tears. Replace if necessary. Do not store your scooter in damp or humid conditions as this will lead to mildew and rapid deterioration of the upholstery parts.
- All moving mechanism will benefit from simple lubrication and inspection. Lubricate using petroleum jelly or light oil. Do not use too much oil, otherwise small drips could stain and damage carpets and furnishings etc. Always perform a general inspection of the tightness of all nuts and bolts.

TROUBLESHOOTING & FAULT REPAIR

P&G S-Drive 45 Amp controller: Your scooter is fitted with S-Drive controller, which continuously monitors the operating conditions of your scooter. If it detects a problem it will indicate with error message by flashing light on the power ON/ OFF light. You must count the number of the flash, and see the list to check what kind of error has happened according to the number)

Flash	Description
1	The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try changing the battery
2	There is a bad connection to the motor. Check all the connections between the motor and the controller
3	The motor has a short circuit to a battery connection. Contact your service agent.
4.	The freewheel switch is activated or the manual brake disengagement mechanism is operated. Check the position of the switch of lever.
5	Not used
6	The S-Drive is being inhibited from driving. Inhibit 2 is active. This may be because the battery charger is connected or the seat is no in the driving position.
7	A throttle fault is indicated. Make sure that the throttle is in the rest position before switching on the scooter.
8.	A controller fault is indicated. Make sure that all connections are secured.
9.	The parking brakes have a bad connection. Check the parking brake and motor connections. Make sure the controller connections are secured.
10.	An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery connections.

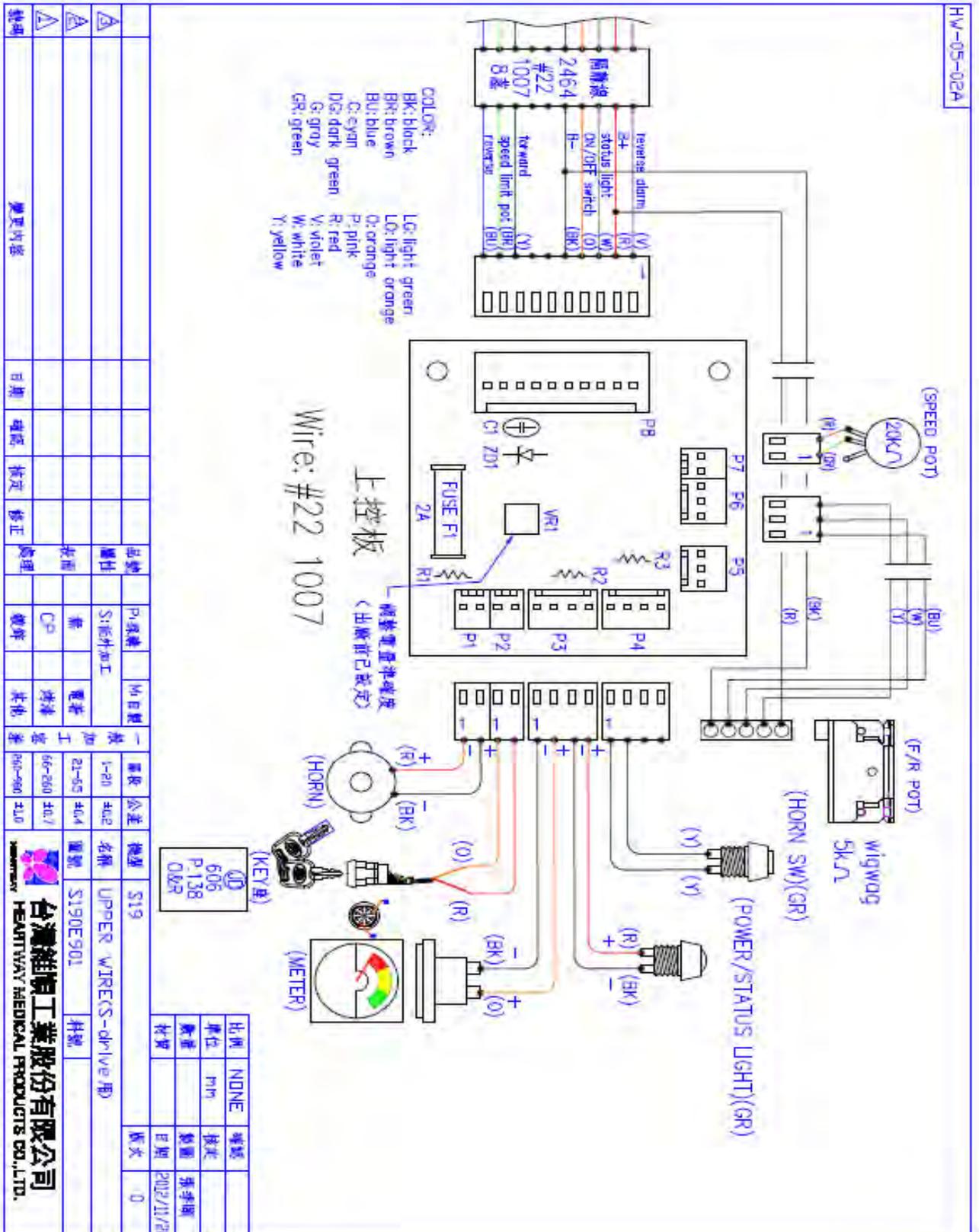
Note:

If you experience any technical problems, it is recommended that you check with your local dealer before attempting to troubleshoot on your own.

The following symptoms could indicate a serious problem with your power scooter. Contact your local dealer if any of the following arises:

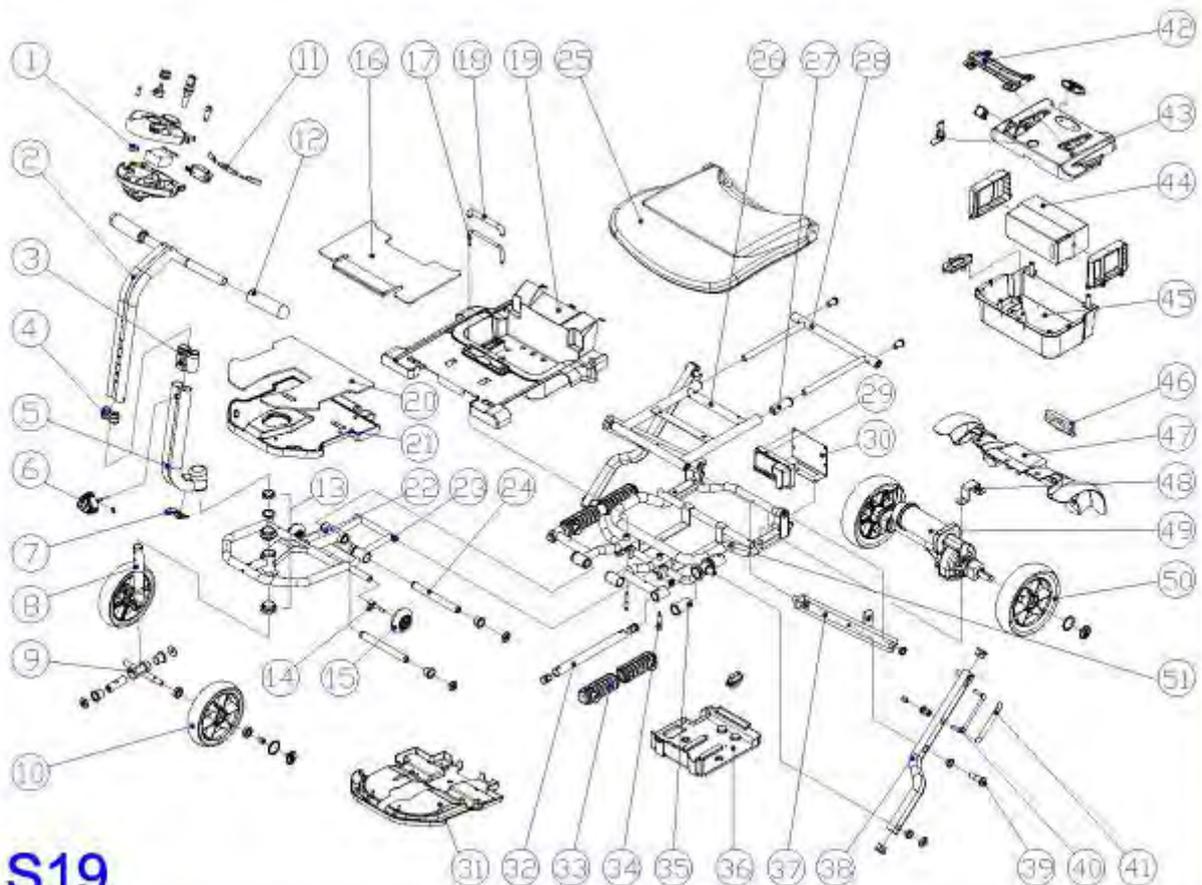
- 1.Motor noise
- 2.Frayed harnesses
- 3.Cracked or broken connectors
- 4.Uneven wear on any of tires
- 5.Jerky motion
- 6.Pulling to one side
- 7.Bent or broken wheel assemblies
- 8.Does not power up
- 9.Powers up, but does not move

CIRCUIT DIAGRAM



BOM LIST DRAWING

- | | | |
|-----------------------------|-------------------------|----------------------|
| ① POTENTIOMETER COMBINATION | ⑲ MAIN COVER | ③⑦ INNER CROSS BAR |
| ② HANDLE BAR | ⑳ CARPET | ③⑧ OUTSIDE CROSS BAR |
| ③ PLUG OF STEM | ㉑ FRONT COVER | ③⑨ SCREW |
| ④ PLUG OF HANDLE BAR | ㉒ FRONT FRAME | ④⑩ RELEASE BAR |
| ⑤ STEM | ㉓ CONNECTED BAR ASM | ④⑪ RELEASE BAR GRIP |
| ⑥ LOCKING KNOB | ㉔ AXIS TUBE | ④⑫ CARRYING HANDLE |
| ⑦ WIRE LEADING COVER | ㉕ CHAIR | ④⑬ BATTERY COVER |
| ⑧ STEM ASM | ㉖ FRONT SEAT FRAME | ④⑭ BATTERY |
| ⑨ FRONT SUSPENSION ASM | ㉗ PLUG OF SEAT FRAME | ④⑮ BATTERY COVER |
| ⑩ FRONT WHEEL | ㉘ REAR SEAT FRAME | ④⑯ REAR REFLECTOR |
| ⑪ WIGWAG | ㉙ CONTROLLER | ④⑰ REAR FENDER |
| ⑫ HANDLE GRIP | ㉚ BREAKET OF CONTROLLER | ④⑱ BREAKET OF MOTOR |
| ⑬ STEM ASM | ㉛ BOTTOM COVER | ④⑲ TRANSAXLE |
| ⑭ FIXED SCREW | ㉜ SLIDER BAR | ⑤⑩ REAR WHEEL |
| ⑮ ASSISTIVE WHEEL | ㉝ RUBBER DUST COVER | ⑤⑪ MAIN FRAME ASM |
| ⑯ CARPET | ㉞ LOCKING PIN | |
| ⑰ RELEASE BAR | ㉟ PLUG OF SLIDER | |
| ⑱ RELEASE BAR GRIP | ㊱ PROTECT COVER | |



WARRANTY DECLARATION

Quality/ Warranty Declaration

Products are to be fit for purpose and of excellent quality and performance. For valid warranty claims Heartway will, at their discretion, replace/ repair/ refund items mutually agreed to be defective.

Heartway's Warranty as Following:

- Frame: Two-year limited warranty
- Controllers: One-and-a-half-year limited warranty
- Electronic Components and Charger: One-year limited warranty
- Warranty Exclusion. The following items are not covered by warranty.

- | | | |
|-----------------|-----------------|----------------------------------|
| ✧ Motor brushes | ✧ Wheel Tires | ✧ Arm Pads |
| ✧ Seat Cushion | ✧ Fuses / Bulbs | ✧ Tiller Cover |
| ✧ Rear Shroud | ✧ Front Shroud | ✧ Batteries and Consumable parts |

Any damage or defect of any nature occurring from the misuse, abuse of the product, improper operation or improper storage is not to be covered. The warranty is to start from the date of arrival of our products.

Normally, the average lifespan of a scooter will last 5-year long. Heartway will be able to provide the spare-part support for five-year long after scooters purchased.

Note: If you encounter a damaged or cracked battery; please enclose it in a plastic bag and call the local authorized dealers immediately for instructions on disposal and recycling.



HEARTWAY MEDICAL PRODUCTS CO., LTD.

NO. 6, ROAD 25, TAICHUNG INDUSTRIAL PARK,
TAICHUNG, TAIWAN R.O.C.408

Explanatory sheet about safety of product for transportation
(Safety Data Sheet for transportation)

1. Basic item

Product name	Lithium ion cell
Product code	Refer to Table 1.
Product model name	Refer to Table 1.
Manufacturer	SANYO Electric Co., Ltd. Energy Company
Address	222-1 Kaminaizen Sumoto Hyogo, Japan
Department in charge	Lithium-Ion Battery Business Unit Battery System Management Department Technical Administration Group
Phone number	+81-799-23-3931
E-mail	joho_gijutsu@gg.jp.panasonic.com

2. Product information

Basic composition of the product

This product is a Lithium ion (polymer) single with or without tube casing.

3. Safety Information

1. The Watt-hour rating of these Lithium ion (polymer) cells is not more than 20Wh.
Refer to Appendix "SDS (SDS-IAT-00002)".
2. These Lithium ion (polymer) cells can be treated as non-dangerous goods, this means they are not categorized to dangerous goods defined by UN3480, under the UN Recommendation on the Transport of Dangerous Good, Special Provision 188.
3. SANYO certifies the Lithium ion cells have passed and satisfied the UN Manual of Tests and Criteria Part III, sub-section 38.3 testing in Sanyo shipping.
4. Packages of these Lithium ion (polymer) cells satisfy the following conditions when SANYO ships.
 - (1) The product name "Lithium ion batteries" and how to deal with the damage of the package are written on the label and attached document.
 - (2) The packages have passed the drop test from the height of 1.2m.
 - (3) Package weight is not more than 10kg.
 - (4) IATA DGR 53rd edition Packing Instruction 965.
5. Since the package weight of these lithium ion (polymer) cells is not more than 10kg in Sanyo shipping, these lithium ion (polymer) cells are exempt from IATA DGR 53rd edition Special Provision A99.
6. Since these Lithium ion (polymer) cells have passed and satisfied the UN Manual of Tests and Criteria Part III, sub-section 38.3 testing, these Lithium ion (polymer) cells are exempt from IATA DGR 53rd edition Special Provision A88.



General Manager H. Kuroda
Technical Administration Group
Battery System Management Department
Lithium-Ion Battery Business Unit
SANYO Electric Co., Ltd. Energy Company

Safety data sheet for product

1. PRODUCT AND COMPANY IDENTIFICATION

- Product name: Lithium ion battery cell
- Product code: None (All models Sanyo manufactured and whose capacity is less than or equal to 4.95Ah)
- Company name: Sanyo Electric Co., Ltd. Energy Company
- Address: 222-1, Kaminaizen, Sumoto City, Hyogo, Japan
- Telephone number: +81-799-24-4111
- Fax number: +81-799-23-2879
- Emergency telephone number: [Weekday] +81-799-23-3931
[Night and holiday] +81-799-24-4131

2. COMPOSITION / INFORMATION ON INGREDIENTS

- Substance or preparation: Preparation
- Information about the chemical nature of product: *1

Common chemical name / General name	CAS number	Classification and hazard labeling
Lithium transition metal oxidate (Li[M] _m [O] _n *2)	12190-79-3	
	12057-17-9	
	182442-95-1	
Iron	7439-89-6	
Aluminum	7429-90-5	
Graphite (Natural graphite) (Artificial graphite)	7782-42-5	
	7440-44-0	
Copper	7440-50-8	
Organic electrolyte	-	Inflammable liquid

*1 Not every product includes all of these materials.

*2 The letter M means transition metal and candidates of M are Co, Mn, Ni and Al. One compound includes one or more of these metals and one product includes one or more of the compounds. The letter m and n means the number of atoms.

3. HAZARDS IDENTIFICATION

For the battery cell, chemical materials are stored in a hermetically sealed metal case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage.

However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the gas release vent will be operated. The battery cell case will be breached at the extreme, hazardous materials may be released.

Moreover, if heated strongly by the surrounding fire, acrid gas may be emitted.

- Most important hazard and effects

Human health effects:

Inhalation: The steam of the electrolyte has an anesthesia action and stimulates a respiratory tract.

Skin contact: The steam of the electrolyte stimulates a skin. The electrolyte skin contact causes a sore and stimulation on the skin.

Eye contact: The steam of the electrolyte stimulates eyes. The electrolyte eye contact causes a sore and stimulation on the eye. Especially, substance that causes a strong inflammation of the eyes is contained.

Environmental effects: Since a battery cell remains in the environment, do not throw out it into the environment.

- Specific hazards:

If the electrolyte contacts with water, it will generate detrimental hydrogen fluoride.

Since the leaked electrolyte is inflammable liquid, do not bring close to fire.

4. FIRST-AID MEASURES

Spilled internal cell materials

- Inhalation:
Make the victim blow his/her nose, gargle. Seek medical attention if necessary.
- Skin contact:
Remove contaminated clothes and shoes immediately. Wash extraneous matter or contact region with soap and plenty of water immediately.
- Eye contact:
Do not rub one's eyes. Immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention immediately.

A battery cell and spilled internal cell materials

- Ingestion:
Make the victim vomit. When it is impossible or the feeling is not well after vomiting, seek medical attention.

5. FIRE-FIGHTING MEASURE

- Suitable extinguishing media: Plenty of water, carbon dioxide gas, nitrogen gas, chemical powder fire extinguishing medium and fire foam.
- Specific hazards: Corrosive gas may be emitted during fire.
- Specific methods of fire-fighting: When the battery burns with other combustibles simultaneously, take fire-extinguishing method which correspond to the combustibles. Extinguish a fire from the windward as much as possible.
- Special protective equipment for firefighters:
 - Respiratory protection: Respiratory equipment of a gas cylinder style or protection-against-dust mask
 - Hand protection: Protective gloves
 - Eye protection: Goggle or protective glasses designed to protect against liquid splashes
 - Skin and body protection: Protective cloth

6. ACCIDENTAL RELEASE MEASURES

Spilled internal cell materials, such as electrolyte leaked from a battery cell, are carefully dealt with according to the followings.

- Precautions for human body:
Remove spilled materials with protective equipment (protective glasses and protective gloves). Do not inhale the gas as much as possible. Moreover, avoid touching with as much as possible.
- Environmental precautions: Do not throw out into the environment.
- Method of cleaning up: The spilled solids are put into a container. The leaked place is wiped off with dry cloth.
- Prevention of secondary hazards: Avoid re-scattering. Do not bring the collected materials close to fire.

7. HANDLING AND STORAGE

• Handling

Technical measures:

Prevention of user exposure: Not necessary under normal use.

Prevention of fire and explosion: Not necessary under normal use.

Precaution for safe handling: Do not damage or remove the external tube.

Specific safe handling advice: Never throw out cells in a fire or expose to high temperatures. Do not soak cells in water or seawater. Do not expose to strong oxidizers. Do not give a strong mechanical shock or fling. Never disassemble, modify or deform. Do not connect the positive terminal to the negative terminal with electrically conductive material. Do not use in the place temperature can be high. In the case of charging, use only dedicated charger or charge according to the conditions specified by Sanyo.

• Storage

Technical measures:

Storage conditions (suitable, to be avoided): Avoid direct sunlight, high temperature, high humidity.

Store in cool place (temperature: -20 ~ 35 degree C, humidity: 45 ~ 85%).

Incompatible products: Conductive materials, water, seawater, strong oxidizers and strong acids

Packing material (recommended, not suitable): Insulative and tear proof materials are recommended.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

- Engineering measures:
No engineering measure is necessary during normal use. In case of internal cell materials' leakage, operate the local exhaust or improve ventilation.

- Control parameters

Common chemical name / General name	ACGIH (2009)	
	TLV-TWA	BEI
Lithium transition metal oxidate	0.02mg/m ³ (as cobalt) * 0.2mg/m ³ (as manganese) * 0.2 mg/m ³ (as nickel) *	-
Aluminum	10mg/m ³ (metal coarse particulate) 5mg/m ³ (flammable powder) 5mg/m ³ (weld fume)	-
Carbon (Natural graphite) (Artificial graphite)	2mg/m ³ (inhalant coarse particulate)	-
Copper	0.2mg/m ³ (fume) 1.0mg/m ³ (a coarse particulate, Mist)	-
Organic electrolyte	-	-

ACGIH: American Conference of Governmental Industrial Hygienists, Inc.

TLV-TWA: Threshold Limit Value-Time Weighted Average concentration

BEI: Biological Exposure Indices

* Not every product includes all of these metals.

- Personal protective equipment

Respiratory protection: Respirator with air cylinder, dust mask

Hand protection: Protective gloves

Eye protection: Goggle or protective glasses designed to protect against liquid splashes

Skin and body protection: Working clothes with long sleeve and long trousers

9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance

Physical state: Solid

Form: Cylindrical or Prismatic or Prismatic (laminated)

Color: Metallic color or black (without tube if it has tube)

Odor: No odor

- pH: NA

- Specific temperatures/temperature ranges at which changes in physical state occur:

There is no useful information for the product as a mixture.

- Flash point: NA

- Explosion properties: NA

- Density: NA

- Solubility, with indication of the solvent(s): Insoluble in water

10. STABILITY AND REACTIVITY

- Stability: Stable under normal use

- Hazardous reactions occurring under specific conditions

- Conditions to avoid: When a battery cell is exposed to an external short-circuit, crushes, deformation, high temperature above 100 degree C, it will be the cause of heat generation and ignition. Direct sunlight and high humidity.

- Materials to avoid: Conductive materials, water, seawater, strong oxidizers and strong acids.

- Hazardous decomposition products: Acrid or harmful gas is emitted during fire.

11. TOXICOLOGICAL INFORMATION

There is no available data on the product itself. The information of the internal cell materials is as follows.

Lithium transition metal oxidate - $\text{Li}[\text{M}]_m[\text{O}]_n$

- Acute toxicity: No applicable data.
 - Reference cobalt: LDLo, oral - Guinea pig 20mg/kg
 - manganese: LD50, oral - Guinea pig 9000mg/kg
 - nickel: LDLo, oral - Guinea pig 5mg/kg
- Local effects: Unknown.
- Sensitization:
 - The nervous system of respiratory organs may be stimulated sensitively.
- Chronic toxicity/Long term toxicity:
 - By the long-term inhalation of coarse particulate or vapor of cobalt, it is possible to cause the serious respiratory-organs disease. Skin reaction or a lung disease for allergic or hypersensitive person may be caused.
 - Cobalt compounds belong to the 2B group of the carcinogen in the IARC category (substance which is suspected to have carcinogenic to man).
 - By the long-term or repetitive inhalation of coarse particulate of Manganese Oxide (MnO_2), lungs and nervous system may be affected; bronchitis, pneumonia, nerve disease or nerve mental disorder (manganese poisoning) may be caused.
 - Nickel Compounds belong to the 1st group of the carcinogen in the IARC category (substance which has carcinogenic to man).
- Skin causticity: Although it is very rare, the rash of the skin and allergic erythema may result.
 - * *Not every product includes all of these metals.*

Aluminum

- Local effects: Aluminum itself has no toxicity. When it goes into a wound, dermatitis may be caused.
- Chronic toxicity/Long term toxicity: By the long-term inhalation of coarse particulate or fume, it is possible to cause lung damage (aluminum lungs).

Graphite

- Acute toxicity: Unknown.
- Local effects: When it goes into one's eyes, it stimulates one's eyes; conjunctivitis, thickening of corneal epithelium or edematous inflammation palpebra may be caused.
- Chronic toxicity/Long term toxicity:
 - Since the long-term inhalation of high levels of graphite coarse particulate may become a cause of a lung disease or a tracheal disease.
- Carcinogenicity:
 - Graphite is not recognized as a cause of cancer by research organizations and natural toxic substance research organizations of cancer.

Copper

- Acute toxicity:
 - 60-100mg sized coarse particulate causes a gastrointestinal disturbance with nausea and inflammation.
 - TDLo, hypodermic - Rabbit 375mg/kg
- Local effects:
 - Coarse particulate stimulates a nose and a tracheal.
 - When it goes into one's eyes, the symptom of the reddening and the pain is caused.
- Sensitization: Sensitization of the skin may be caused by long-term or repetitive contact.

Organic Electrolyte

- Acute toxicity:
 - LD50, oral - Rat 2,000mg/kg or more
- Local effects: Unknown.
- Skin irritation study: Rabbit - Mild
- eye irritation study: Rabbit - Very severe

12. ECOLOGICAL INFORMATION

- Persistence/degradability:
Since a battery cell and the internal materials remain in the environment, do not bury or throw out into the environment.
-

13. DISPOSAL CONSIDERATIONS

- Recommended methods for safe and environmentally preferred disposal:
Product (waste from residues)
Specified collection or disposal of lithium ion battery is required by the law like as "battery control law" in several nations. Collection or recycle of the battery is mainly imposed on battery's manufacturer or importer in the nations recycle is required.
 - **Contaminated packaging**
Neither a container nor packing is contaminated during normal use. When internal materials leaked from a battery cell contaminates, dispose as industrial wastes subject to special control.
-

14. TRANSPORT INFORMATION

In the case of transportation, avoid exposure to high temperature and prevent the formation of any condensation. Take in a cargo of them without falling, dropping and breakage. Prevent collapse of cargo piles and wet by rain. The container must be handled carefully. Do not give shocks that result in a mark of hitting on a cell. Please refer to Section 7-HANDLING AND STORAGE also.

UN regulation

- ID number: 3480
- Proper shipping name:
Lithium ion batteries
- Class: 9 *
- Packing group: II *

** However this product is defined as above, it is **not** recognized as "DANGEROUS GOODS" when its transport condition accords with instructions or provisions depend on region and transportation mode. About the instructions or provisions, please see descriptions in box brackets of following regulations.*

Regulation depends on region and transportation mode

- Worldwide, air transportation:
IATA-DGR ("packing instruction 965 section II")
(When batteries are packaged with equipments or contained in equipments, refer packing instruction 966 or 967 instead of 965.)
 - Worldwide, sea transportation:
IMO-IMDG Code [special provision 188]
 - Europe, road transportation:
ADR [special provision 188]
-

15. REGULATORY INFORMATION

- Regulations specifically applicable to the product:
Wastes Disposal and Public Cleaning Law [Japan]
Law for Promotion of Effective Utilization of resources [Japan]
US Department of Transportation 49 Code of Federal Regulations [USA]

** About overlapping regulations, please refer to Section 14-TRANSPORT INFORMATION.*

16. OTHER INFORMATION

- This safety data sheet is offered an agency who handles this product to handle it safely.
- The agency should utilize this safety data sheet effectively (put it up, educate person in charge) and take proper measures.
- ***The information contained in this Safety data sheet is based on the present state of knowledge and current legislation.***
- This safety data sheet provides guidance on health, safety and environmental aspects of the product and should not be construed as any guarantee of technical performance or suitability for particular applications.

Reference

Chemical substances information: Japan Advanced Information center of Safety and Health
International Chemical Safety Cards (ICSCs): International Occupational Safety and Health Information Centre (CIS)
Dangerous Goods Regulations – 53rd Edition Effective 1 January 2012: International Air Transport Association (IATA)
IMDG Code - 2010 Edition: International Maritime Organization (IMO)
The European Agreement concerning the International Carriage of Dangerous Goods by Road – 2011: The United Nations Economic Commission for Europe (UNECE)
RTECS (CD-ROM)
MSDS of raw materials prepared by the manufactures

First edition: Apr. 28, 2010
Prepared and approved by
Battery System Management Department
Lithium-Ion Battery Business Unit
Energy Company
Sanyo Electric Co., Ltd.

Test Verification Of Conformity

On the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the essential requirements of the referenced specifications at the time the tests were carried out.

Verification/Report Number(s):	S1210038
Applicant Name/Address:	HEARTWAY MEDICAL PRODUCTS Co., Ltd. No.6 Gongyequ 25th Rd.,Nantun Dist.,Taichung City 408,Taiwan (R.O.C.)
Manufacture Name/Address:	RUBICON TECH Co., Ltd. 2F-12,No.210,Gongyequ 38th Rd., Xitun Dist, Taichung, Taiwan (R.O.C.)
Product(s) Tested:	Li-Ion Rechargeable Battery Pack
Ratings and principal characteristics:	24Vdc, 11.5Ah
Compliance with standards:	UN38.3
Model(s):	RT-705-1W
Brand name:	N/A
Issue Date:	2012. 12. XX

This Verification is for the exclusive use of AnTek's Client and is provided pursuant to the agreement between AnTek and its Client. AnTek's responsibility and liability are limited to the terms and conditions of the agreement. AnTek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Verification. Only the Client is authorized to copy or distribute this Verification. Any use of the AnTek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by AnTek. The observations and test results referenced from this Verification are relevant only to the sample tested. This Verification by itself does not imply that the material, product, or service is or has ever been under a AnTek certification program. The conclusion of the consignment test is only valid for the provided sample. In the test report, IATA DGR is referred to "Dangerous Goods Regulations" of International Air Transport Association; IMO IMDG Code is referred to "INTERNATIONAL MARITIME DANGEROUS GOODS CODE" of International Maritime Organization (IMO); GB12268 is referred to National Standard named "List of dangerous goods" .


Joe Y. L. Lin
Manager
AnTek Certification Inc.
2012.12.XX



<Report No.: S1212013>

LITHIUM ION BATTERY SAFETY TESTING REPORT

Applicant:	HEARTWAY MEDICAL PRODUCTS Co., Ltd. No.6 Gongyequ 25th Rd., Nantun Dist., Taichung City 408, Taiwan (R.O.C.)
Product:	Li-Ion Rechargeable Battery Pack
Model:	RT-705-1W
Rating:	24Vdc, 11.5Ah
Test method & Criterion	United Nations "Recommendations on the TRANSPORT OF DANGEROUS GOODS"
Appearance	--
Verification Issuing Office Name	AnTek Certification Inc. 7F., No. 351, Yangguang St., Neihu District, Taipei City, Taiwan
Test Performed date:	Nov. 14, 2012– Dec. 03, 2012
Test Items:	Altitude Simulation, Thermal Test, Vibration, Shock, External Short Circuit, Overcharge
Conclusion:	The sample has passed the test items of UN38.3

Prepared by:

Gary Cheng

Gary Cheng
Engineer

Reviewed by:

Rick Lin

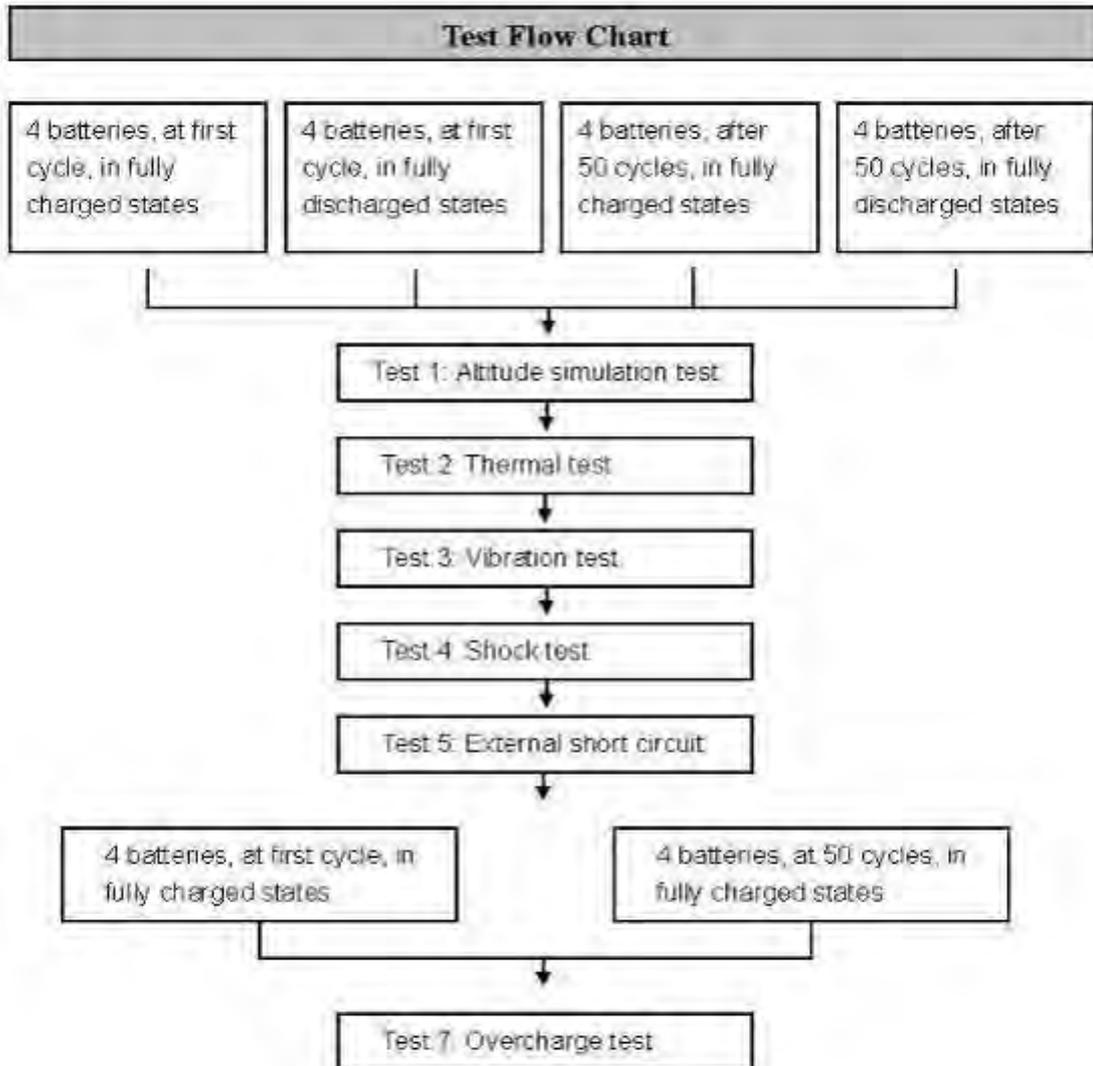
Rick Lin
Project engineer

Label

Product Name	Rechargeable Lithium Battery Module 71MR190/78/113-4
Product Model	RT-705-1W
Nominal Voltage	24 V
Nominal Capacity	11.5 Ah
Manufacturer	Rubicon & Tech., Taiwan
Date of Manufacture Serial number	
Made In Taiwan	

Test Items

No	Name of Test Items	Standard requirement or the Clause Number of Standard	Test Result	Conclusion	Remark
1.	Altitude Simulation	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.1	See Appendix 1	Passed	—
2.	Thermal Test	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.2	See Appendix 2	Passed	—
3.	Vibration	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.3	See Appendix 3	Passed	—
4.	Shock	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.4	See Appendix 4	Passed	—
5.	External Short Circuit	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.5	See Appendix 5	Passed	—
6.	Impact	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.6	See Appendix 6	N/A	Only test for cell level
7.	Overcharge	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.7	See Appendix 7	Passed	—
8.	Forced Discharge	UN Manual of Tests and Criteria Section (4th) 38.3 Test T.8	See Appendix 8	N/A	Only test for cell level
Test Environment Condition		Ambient Temperature: 23.8 °C Ambient Humidity: 54.8%			



*Test 6 and Test 8 are required to cell level, not battery pack level.

Test Procedure

Pre-Learning:

- (a) When testing primary cells and batteries under tests 1 to 5 the following shall be tested in the quantity indicated:
- (i) ten cells in undischarged states;
 - (ii) ten cells in fully discharged states;
 - (iii) four small batteries in undischarged states;
 - (iv) four small batteries in fully discharged states;
 - (v) four large batteries in undischarged states; and
 - (vi) four large batteries in fully discharged states.
- (b) When testing rechargeable cells and batteries under tests 1 to 5 the following shall be tested in the quantity indicated:
- (i) ten cells at first cycle, in fully charged states;
 - (ii) four small batteries at first cycle, in fully charged states;
 - (iii) four small batteries after 50 cycles ending in fully charged states;
 - (iv) two large batteries at first cycle, in fully charged states; and
 - (v) two large batteries after 25 cycles ending in fully charged states.
- (c) When testing primary and rechargeable cells under test 6, the following shall be tested in the quantity indicated:
- (i) for primary cells, five cells in undischarged states and five cells in fully discharged states;
 - (ii) for component cells of primary batteries, five cells in undischarged states and five cells in fully discharged states;
 - (iii) for rechargeable cells, five cells at first cycle at 50% of the design rated capacity; and
 - (iv) for component cells of rechargeable batteries, five cells at first cycle at 50% of the design rated capacity.
- For prismatic cells, ten test cells are required instead of the five described above, so that the procedure can be carried out on five cells along the longitudinal axes and, separately, five cells along the other axes. In every case, the test cell is only subjected to one impact.
- (d) When testing rechargeable batteries under test 7, the following shall be tested in the quantity indicated:
- (i) four small batteries at first cycle, in fully charged states;
 - (ii) four small batteries after 50 cycles ending in fully charged states;
 - (iii) two large batteries at first cycle, in fully charged states; and
 - (iv) two large batteries after 25 cycles ending in fully charged states.

Batteries not equipped with overcharge protection that are designed for use only in a battery assembly, which affords such protection, are not subject to the requirements of this test.

- (e) When testing primary and rechargeable cells under test 8, the following shall be tested in the quantity indicated:
- (i) ten primary cells in fully discharged states,
 - (ii) ten rechargeable cells, at first cycle in fully discharged states, and
 - (iii) ten rechargeable cells after 50 cycles ending in fully discharged states.
- (f) When testing a battery assembly in which the aggregate lithium content of all anodes, when fully charged, is not more than 500 g, or in the case of a lithium ion battery, with a Watt-hour rating of not more than 6 200 Watt-hours, that is assembled from cells or batteries that have passed all applicable tests, one battery assembly in a fully charged state shall be tested under tests 3, 4 and 5, and, in addition, test 7 in the case of a rechargeable battery assembly. For a rechargeable battery assembly, the assembly shall have been cycled at least 25 cycles.

Test 1: Altitude simulation test

Test procedure:

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).

Requirement:

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Test 2: Thermal test

Test procedure:

Test cells and batteries are to be stored for at least six hours at a test temperature equal to 75 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

Requirement:

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Test 3: Vibration test

Test procedure:

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

Requirement:

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Test 4: Shock test

Test procedure:

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

Requirement:

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

Test 5: External short circuit test

Test procedure:

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55 ± 2 °C. The cell or battery must be observed for a further six hours for the test to be concluded.

Requirement:

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire within six hours of this test.

Test 6: Impact test

Test procedure:

The test sample cell or component cell is to be placed on a flat surface. A 15.8 mm diameter bar is to be placed across the centre of the sample. A 9.1 kg mass is to be dropped from a height of 61 ± 2.5 cm onto the sample.

A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm diameter curved surface lying across the centre of the test sample. A prismatic cell is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each impact.

A coin or button cell is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8 mm diameter curved surface lying across its centre.

Requirement:

Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire within six hours of this test.

Test 7: Overcharge test

Test procedure:

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

- (a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.
- (b) when the manufacturer's recommended charge voltage is more than 18V, the minimum



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voltage of the test shall be 1.2 times the maximum charge voltage

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

Requirement:

Rechargeable batteries meet this requirement if there is no disassembly and no fire within seven days of the test.

Test T.8: Forced discharge

Test procedure

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

Requirement

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire within seven days of the test.

Appendix I :Altitude Simulation

Battery serial number	Before T1		After T1		Weight Ratio (%)	Voltage Ratio (%)	Whether there is seepage , exhaust , disintegrate , break and burn
	Weight(kg)	Voltage(V)	Weight(kg)	Voltage(V)			
501	1.71	29.28	1.71	29.28	100.0	100.0	NO
502	1.71	29.28	1.71	29.28	100.0	100.0	NO
503	1.71	29.29	1.71	29.29	100.0	100.0	NO
504	1.71	29.28	1.71	29.28	100.0	100.0	NO
5	1.71	29.29	1.71	29.29	100.0	100.0	NO
6	1.71	29.29	1.71	29.29	100.0	100.0	NO
7	1.71	29.29	1.71	29.29	100.0	100.0	NO
8	1.71	29.28	1.71	29.28	100.0	100.0	NO

501-504 = 50 cycle

5-8 = 1 cycle

Appendix 2: Thermal Test

Battery serial number	Before T2		After T2		Weight Ratio (%)	Voltage Ratio (%)	Whether there is seepage, exhaust, disintegrate, break and burn
	Weight(kg)	Voltage(V)	Weight(kg)	Voltage(V)			
501	1.71	29.28	1.71	28.97	100.0	98.94	NO
502	1.71	29.28	1.71	28.87	100.0	98.59	NO
503	1.71	29.29	1.71	28.96	100.0	98.87	NO
504	1.71	29.28	1.71	28.96	100.0	98.90	NO
5	1.71	29.29	1.71	28.96	100.0	98.87	NO
6	1.71	29.29	1.71	28.87	100.0	98.56	NO
7	1.71	29.29	1.71	28.97	100.0	98.90	NO
8	1.71	29.28	1.71	28.96	100.0	98.90	NO

Appendix 3: Vibration

Battery serial number	Before T3		After T3		Weight Ratio (%)	Voltage Ratio (%)	Whether there is seepage, exhaust, disintegrate, break and burn
	Weight(Kg)	Voltage(V)	Weight(Kg)	Voltage(V)			
501	1.71	28.97	1.71	28.97	100.0	100.0	NO
502	1.71	28.87	1.71	28.87	100.0	100.0	NO
503	1.71	28.96	1.71	28.96	100.0	100.0	NO
504	1.71	28.96	1.71	28.96	100.0	100.0	NO
5	1.71	28.96	1.71	28.96	100.0	100.0	NO
6	1.71	28.87	1.71	28.87	100.0	100.0	NO
7	1.71	28.97	1.71	28.97	100.0	100.0	NO
8	1.71	28.96	1.71	28.96	100.0	100.0	NO

Appendix 4 Shock

Battery serial number	Before T4		After T4		Weight Ratio (%)	Voltage Ratio (%)	Whether there is seepage, exhaust, disintegrate, break and burn
	Weight(g)	Voltage(V)	Weight(g)	Voltage(V)			
501	1.71	28.97	1.71	28.97	100.0	100.0	NO
502	1.71	28.87	1.71	28.87	100.0	100.0	NO
503	1.71	28.96	1.71	28.96	100.0	100.0	NO
504	1.71	28.96	1.71	28.96	100.0	100.0	NO
5	1.71	28.96	1.71	28.96	100.0	100.0	NO
6	1.71	28.87	1.71	28.87	100.0	100.0	NO
7	1.71	28.97	1.71	28.97	100.0	100.0	NO
8	1.71	28.96	1.71	28.96	100.0	100.0	NO

Appendix 5: External Short Circuit

Battery serial number	Maximum temperature (°C)	Initial Voltage(V)	External resistance(Ω)	Whether disintegrate, break and burn
501	56.5	28.97	0.08	NO
502	56.7	28.87	0.08	NO
503	56.6	28.96	0.08	NO
504	56.8	28.96	0.08	NO
5	56.8	28.96	0.08	NO
6	56.7	28.87	0.08	NO
7	56.8	28.97	0.08	NO
8	56.9	28.96	0.08	NO

Appendix 7: Overcharge

Battery serial number	Initial Voltage(V)	Charge Current (A)	Charge Voltage (V)	Whether disintegrate, burn
9	29.29	6.0	35.28	NO
10	29.29	6.0	35.28	NO
11	29.29	6.0	35.28	NO
12	29.28	6.0	35.28	NO
13	29.29	6.0	35.28	NO
14	29.29	6.0	35.28	NO
15	29.28	6.0	35.28	NO
16	29.28	6.0	35.28	NO

Photo:



Photo:

