



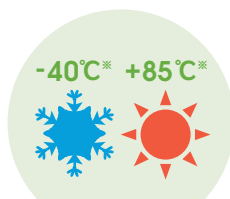
Ni-MH BATTERY



FDK Ni-MH batteries are resistant to over-charge and over-discharge, have excellent safety, and can be easily transported. In addition, Ni-MH batteries are easy to recycle because they contain a high nickel content.

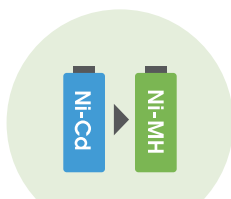


Rechargeable and environmentally friendly



Usable in a wide temperature range

※ limited to in-vehicle Low-temp discharge type.



Best for replacing Ni-Cd batteries due to longer life



High recyclability



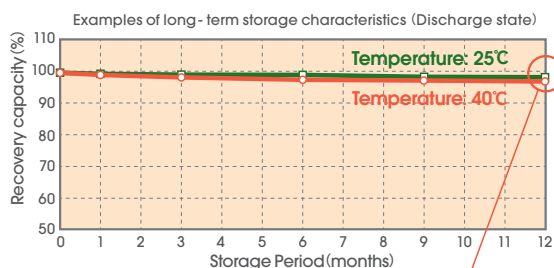
Easy to transport

Features of FDK nickel metal-hydride batteries

FDK original technology

Positive electrode material

Nickel hydroxide coated with a highly conductive cobalt compound

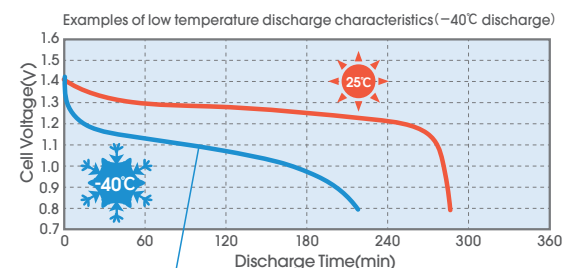


Suppressed capacity deterioration after long-term storage

Model: HR-AAULT Charge: 1000mA (-ΔV=10mV) Rest: 1hour
Discharge: 1000mA (E.V.=1.00V)
Ambient temperature: 25°C

Negative electrode material

Super lattice hydrogen absorbing alloy



Can be used even at -40°C depending on usage conditions

Model: HR-AAAUT Charge: 500mA (-ΔV=10mV) Ambient Temperature: 25°C
Rest: 3hours Discharge: 100mA (E.V.=0.80V)
Ambient Temperature: -40°C

Applications for FDK nickel metal-hydride batteries

FDK's line-up of Ni-MH batteries offer an exceptional solution for your energy needs, and may be used in a wide variety of applications to enhance performance while extending runtime.

	High Durability for In-Vehicle Applications	High Durability	High-Rate Discharge	Standard	Dry Cell Compatible
1 Security		security			
2 In-vehicle transportation	eCall · eToll dashboard cameras	reefer containers railroad crossing security equipment	electric bikes		
3 Emergency		emergency lights			
4 Medical & health care			electric wheelchairs nursing lift	bedside monitors	electric sphygmomanometers
5 Lighting				external camera flashes	flashlights
6 Home appliances				electric shavers	cordless mice remote controllers
7 Information		UPS, base stations		wireless devices	cordless keyboards phone chargers
8 Construction		elevator landing devices		street lights solar systems	transceivers
9 Toys			remote control toys		
10 Power tools			electric tools		

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FDK Ni-MH batteries have a wide operating temperature range (-40 to +85°C) for in-vehicle applications. They work especially well in low temperatures, making them ideal for cold regions.

Wide operating temperature range

[Standard Ni-MH Battery]

0 to +50°C

0.2It discharge

Low-temp. discharge type

-40 to +85°C^{※1}

High Durability Ni-MH Battery for In-Vehicle Applications

The high durability model for in-vehicle applications allows a long life providing continuous usage over a wide temperature range.

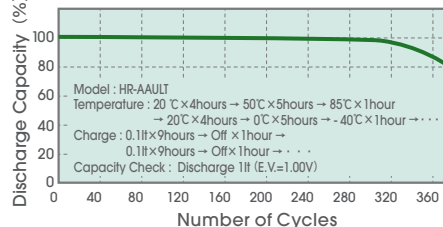


Features

Usable in a wide temperature range

The high durability model for in-vehicle applications can be used in a wide temperature range (-40°C to +85°C) as is required for in-vehicle applications. The battery life is also significantly longer than the standard Ni-MH Battery. In addition, these batteries utilize a safe, water-based electrolyte and thus are suitable for in-vehicle applications.

Temperature Cycling Characteristics



Applications

- eCall, eToll, dashboard cameras etc.



Specifications

Model	HR-2/3AAAUT	HR-AAAUT	HR-AAAUTE Low-temp. Discharge Type	HR-AAULT	HR-AAUTE	HR-AAUTEW Low-temp. Discharge Type	HR-AAUTEWM Long life Type	HR-4/3FAUT
Nominal Voltage	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V
Typical Capacity ^{※2}	220mAh	500mAh	500mAh	1050mAh	1100mAh	1100mAh	1100mAh	3700mAh
Minimum Capacity ^{※3}	200mAh	460mAh	460mAh	1000mAh	1000mAh	1000mAh	1000mAh	3500mAh
Quick-Charge ^{※4}	Current	220mA	500mA	1050mA	1100mA	1100mA	1100mA	3000mA
	Time	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.3h
Dimensions (incl.tube) ^{※5}	Diameter	10.5mm	10.5mm	14.2mm	14.2mm	14.2mm	14.2mm	18.0mm
	Height	30.0mm	44.5mm	44.5mm	49.0mm	50.0mm	50.0mm	67.5mm
Approx. Weight ^{※5}	8g	13g	13g	25g	27g	27g	27g	58g

※1 : Battery capacity and life may be reduced at extreme temperatures. Please contact us for details. ※2 : Typical capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※3 : Minimum capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※4 : Consult FDK according to conditions of use. ※5 : Including label / heat shrink tube.

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High Durability Ni-MH Battery

Long life / high reliability.



Features

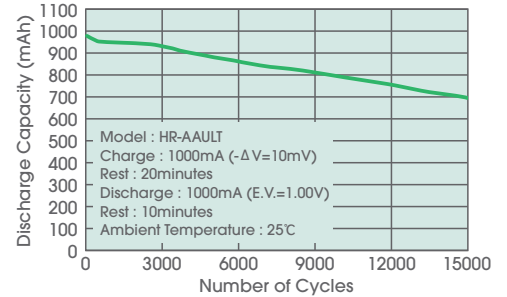
• Long life

Excellent battery life in repeated charge/discharge conditions. Suitable for nickel cadmium battery replacement (for emergency lights, emergency exit lights, and security equipment), for solar power generation, and wind power generation batteries.

Applications

- Suitable for emergency lights, emergency exit lights, security equipment, communication base stations, medical equipment, ATMs, POSs, smart meters, road studs (cat's eyes), and various kinds of backup power supply.
- High durability Ni-MH batteries meet the MT/MU classifications defined in IEC 61951-2^{※1}.
- They can also achieve excellent battery life via intermittent or timer charging methods for maintaining charge after main charging.

Charge / Discharge Cycle Characteristics



Specifications

Model	HR-2/3AAAUTU MU Grade Type	HR-AAAUTU MU Grade Type	HR-AAULTU MU Grade Type	HR-AAULT	HR-AAUT	HR-4/5FAUPT	HR-AUT	HR-5/4SCUT	HR-4/3FAUT
Nominal Voltage	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V
Typical Capacity ^{※2}	220mAh	500mAh	780mAh	1050mAh	1580mAh	1650mAh	2200mAh	3250mAh	3700mAh
Minimum Capacity ^{※3}	200mAh	460mAh	700mAh	1000mAh	1500mAh	1500mAh	2000mAh	3000mAh	3500mAh
Quick-Charge ^{※4}	Current	220mA	500mA	780mA	1050mA	1580mA	2200mA	3250mA	3000mA
	Time	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.3h
Dimensions (incl.tube) ^{※5}	Diameter	10.5mm	10.5mm	14.2mm	14.2mm	14.2mm	18.1mm ^{※6}	17.0mm	23.0mm
	Height	30.0mm	44.5mm	49.0mm	49.0mm	50.0mm	43.2mm ^{※6}	50.0mm	67.5mm
Approx. Weight	8g	13g	20g	25g	26g	37g	37g	69g	58g

※1: Compliance with IEC 61951-2 MT/MU classifications does not guarantee. ※2: Typical capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※3: Minimum capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※4: Consult FDK according to conditions of use. ※5: Including heat shrink tube. ※6: Including paper tube / heat shrink tube.

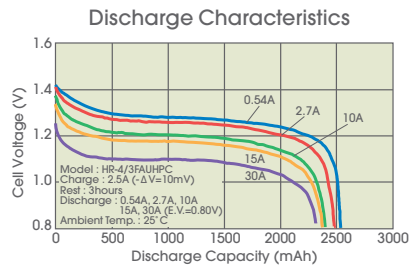
High-Rate Discharge Ni-MH Battery



Suitable for high drain use with stable voltage.

Features

- **Superior high-rate discharge characteristics**
FDK's original electrode manufacturing process, coupled with specialized current collectors minimize internal impedance, which in turn enables high-rate discharging and secures a stable discharge voltage.



Applications

- Electric tools, nursing lift, electric motor applications etc.



Specifications

Model	HR-4/5FAUP	HR-4/3FAUHPC	HR-SCU	HR-4/3FAUPC	HR-4/3FAUP	
Nominal Voltage	1.2V	1.2V	1.2V	1.2V	1.2V	
Typical Capacity ^{※1}	1950mAh	2700mAh	3000mAh	3200mAh	4000mAh	
Minimum Capacity ^{※2}	1800mAh	2500mAh	2700mAh	3050mAh	3750mAh	
Quick-Charge ^{※3}	Current	1950mA	2700mA	3000mA	4000mA	
	Time	1.1h	1.1h	1.1h	1.1h	1.1h
Dimensions (incl.tube) ^{※4}	Diameter	18.1mm ^{※5}	18.1mm ^{※5}	23.0mm	18.1mm ^{※5}	18.1mm ^{※5}
	Height	43.2mm ^{※5}	67.0mm ^{※5}	43.5mm	67.0mm ^{※5}	67.0mm ^{※5}
Approx. Weight	39g	57g	59g	59g	58g	

※1: Typical capacity when a single cell is discharged at 0.2It after being charged at 0.1It for 16 hours. ※2: Minimum capacity when a single cell is discharged at 0.2It after being charged at 0.1It for 16 hours. ※3: Consult FDK according to conditions of use. ※4: Including heat shrink tube. ※5: Including paper tube / heat shrink tube.

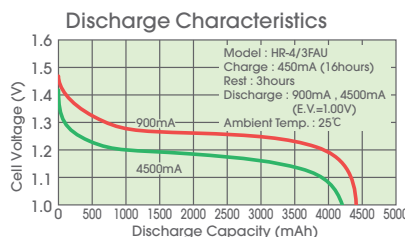
Standard Ni-MH Battery



For general industrial applications.

Features

- **High energy density**
Standard Ni-MH batteries achieve a high energy density by using exclusively developed materials and construction. Standard Ni-MH batteries can allow for an extended run time in various applications.



Applications

- Audio / video equipment, information / communication devices, lighting equipment, measuring instruments, home appliances, toys etc.



Specifications

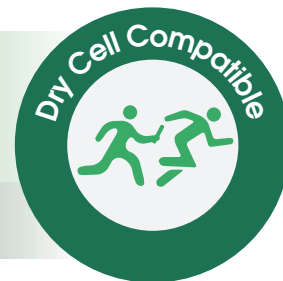
Model	HR-AAAUC Long Life Type	HR-5/4AAAU	HR-4/5AAUC Long Life Type	HR-AAUQ Long Life Type	HR-AAUC Long Life Type	HR-AAUE	HR-AAU	HR-4/5AU	HR-AUE	HR-4/3AU	HR-4/3FAU
Nominal Voltage	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V
Typical Capacity ^{※1}	700mAh	850mAh	1100mAh	840mAh	1200mAh	1400mAh	1650mAh	2150mAh	2700mAh	4000mAh	4500mAh
Minimum Capacity ^{※2}	650mAh	760mAh	1000mAh	770mAh	1100mAh	1250mAh	1500mAh	1950mAh	2450mAh	3600mAh	4100mAh
Quick-Charge ^{※3}	Current	700mA	850mA	1100mA	840mA	1200mA	1400mA	1650mA	2150mA	2700mA	3000mA
	Time	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.4h
Dimensions (incl.tube) ^{※4}	Diameter	10.5mm	10.5mm	14.2mm	14.2mm	14.2mm	14.2mm	17.0mm	17.0mm	17.0mm	18.0mm
	Height	44.5mm	50.0mm	43.0mm	50.0mm	50.0mm	50.0mm	43.0mm	50.0mm	67.5mm	67.5mm
Approx. Weight	12g	14g	21g	18g	22g	25g	27g	33g	39g	53g	59g

※1: Typical capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※2: Minimum capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※3: Consult FDK according to conditions of use. ※4: Including heat shrink tube.

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Dry Cell Compatible Ni-MH Battery

Rechargeable consumer batteries that can save resources.

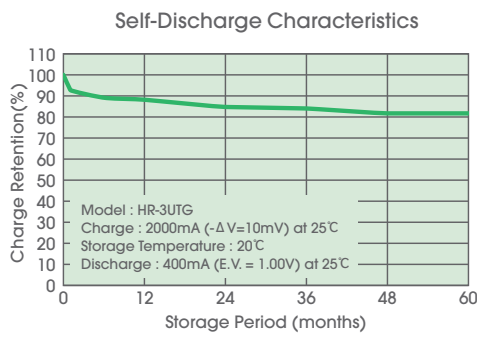


Ni-MH BATTERY

Handling Precautions

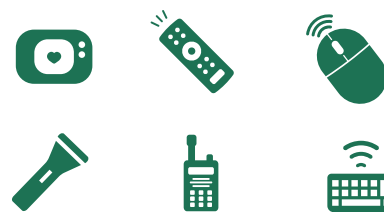
Features

- Dry cell compatible form factor**
 Dry cell compatible Ni-MH batteries can be used in most equipment that use dry cells.
- Cost effectiveness**
 Economical batteries with less waste due to being rechargeable unlike a dry cell.
- Low self-discharge**
 Ready to use after purchasing, can be stored as emergency supplies.



Applications

- For digital cameras, audio equipment, remote controls, clocks, radio-controlled hobby items, amateur 2-way radio etc.
- Dry cell compatible Ni-MH batteries can also be used for business purposes other than those listed above.
- It is necessary to confirm the application and battery usage conditions to sell dry cell compatible Ni-MH batteries. Please contact us for more details.



Specifications

Model	HR-4UQ	HR-4UTG Long Life Type	HR-4UTG	HR-4UTGX	HR-3UQ	HR-3UTG Long Life Type	HR-3UTG	HR-3UWX
Nominal Voltage	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V	1.2V
Typical Capacity ^{※1}	600mAh	800mAh	800mAh	1000mAh	1000mAh	2000mAh	2000mAh	2500mAh
Minimum Capacity ^{※2}	550mAh	750mAh	750mAh	930mAh	950mAh	1900mAh	1900mAh	2400mAh
Quick-Charge ^{※3}	Current	600mA	800mA	800mA	1000mA	1000mA	2000mA	2500mA
	Time	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h	1.1h
Dimensions (incl.tube) ^{※4}	Diameter	10.5mm	10.5mm	10.5mm	10.5mm	14.35mm	14.35mm	14.5mm
	Height	44.5mm	44.5mm	44.5mm	44.5mm	50.4mm	50.4mm	50.4mm
Approx. Weight	11g	13g	13g	13g	19g	27g	27g	32g

※1: Typical capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※2: Minimum capacity when being discharged at 0.2It until the voltage reaches to 1.00V within 1 hour after a single cell being charged for 16 hours at 0.1It. ※3: Consult FDK according to conditions of use. ※4: Including label / heat shrink tube.

Battery Pack, Battery System

FDK provides options for battery packs and battery systems depending on the requirements of each application.

When batteries are used in equipment, most instances are as battery packs or battery systems. FDK has a wealth of experience with battery packs, as well as both custom designed and standard battery systems. We design and manufacture with consideration of battery safety and reliability for each application.

- Battery pack (assembly of multiple cells)
- Battery system (assembly of multiple cells with BMS that controls charge and discharge)

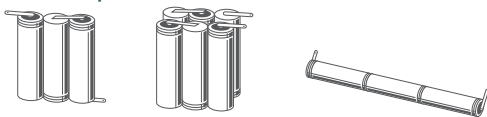


Incorporating Battery Packs

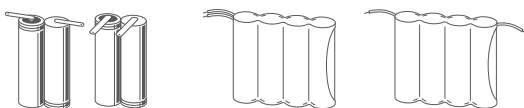
Standard Configuration

When using batteries in equipment, battery model, number of cells and shape will differ depending on rated power, space and usage conditions of equipment.

● Connection shape

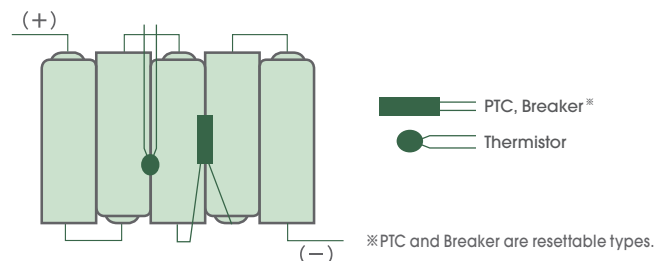


● Terminal direction



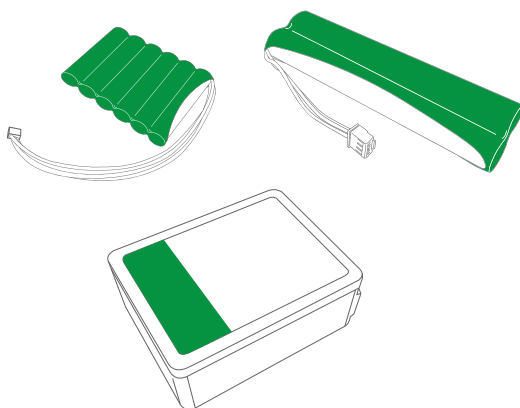
Safety Device

When designing an assembled battery, it is necessary to install a safety device in case of charger failure and external short circuit. FDK recommends that the following parts are built into the assembled battery.



Battery Pack Shape Example

FDK can produce battery packs with various shapes according to usage. Our cases can be made from heat shrink tubing, resin, metal etc. Please consult us regarding the electrical wiring and terminal types.



Usage of Battery Packs

Our products are used in various applications such as in-vehicle applications, emergency lights, home-use, etc. Please contact us about the usage of applications, ambient temperature, charge and discharge conditions, etc.



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Battery System

FDK save our customers' development resources by providing batteries with control functions according to the application.

Our battery packs include a battery management system (BMS) that controls charging and discharging. This brings out the best performance of Ni-MH batteries and contributes to improving the function of our customers' products while reducing development time.

Battery Management System

FDK's BMS is an original system that has functions to control charge and discharge, as well as diagnose and predict battery life etc.

Battery Management

- **Charge/discharge control:**
Prevents over-charge and discharge, and minimizes battery performance degradation
- **Self-diagnosis function:**
Diagnosis of charge circuit and discharge circuits
High reliability (internal resistance and self-discharge rate) through battery diagnostics
- **Lifetime prediction function(Options):**
Capable of predicting battery lifetime through usage and environmental history and giving advanced notice

Examples of Custom Control Functions

- ① Low temperature charge control function for cold regions
- ② Lifetime prediction function to reduce the number of battery replacements
- ③ Charge control function with built-in charge circuit




Custom Designed Battery System

Our battery systems have achieved use in many applications requiring high reliability such as medical equipment, infrastructure, and information equipment.

Data centers Servers DC12V 280W output	Medical equipment DC12V 70W output	Elevator automatic landings DC48V 1kW output
	Disaster response vending machines DC48V 450W output	Base stations DC48V 2kW output

Standard Battery System

We offer standard battery systems with DC12V, DC24V, and DC48V input and output.

Model	BBUS-100012-01	BBUS-122024-02	BBUS-921048-01	BBUS-192048-01
Output Voltage	DC12V	DC24V	DC48V	
Capacity	10Wh	1100Wh	920Wh	1900Wh
Output current/power	50W	30A	45A	1kW
Dimensions	W 101mm D 150mm H 20mm	W 300mm D 422mm H 150mm	W 375mm D 235mm H 191mm	W 448mm D 460mm H 85.8mm
Approx. Weight	460g	25kg	19.5kg	31kg
Applications	Power supply backup for industrial computers and surveillance cameras. 	Power supply backup for railway signal equipment, and surveillance cameras. 	Power supply backup for base stations, and surveillance cameras. 	

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Ni-MH Battery Charger for 10-20 Series Battery Packs

- ✓ Designed to charge 10-20 series Ni-MH battery pack.
※Please contact us if you have a request in regards to other series.
- ✓ Offers most suitable charge control.
- ✓ Includes refresh discharge function.
- ✓ Includes overcharging and overheating prevention function.



Item	FIC10M-FDK01	FIC20M-FDK01
Rating Output Voltage	10 series : DC14V	20 series : DC28V
Charging Current	1650mA (Constant Current)	
Charging Time	Approx. 2 hours (Capacity : Approx. 3200mAh) Approx. 2.5 hours (Capacity : Approx. 4000mAh)	
Charging Control	-ΔV, battery temperature detection, timer	
Refresh Discharge Function	Refresh discharge time : Approx. 9 hours (Capacity : 3200mAh)	
Input	AC100~240V 50-60Hz 57-76VA	AC100~240V 50-60Hz 103-130VA
Indicators	Charging: Red light, Fully charged: Green light, Refreshing: Orange light, Error: Blinking red light	
Safety Approval	Please contact us	PSE
Dimensions	170(L) X 95(W) X 59(H) mm	
Approx. Weight	600g	
Operating Temperature	0°C to +40°C	
Storage Temperature	-20°C to +60°C	

Charging Method

Charging Method	Constant current charging					
	Main charging				Maintenance charging	
	Quick charging			Low rate charging	Pulse current charging	Intermittent charging
Overview	Peak voltage control charging	dT/dt control charging	-ΔV control charging	Timer control charging		
<p>V : Battery voltage I : Charge current T : Battery temperature</p>						
	Terminate charging by detecting battery peak voltage.	Terminate charging by detecting battery temperature rate.	Terminate charging by detecting specified battery voltage drop after peak voltage.	Terminate charging by counting elapsed time.	Charging by pulse current to compensate self-discharge after main charging to keep fully charged state.	Charging intermittently after main charging to return to fully charged state. (Factor of recharging: battery voltage, elapsed time)
Charging Time	1~2h	1~2h	1~2h	11~12h	—	—
Charging Current ^{※1}	0.5~1.0It	0.5~1.0It	0.5~1.0It	0.1It	1/20~1.0It (Avg.1/500It)	1/20~1.0It
Standard Type	◎	◎	◎	○	◎	◎
High Durability Type	◎	◎	◎	—	○	○
High-Rate Discharge Type	◎	◎	◎	—	○	○
Dry Cell Compatible Type	◎	○	◎	○ ^{※2}	—	○

◎ Recommended : Suitable to exhibit battery performance. ○ Available : Can be used depending on the specification of equipment.

● 1It(A) = Rated capacity (Ah) / 1 (h)

● Proper charging method and charging condition are depending on the specification/usage of equipment or structure of battery pack. Please contact us for details.

● If your device supports a charge rate of 0.1It or more, please note that the overcharge performance and temperature rise conditions will differ depending on your battery type.

Please contact us before deciding on specifications.

● When a large number of cells, a high capacity battery, or a battery assembly that does not dissipate heat effectively is used, abnormal heat generation may occur even if the charging current is less than 0.1It.

※1 Charging current is just a reference, please contact us for details.

※2 Some charging methods should not be applied to dry cell compatible batteries regardless of equipment specification. Please contact us for details.

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Ni-MH Batteries Handling Precautions for Safe Use

Carefully read these instructions before using Ni-MH batteries for the first time.

For your safety and that of your customers, observe all cautionary information provided in this manual. Save this manual for future reference. The following information is intended to highlight potential safety hazards that can be associated with the misuse, misapplication or damage of Ni-MH batteries. Please carefully evaluate the information in this section when using Ni-MH batteries (single cells or assembled batteries) or when using or manufacturing equipment incorporating Ni-MH batteries. This catalogue is not a substitute for independent evaluation of equipment incorporating Ni-MH batteries. Customers incorporating Ni-MH batteries into their equipment must assure that their completed product has been properly designed, manufactured and tested. End users of equipment incorporating Ni-MH batteries should also be provided with sufficient warnings and instructions on their safe operation. As appropriate, some or all of the following warnings and information should be incorporated into the instruction manual accompanying your equipment.

Batteries of this type are not sold to individual customers. If you wish to replace the battery in your device, please contact the store where you purchased it or the device manufacturer.

⚠ DANGER

- Failure to carefully observe the following procedures and precautions can result in leakage of battery fluid (electrolyte), heat generation, bursting, fire and serious personal injury.
 - Never dispose of Ni-MH batteries in a fire or heat them. Doing so may melt the insulation, damage the gas release vents or protective devices, ignite hydrogen gas, and cause leakage of battery fluid (electrolyte), heat generation, bursting and fire.
 - Do not connect the ⊕ (positive) and ⊖ (negative) terminals of Ni-MH batteries together with electrically conductive materials, including lead wires. Do not transport or store Ni-MH batteries with their terminals uncovered or in contact with a metal object (such as a necklace) or other conductive material. Doing so may cause short circuit, which would result in excessive current flow and possibly cause leakage of battery fluid, heat generation, bursting and fire. When carrying or storing batteries, use an appropriate case.
 - Only charge Ni-MH batteries using chargers that satisfy FDK's specifications. Only charge batteries under the conditions specified by FDK. Failure to follow proper charging procedures may cause excessive current flow, loss of control during charging, leakage of battery fluid, heat generation, bursting and fire.
 - Never disassemble Ni-MH batteries. Doing so may cause an internal or external short circuit or result in exposed material of battery reacting chemically with the air. It may also cause heat generation, bursting and fire. Also, this is dangerous as it may cause exposure to alkaline fluid.
 - Never modify or reconstruct Ni-MH batteries. Protective devices to prevent danger are built into batteries (single cells or assembled batteries). If these are damaged, excessive current flow may cause loss of control during charging or discharging of the battery, leakage of battery fluid, heat generation, bursting and fire.
 - Never solder lead wires directly on to Ni-MH batteries. The heat of the soldering operation may melt the insulation, damage the gas release vents or protective devices, cause leakage of battery fluid, heat generation, bursting and fire.
 - The ⊕ (positive) and ⊖ (negative) terminals of Ni-MH batteries are predetermined. Do not force the terminal connection to a charger or equipment. If the terminals cannot be easily connected to the charger or equipment, check if the ⊕ and ⊖ terminals are correctly positioned. If the terminals are reversed, during charging the battery may be discharged rather than charged. Furthermore, reversed connections may cause abnormal chemical reaction in the battery, the flow of abnormal currents, leakage of battery fluid, heat generation, bursting and fire.
 - The gas release vent which releases internal gas is located in the ⊕ positive terminal of the Ni-MH batteries. For this reason, never deform this section or cover or obstruct its gas release structure. If this section is deformed or covered or obstructed, the gas release vent will not function properly, possibly causing leakage of battery fluid, heat generation, bursting and fire.
 - Do not directly connect Ni-MH batteries to a direct power source or the cigarette lighter socket in a car. High voltage may cause excessive current flow, leakage of battery fluid, heat generation, bursting and fire.
 - Do not use Ni-MH batteries in any equipment other than those specified by FDK. Depending on the equipment being used, doing so may cause abnormal current flow, leakage of battery fluid, heat generation, bursting and fire.
- Ni-MH batteries contain a strong colorless alkaline solution (electrolyte). Alkaline solution is extremely corrosive and will cause skin damage. If any fluid from Ni-MH batteries comes in contact with a user's eyes, they should immediately flush their eyes and wash them thoroughly with clean water from a tap or another source and consult a doctor immediately. Strong alkaline solution can damage eyes and lead to permanent loss of eyesight.
- When Ni-MH batteries are to be incorporated in equipment or housed within a case, avoid airtight structures as this may lead to the equipment or case being damaged or may be harmful to users.
- Please contact us before using Ni-MH batteries in waterproof housing or cases. This may lead to the accumulation of gases from the battery which can ignite and cause rupturing.

⚠ WARNING

- Do not apply water, seawater or other oxidizing reagents to Ni-MH batteries, as this can cause rust and heat generation. If a battery becomes rusted, the gas release vent may no longer operate, and can result in bursting.
- Do not connect more than 21 Ni-MH batteries in series, as this may cause electrical shocks, leakage of battery fluid and heat generation.
- Keep Ni-MH batteries or the equipment out of the reach of infants and small children, in order to avoid them swallowing batteries. In the event the batteries are swallowed, consult a doctor immediately.
- Do not charge or use Ni-MH batteries with the ⊕ and ⊖ terminals reversed. Charging batteries with the terminals reversed may discharge rather than charge the batteries, or it may cause abnormal chemical reaction in the batteries. Using batteries with the terminals reversed may discharge with of abnormal current, leakage of battery fluid, heat generation, bursting and fire.
- Do not over-charge Ni-MH batteries by exceeding the predetermined charging period specified by the battery charger's instructions or indicator. If Ni-MH batteries are not fully charged after the battery charger's predetermined charging period has elapsed, stop the charging process. Prolonged charging may cause leakage of battery fluid, heat generation, bursting. Be sure to handle recharged batteries carefully as they may be hot.
- Do not use Ni-MH batteries if the outer tube/label is scratched or damaged. Doing so will expose the battery to the risk of a short circuit, and may cause leakage of battery fluid, heat generation, bursting and fire.

- Do not remove the outer tube from a battery or damage it. Doing so will expose the battery to the risk of a short circuit, and may cause leakage of battery fluid, heat generation, bursting and fire.
- If Ni-MH batteries leak fluid, change color, change shape, or change in any other way, do not use them, otherwise they may cause heat generation, bursting and fire.
- Ni-MH batteries contain strong colorless alkaline solution (electrolyte). If the skin or clothing comes in contact with fluid from a Ni-MH batteries. Battery fluid can irritate the skin thoroughly wash the area immediately with clean water from the tap or another source.
- When transporting Ni-MH batteries, pack them carefully so that the batteries inside the case are not moved.

⚠ CAUTION

- Do not strike or drop Ni-MH batteries. Sharp impacts or concussions to Ni-MH batteries may cause leakage of battery fluid, heat generation, bursting and fire.
- Store Ni-MH batteries out of the reach of infants and small children. When charging or using a battery, do not let infants or small children remove the battery from the charger or the equipment being used.
- Children should not use Ni-MH batteries unless they have been carefully instructed on the contents of this instruction manual and their parents or guardians have confirmed that the children understand and appreciate the proper usage and safety hazards presented by the batteries.
- Do not charge Ni-MH batteries if they have been cooled to 0°C or below. Doing so may cause leakage of battery fluid, impair performance or shorten operating life of Ni-MH batteries.
- Do not use or store Ni-MH batteries at high temperature, such as in strong direct sunlight, in cars during hot weather, or directly in front of a heater. This may cause leakage of battery fluid. It could also impair performance and shorten battery life of Ni-MH batteries.
- Do not use old and new batteries mixed together, or batteries at different charge levels. Do not use Ni-MH batteries mixed together with a dry cell or other battery of a different capacity, type, or brand name. This may cause leakage of battery fluid and heat generation.
- When more than two batteries are to be used together, charge them simultaneously prior to use. If they are not charged at the same time, it could cause leakage of battery fluid and heat generation.
- Do not connect Ni-MH batteries in parallel as this may cause leakage of battery fluid, heat generation, bursting and fire.
- For the recommended charging method for Ni-MH batteries, read the battery charger's instruction manual carefully.
- Do not place or cover flammable materials on the battery while charging or discharging the Ni-MH batteries. It may cause leakage of battery fluid, heat generation, bursting and fire.
- If Ni-MH batteries do not perform or function well with certain subject, refer to the instruction manual or warnings of the subject equipment.
- Do not charge Ni-MH batteries beyond the recommended time described in the instruction manual for the charger or equipment. Overcharging cause leakage of battery fluid, heat generation, bursting and fire. It could also impair performance and shorten battery life of Ni-MH batteries.
- After long term storage, there is a possibility that a battery cannot be fully charged. In order to fully charge it, charge and discharge the battery a few times.
- Be sure to turn off the equipment after use of Ni-MH batteries, as this may result in leakage of battery fluid.
- After they have been removed from equipment, store Ni-MH batteries in a dry place and within the recommended storage temperature range. This will help preserve the batteries' performance and durability and to minimize the possibility of leakage of battery fluid or corrosion. (For the indicated storage temperature range, refer to the rating table of this catalogue. FDK recommends a temperature range from -20 to 30 °C for longer battery life).
- Before using Ni-MH batteries, be sure to read the instruction manual and all precautions carefully, then store the manual and precautions carefully to use as reference when the need arises. If you have specific questions about the instruction manual or the precautions, contact FDK at the location listed on the last page of this catalogue.
- If corrosion, heat generation or other abnormalities with new Ni-MH batteries are detected, immediately stop using them and return them to the store or FDK that they were purchased from.
- If the Ni-MH battery terminals become dirty, clean them with a soft dry cloth prior to use. Dirt on the terminals can result in poor contact with the equipment, loss of power, or inability to charge.
- When incorporating Ni-MH batteries into their equipment or case, use materials with alkali resistance for the contact point and terminal of the battery. (Copper-containing materials can cause rust and corrosion problems).
- Batteries have a limited lifetime. Even in the same equipment, the battery life varies depending on the ambient temperature during operation and number of charge/discharge cycles. Therefore, if the operating time of a Ni-MH battery becomes much shorter than its initial operating time, even after recharging, it is most likely near the end of its battery life and should be replaced with a new battery.
- Remove Ni-MH batteries from your device if it will not be used for an extended period of time, as this may result in leakage of battery fluid. Also, be sure to turn off your device after using Ni-MH batteries.
- Ni-MH batteries should be charged after first purchase or having not been used for a long period of time.