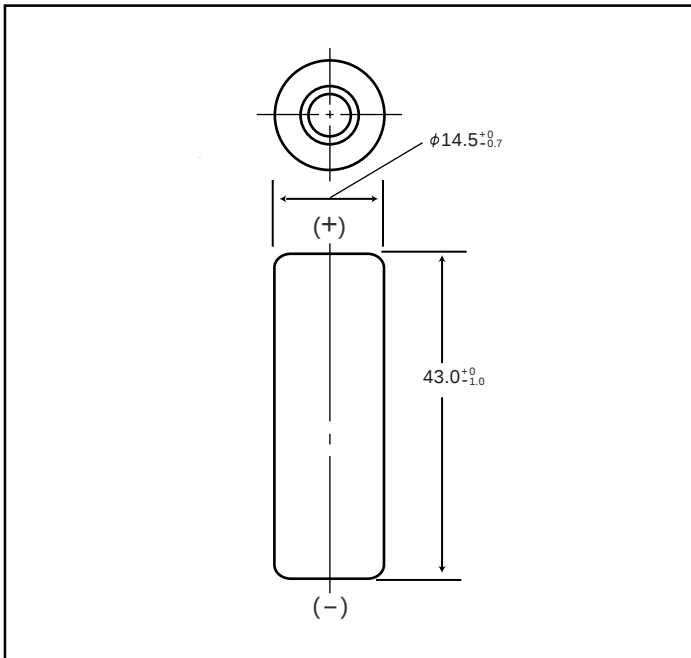


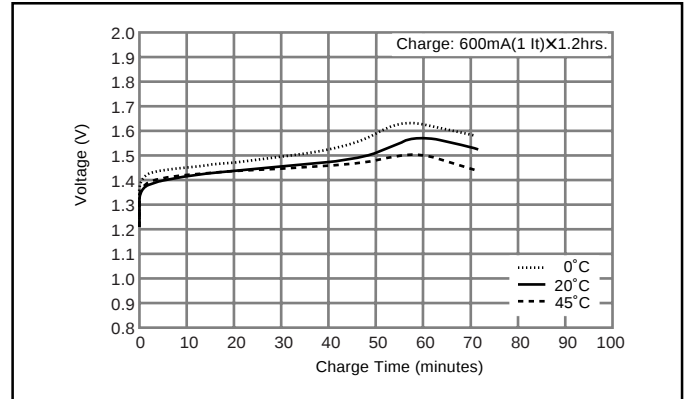
# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR120AA Cylindrical 4/5AA size (HR 15/43)

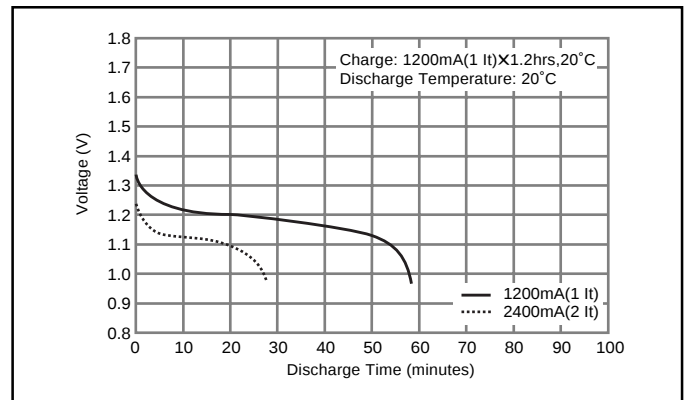
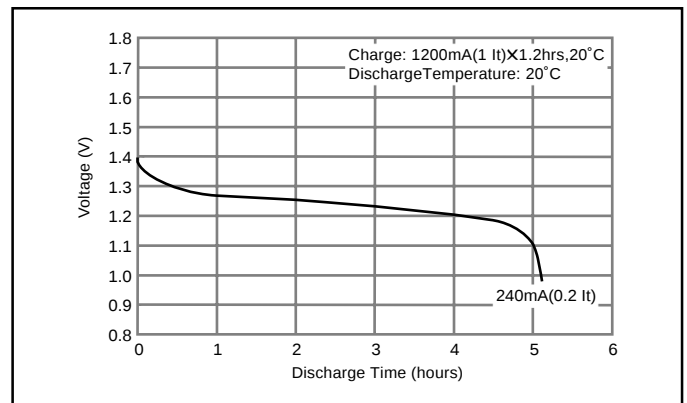
### Dimensions (with Tube) (mm)



### Typical Charge Characteristics



### Typical Discharge Characteristics



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 14.5+0/-0.7 | 0.57+0/-0.03 |
| Height             | 43.0+0/-1.0 | 1.69+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 23          | 0.81         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 1220 mAh                |               |
|                                                        | Rated (Min.) | 1150 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 19mΩ                    |               |
| Charge                                                 | Standard     | 120mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 1200mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | 0°C to 45°C   |
|                                                        |              |                         | 32°F to 113°F |
|                                                        | Discharge    |                         | 0°C to 40°C   |
|                                                        |              |                         | 32°F to 104°F |
| Storage                                                | < 1 year     |                         | -10°C to 65°C |
|                                                        | < 3 months   |                         | 14°F to 149°F |
|                                                        | < 1 month    |                         | -20°C to 35°C |
|                                                        | < 1 month    |                         | -4°F to 95°F  |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

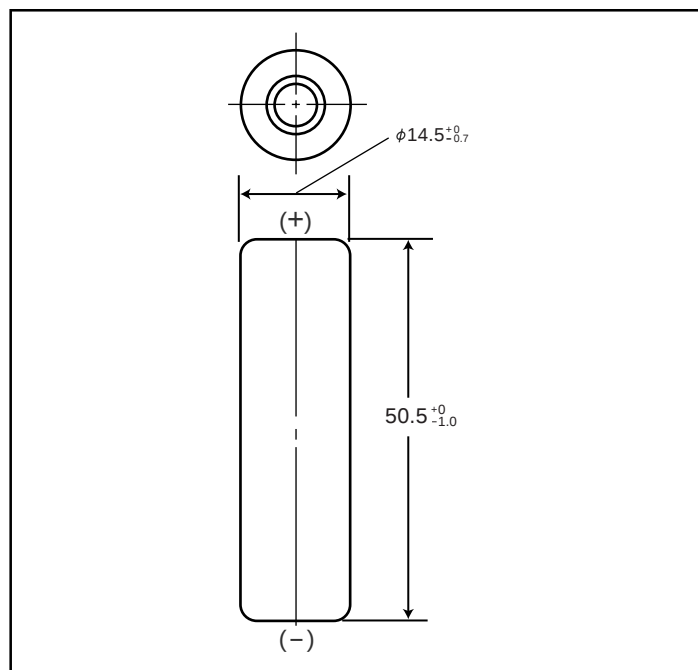
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR150AA Cylindrical AA size (HR 15/51)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 14.5+0/-0.7 | 0.57+0/-0.03 |
| Height             | 50.0+0/-1.0 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 26          | 0.92         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 1580 mAh                |               |
|                                                        | Rated (Min.) | 1500 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 20mΩ                    |               |
| Charge                                                 | Standard     | 150mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 1500mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | °C            |
|                                                        |              |                         | °F            |
| Storage                                                | < 1 year     | -20°C to 35°C           | -4°F to 95°F  |
|                                                        | < 3 months   | -20°C to 45°C           | -4°F to 113°F |
|                                                        | < 1 month    | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

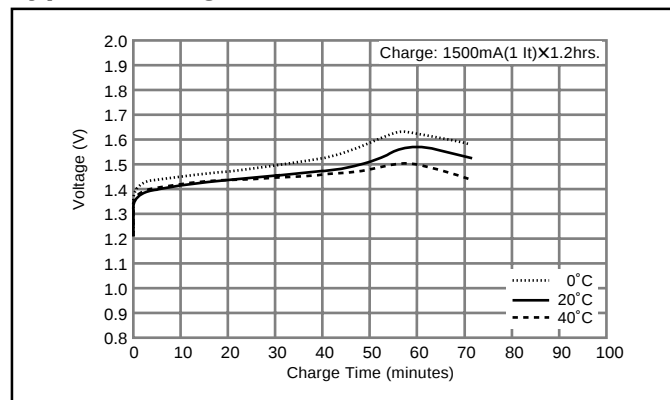
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

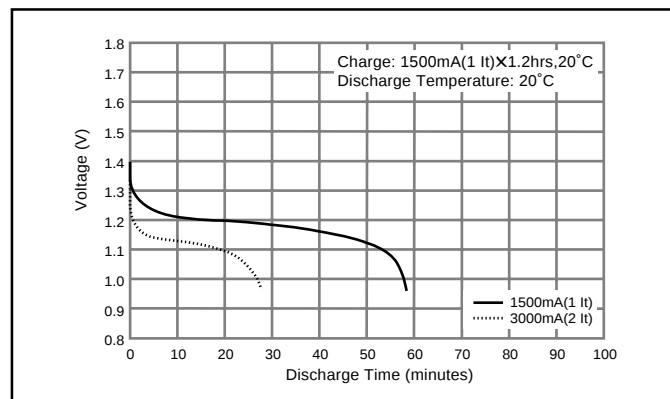
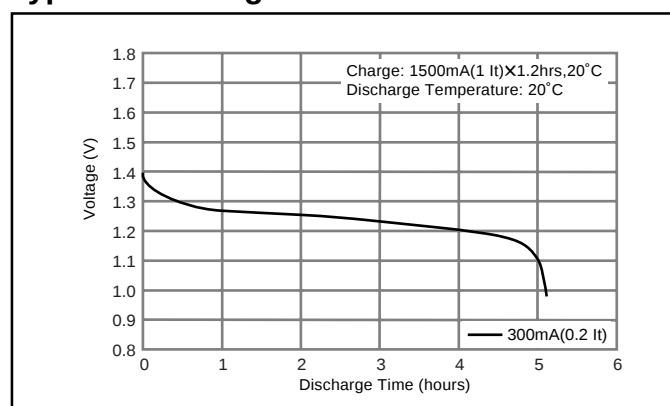
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn (Ah)/1h.$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



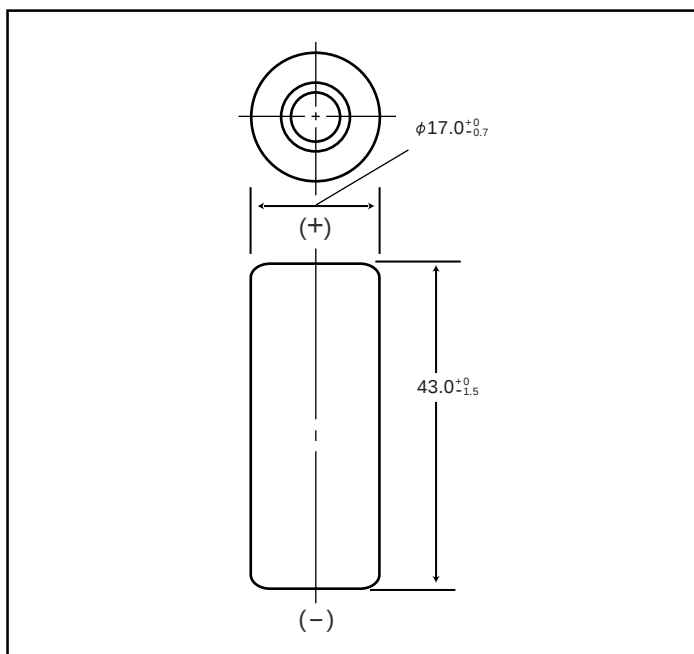
### Typical Discharge Characteristics



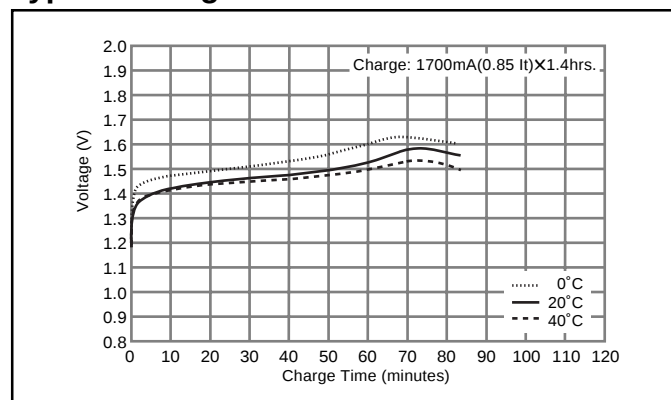
# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR200A Cylindrical 4/5A size (HR 17/43)

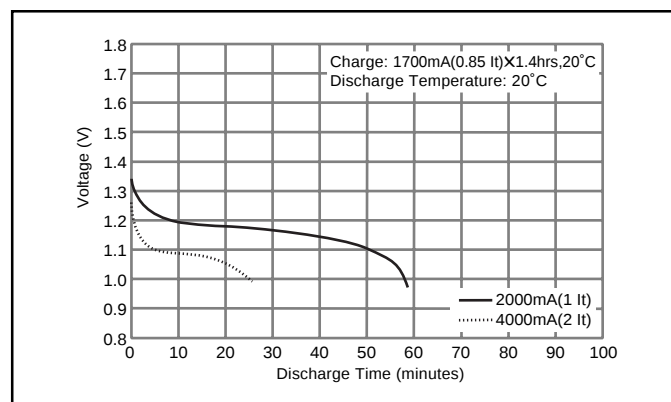
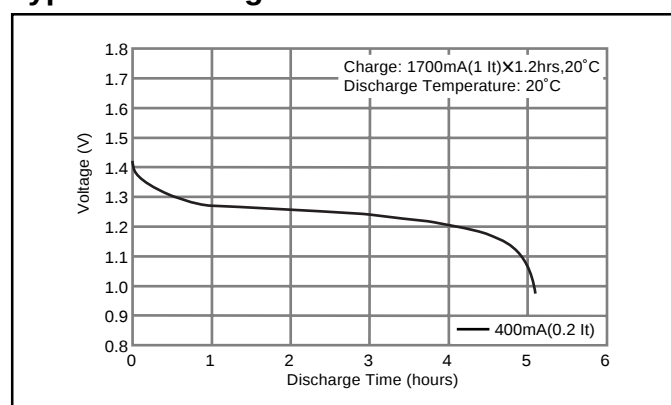
### Dimensions (with Tube) (mm)



### Typical Charge Characteristics



### Typical Discharge Characteristics



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 32          | 1.13         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 2040 mAh                |               |
|                                                        | Rated (Min.) | 2000 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 20mΩ                    |               |
| Charge                                                 | Standard     | 200mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 2000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | 0°C to 45°C   |
|                                                        |              |                         | 32°F to 113°F |
|                                                        | Discharge    |                         | 0°C to 40°C   |
|                                                        |              |                         | 32°F to 104°F |
| Storage                                                | < 1 year     |                         | -10°C to 65°C |
|                                                        | < 3 months   |                         | 14°F to 149°F |
|                                                        | < 1 month    |                         | -20°C to 35°C |
|                                                        | < 1 month    |                         | -4°F to 95°F  |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

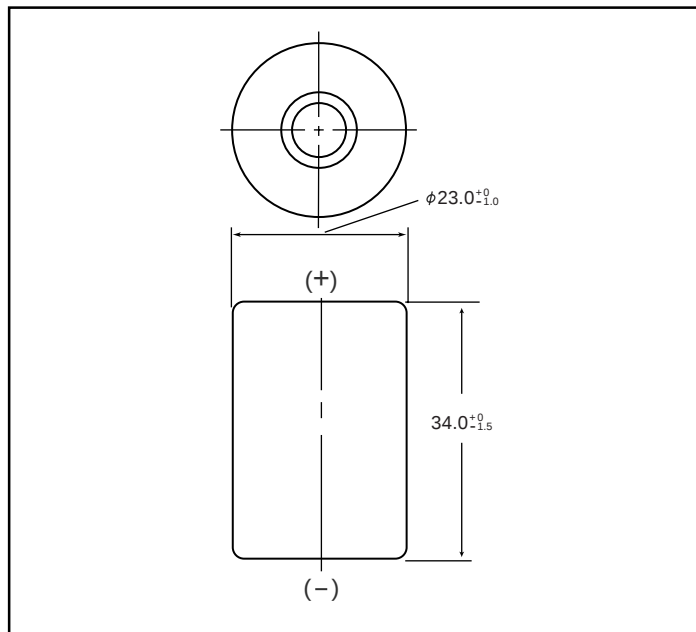
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR200SCP Cylindrical 4/5SC size (HR 23/34)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-0.1 | 0.91+0/-0.04 |
| Height             | 34.0+0/-1.5 | 1.34+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 42          | 1.48         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 2100 mAh                |               |
|                                                        | Rated (Min.) | 1900 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 5mΩ                     |               |
| Charge                                                 | Standard     | 200mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 2000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | -10°C to 65°C |
|                                                        |              |                         | 14°F to 149°F |
| Storage                                                | < 2 years    |                         | -20°C to 35°C |
|                                                        | < 6 months   |                         | -20°C to 45°C |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

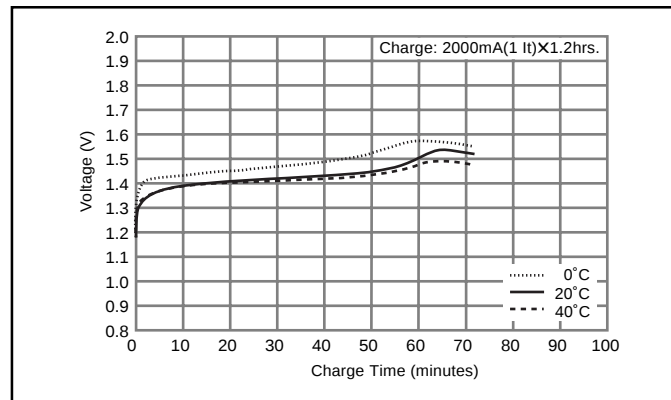
\*\* For reference only.

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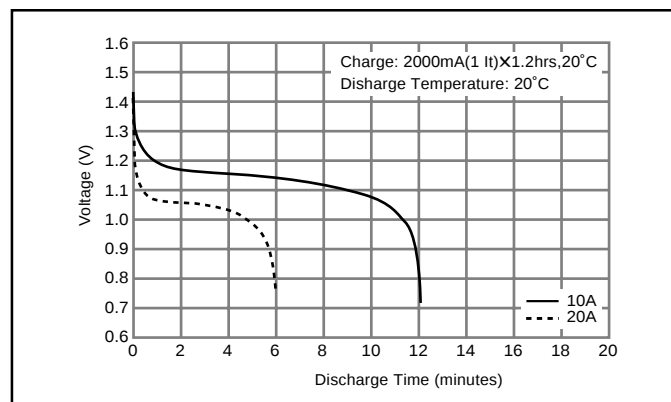
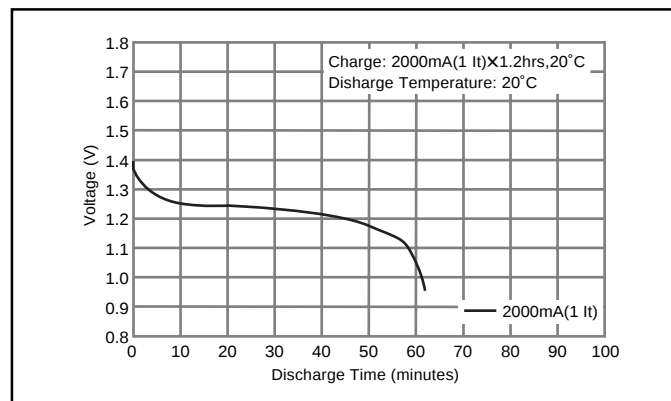
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn(Ah)/1h$ .

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



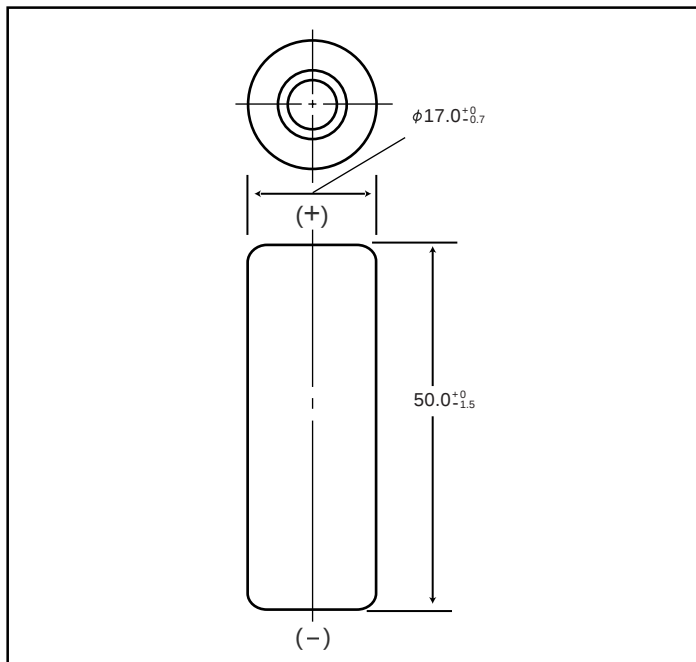
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210A Cylindrical A size (HR 17/50)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 50.0+0/-1.5 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 38          | 1.34         |

|                                                        |           |              |                         |               |
|--------------------------------------------------------|-----------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |           | 1.2V         |                         |               |
| Discharge Capacity*                                    |           | Average**    | 2200 mAh                |               |
|                                                        |           | Rated (Min.) | 2100 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |           | 20mΩ         |                         |               |
| Charge                                                 |           | Standard     | 210mA (0.1It) x 16hrs.  |               |
|                                                        |           | Rapid        | 2100mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard     | °C                      | °F            |
|                                                        |           |              | 0°C to 45°C             | 32°F to 113°F |
|                                                        |           | Rapid        | 0°C to 40°C             | 32°F to 104°F |
|                                                        | Discharge |              | -10°C to 65°C           | 14°F to 149°F |
|                                                        | Storage   | < 1 year     | -20°C to 35°C           | -4°F to 95°F  |
|                                                        |           | < 3 months   | -20°C to 45°C           | -4°F to 113°F |
|                                                        |           | < 1 month    | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

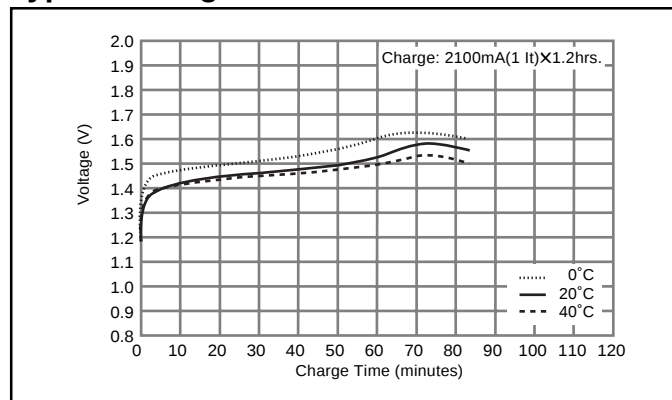
\*\* For reference only.

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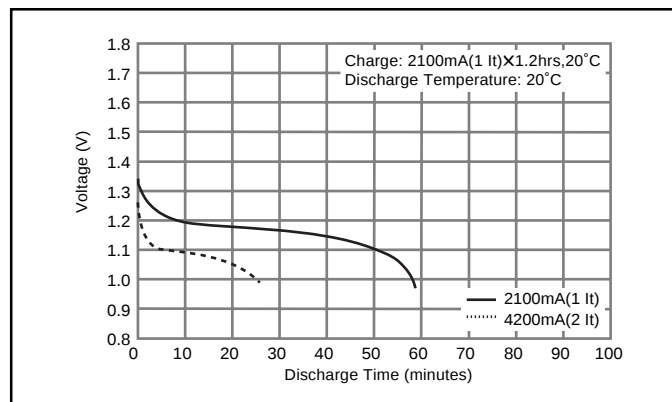
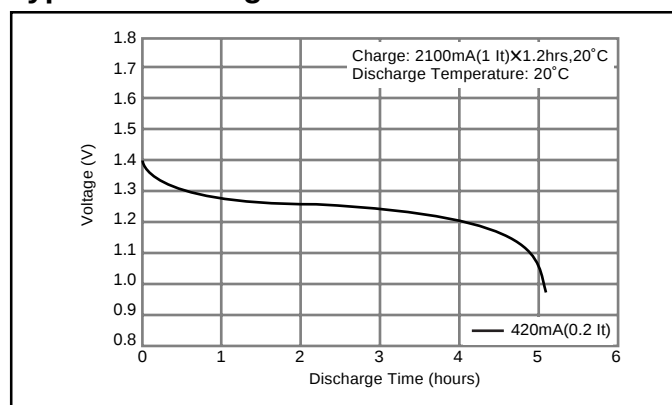
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn (Ah)/1h.$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



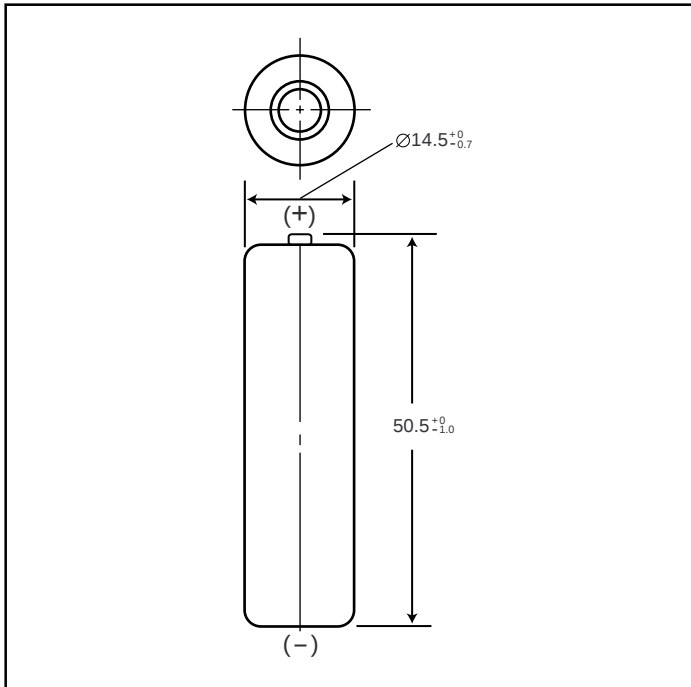
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210AA/B Cylindrical AA size (HR 15/51)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm           | inch         |
|--------------------|--------------|--------------|
| Diameter           | 14.5 +0/-0.7 | 0.57 +0/-0.3 |
| Height             | 50.5 +0/-1.0 | 1.99 +0/-0.5 |
| Approximate Weight | Grams        | Ounces       |
|                    | 29           | 1.02         |

|                                                        |              |            |                         |               |
|--------------------------------------------------------|--------------|------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V       |                         |               |
| Discharge Capacity*                                    | Average**    | 2080mAh    |                         |               |
|                                                        | Rated (Min.) | 2000mAh    |                         |               |
| Approx. internal Impedance at 1000Hz at charged state. |              | 25mΩ       |                         |               |
| Charge                                                 |              | Standard   | 200mA (0.1It) x 16 hrs. |               |
|                                                        |              | Rapid      | 1200mA (1It) x 2 hrs.   |               |
| Ambient Temperature                                    | Charge       | Standard   | °C                      | °F            |
|                                                        |              |            | 0°C to 45°C             | 32°F to 113°F |
|                                                        |              | Rapid      | 0°C to 40°C             | 32°F to 113°F |
|                                                        | Discharge    |            | -10°C to 65°C           | 14°F to 149°F |
|                                                        | Storage      | < 1 year   | -20°C to 35°C           | -4°F to 95°F  |
|                                                        |              | < 3 months | -20°C to 45°C           | -4°F to 113°F |
|                                                        |              | < 1 month  | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

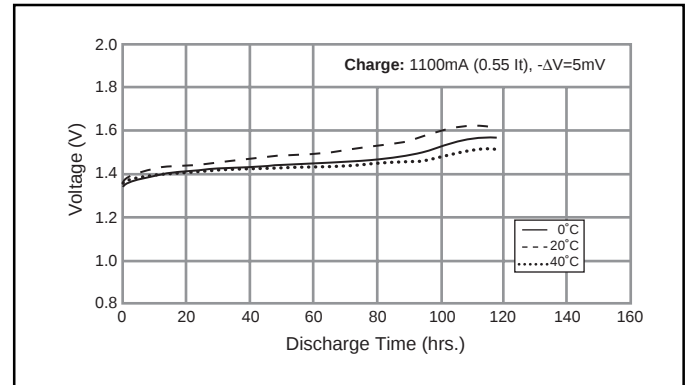
$$It(A) = Cn (Ah)/1h$$

\* [It] is the reference test current in amperes

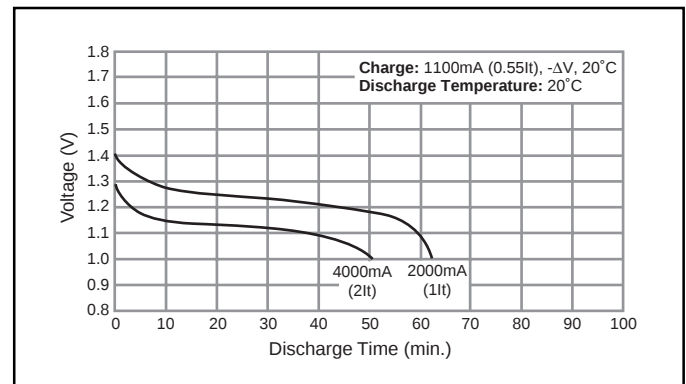
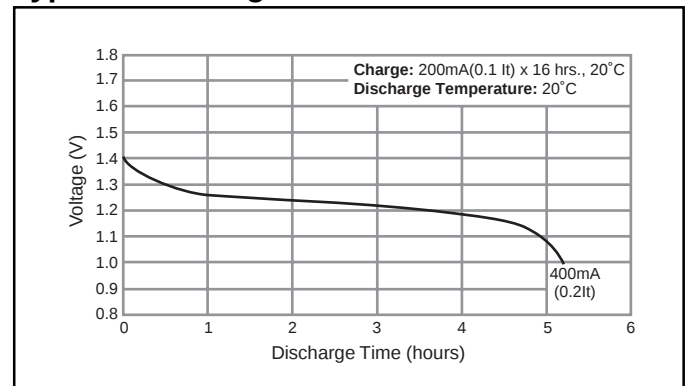
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



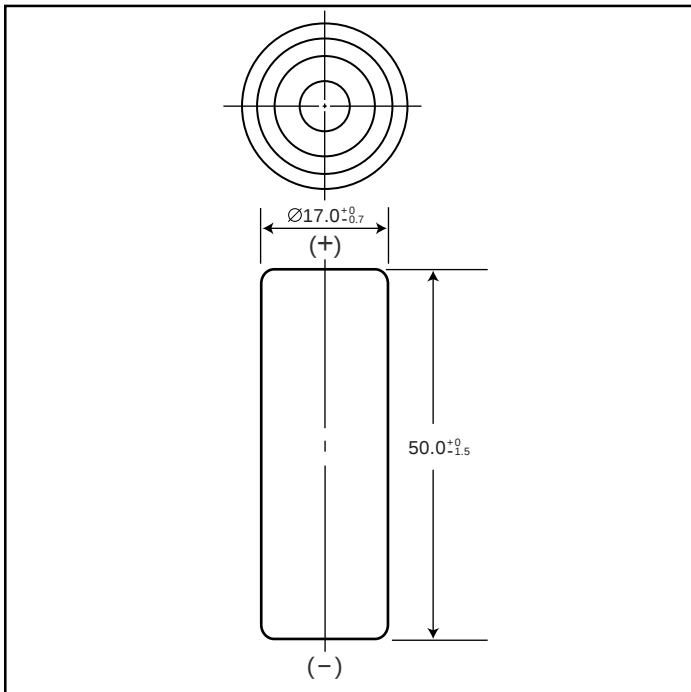
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210AH Cylindrical A size (HR 17/50)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 50.0+0/-1.5 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 38          | 1.34         |

|                                                        |                      |                         |               |
|--------------------------------------------------------|----------------------|-------------------------|---------------|
| Nominal Voltage                                        |                      | 1.2V                    |               |
| Discharge Capacity <sup>1</sup>                        | Average <sup>2</sup> | 2050mAh                 |               |
|                                                        | Rated (Min.)         | 1900mAh                 |               |
| Approx. internal Impedance at 1000Hz at charged state. |                      | 20mΩ                    |               |
| Charge                                                 | Standard             | 210mA (0.1It) x 16 hrs. |               |
|                                                        | Rapid                | -                       |               |
| Ambient Temperature                                    | Charge               | Standard                | °C            |
|                                                        |                      |                         | -10°C to 60°C |
|                                                        |                      |                         | 14°F to 140°F |
|                                                        | Discharge            |                         | °F            |
|                                                        |                      |                         | -10°C to 60°C |
|                                                        |                      |                         | 14°F to 140°F |
| Storage                                                | < 1 year             | -20°C to 35°C           | -4°F to 95°F  |
|                                                        | < 3 months           | -20°C to 45°C           | -4°F to 113°F |
|                                                        | < 1 month            | -20°C to 55°C           | -4°F to 131°F |
|                                                        | < 1 week             | -20°C to 60°C           | -4°F to 140°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

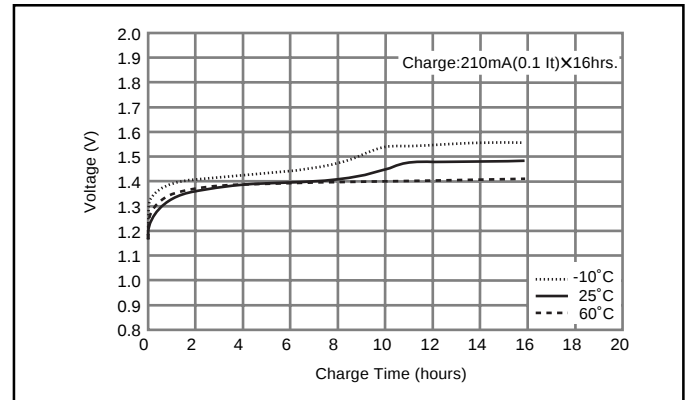
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**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

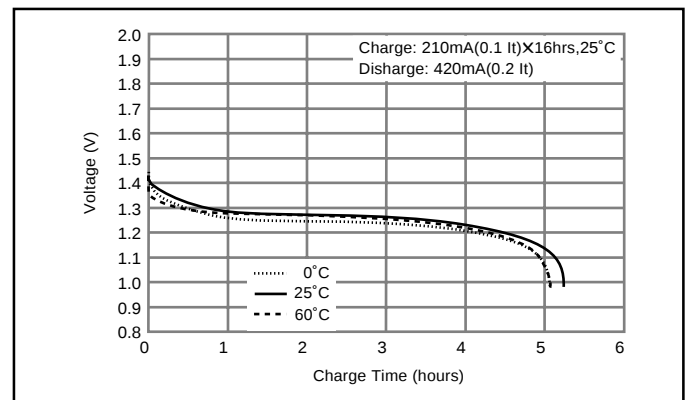
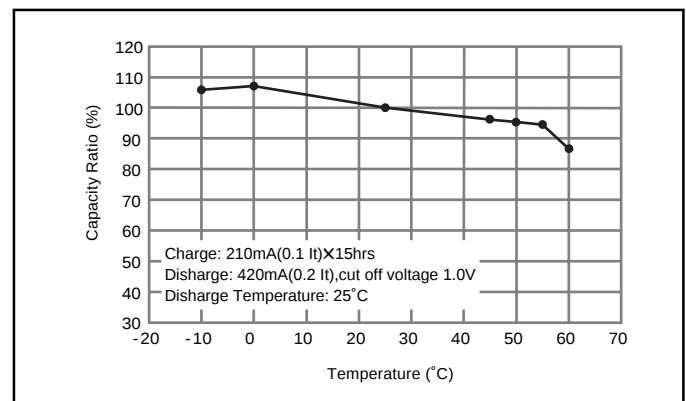
$$It(A) = Cn (Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



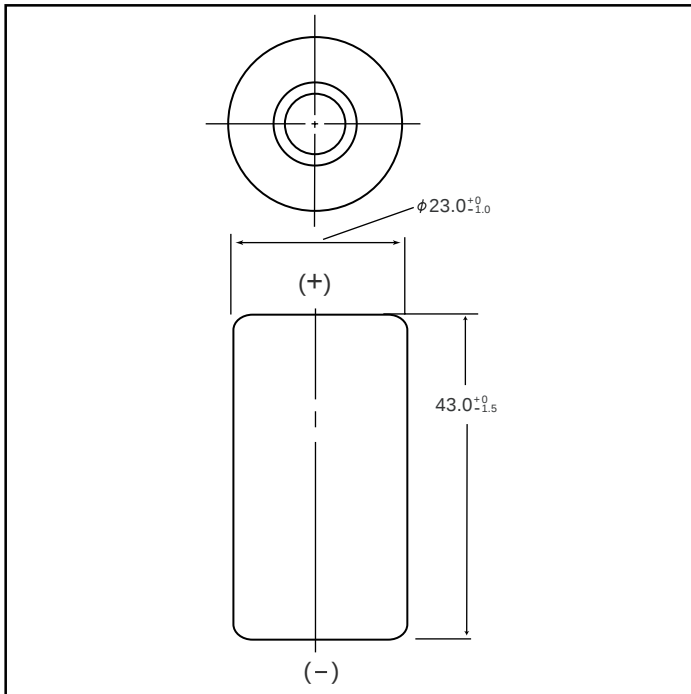
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR250SCH Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-1.0 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 55          | 1.94         |

|                                                        |           |                      |                                   |               |
|--------------------------------------------------------|-----------|----------------------|-----------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                              |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 2650 mAh                          |               |
|                                                        |           | Rated (Min.)         | 2500 mAh                          |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 5mΩ                               |               |
| Charge                                                 |           | Standard             | 250mA x 16hrs.                    |               |
|                                                        |           | Rapid <sup>3</sup>   | 1250mA x 2.4 hrs. <sup>4</sup>    |               |
|                                                        |           | Low Rate             | 125mA x 32 hrs.<br>83mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                                | °F            |
|                                                        |           |                      | -10°C to 60°C                     | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                     | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                     | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                     | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                     | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                     | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                     | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

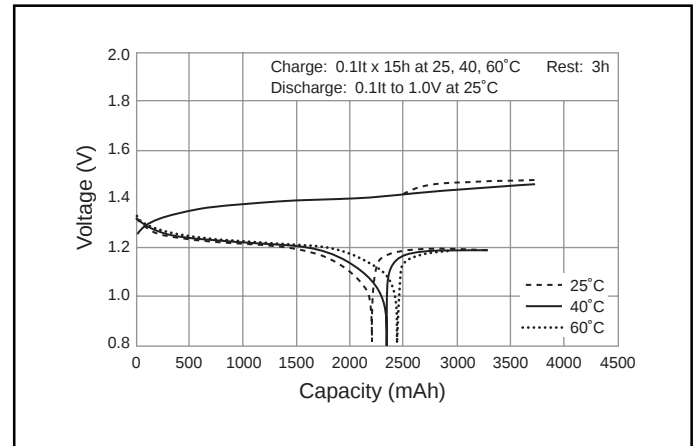
Rapid charger timer; 2.4h (at 1.25A)

Trickle timer; within 2h

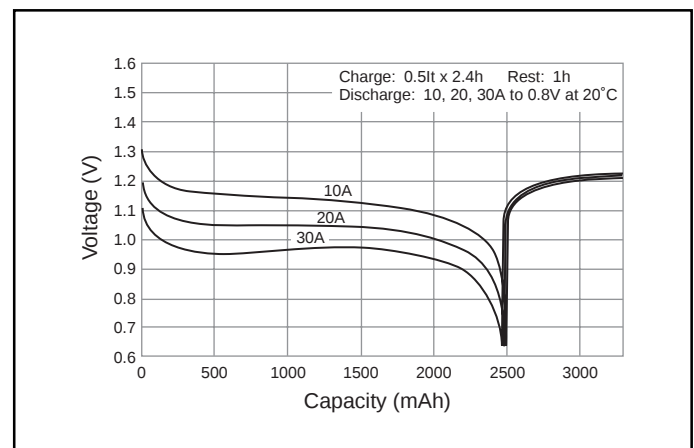
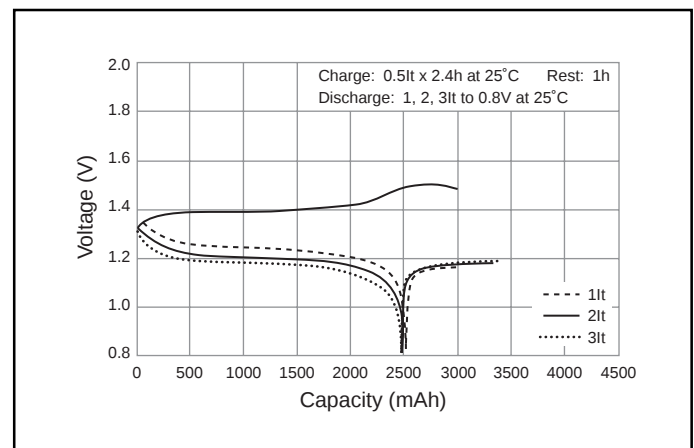
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$It(A) = C_n (Ah)/1h$

\* [It] is the reference test current in amperes

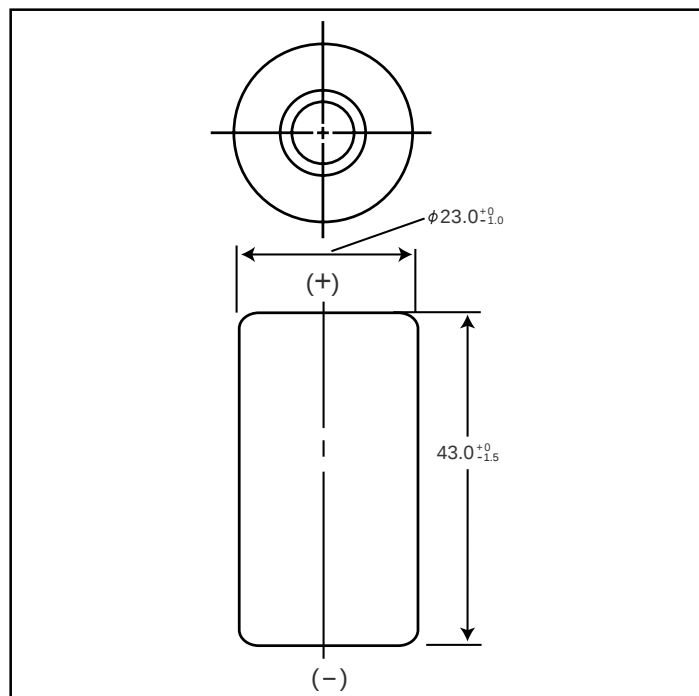
\* [C<sub>n</sub>] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR260SCP Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-1.0 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 55          | 1.94         |

|                                                        |           |                      |                   |               |
|--------------------------------------------------------|-----------|----------------------|-------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V              |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 2600 mAh          |               |
|                                                        |           | Rated (Min.)         | 2450 mAh          |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 5mΩ               |               |
| Charge                                                 |           | Standard             | 260mA x 16hrs.    |               |
|                                                        |           | Rapid                | 2600mA x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                | °F            |
|                                                        |           |                      | 0°C to 45°C       | 32°F to 113°F |
|                                                        |           | Rapid                | 10°C to 40°C      | 50°F to 104°F |
|                                                        | Discharge |                      | -10°C to 65°C     | 14°F to 149°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C     | -4°F to 95°F  |
|                                                        |           | < 3 months           | -20°C to 45°C     | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C     | -4°F to 131°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

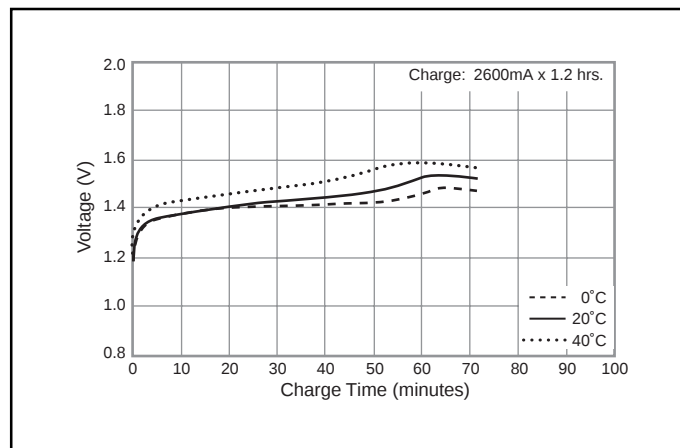
$$It(A) = Cn(Ah)/1h$$

\* [It] is the reference test current in amperes

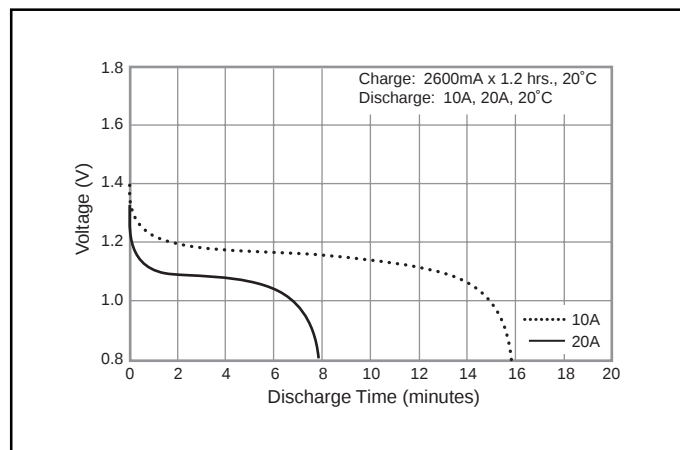
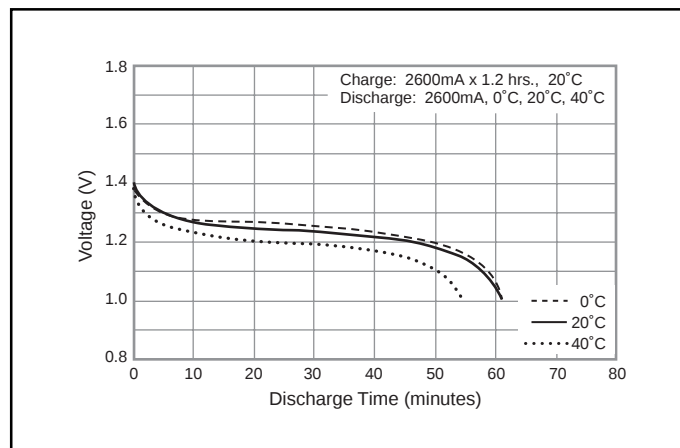
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



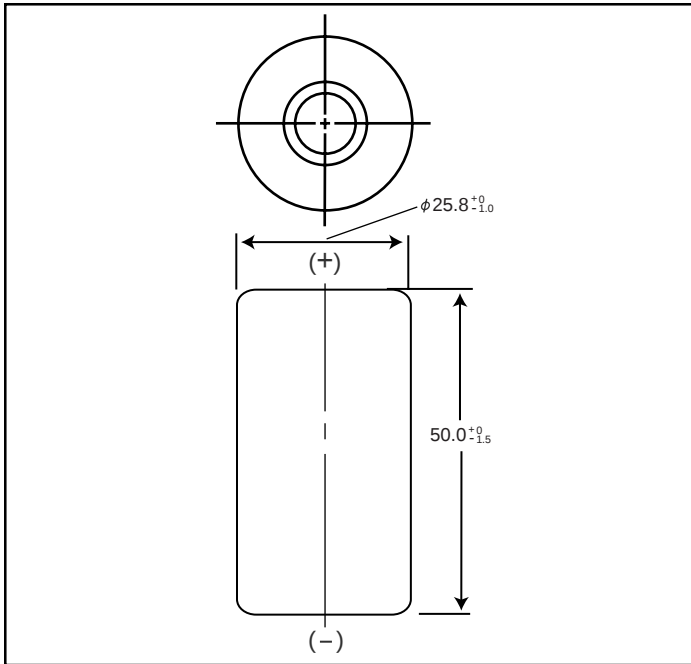
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR300CH Cylindrical C size (HR 26/50) for backup use

### Dimensions (with Tube) (mm)



### Specifications

|                           | mm           | inch          |
|---------------------------|--------------|---------------|
| <b>Diameter</b>           | 25.8+0/-1.0  | 1.02+0/-0.04  |
| <b>Height</b>             | 50.0+0/-1.5  | 1.97+0/-0.06  |
| <b>Approximate Weight</b> | <b>Grams</b> | <b>Ounces</b> |
|                           | 80           | 2.82          |

|                                                        |                      |                                      |               |               |
|--------------------------------------------------------|----------------------|--------------------------------------|---------------|---------------|
| Nominal Voltage                                        |                      | 1.2V                                 |               |               |
| Discharge Capacity <sup>1</sup>                        | Average <sup>2</sup> | 3300 mAh                             |               |               |
|                                                        | Rated (Min.)         | 3100 mAh                             |               |               |
| Approx. Internal impedance at 1000Hz at charged state. |                      | 5mΩ                                  |               |               |
| Charge                                                 | Standard             | 300mA (0.1It) x 16hrs.               |               |               |
|                                                        | Rapid <sup>3</sup>   | 1500mA (1It) x 2.4 hrs. <sup>4</sup> |               |               |
|                                                        | Low Rate             | 155mA x 32 hrs.<br>100mA x 48 hrs.   |               |               |
| Ambient Temperature                                    | Charge               | Standard                             | °C            | °F            |
|                                                        |                      |                                      | 0°C to 45°C   | 32°F to 113°F |
|                                                        |                      | Rapid                                | 10°C to 40°C  | 32°F to 104°F |
|                                                        |                      | Low Rate                             | -10°C to 45°C | 14°F to 149°F |
|                                                        | Discharge            |                                      | -10°C to 65°C | 14°F to 113°F |
|                                                        | Storage              | < 1 year                             | -20°C to 35°C | -4°F to 95°F  |
|                                                        |                      | < 3 months                           | -20°C to 35°C | -4°F to 95°F  |
|                                                        |                      | < 1 month                            | -20°C to 55°C | -4°F to 131°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

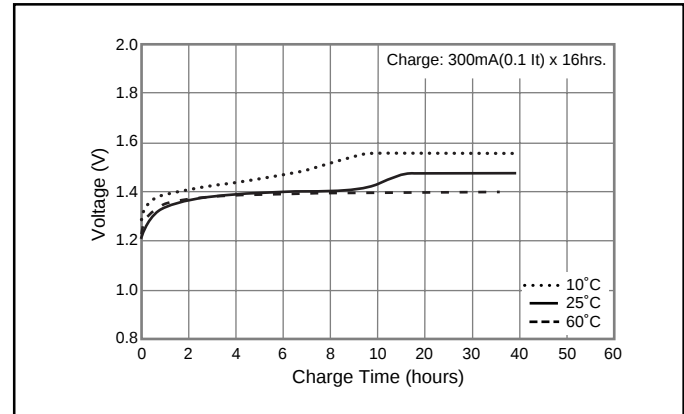
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

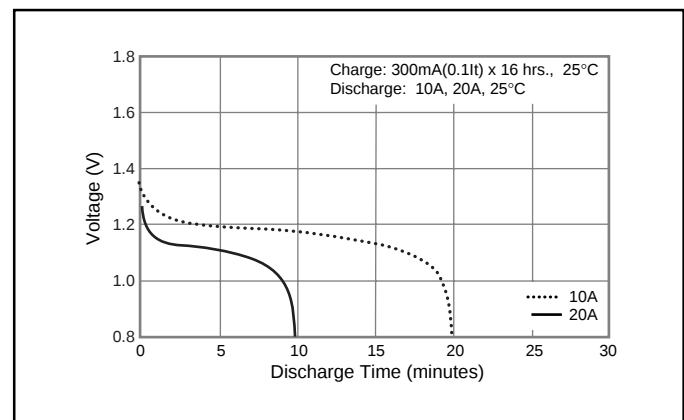
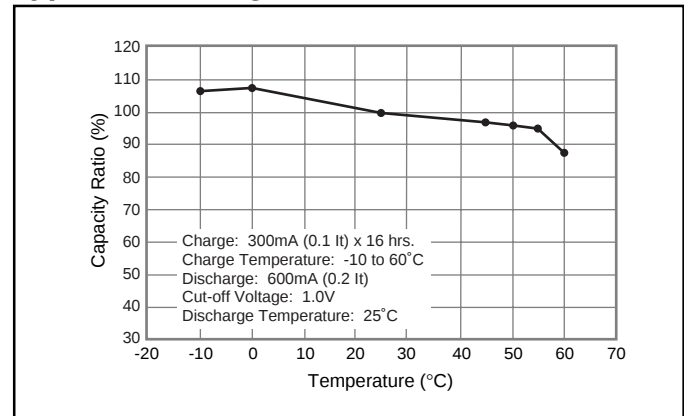
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = C_n (Ah)/1h.$$

• [It] is the reference test current in amperes

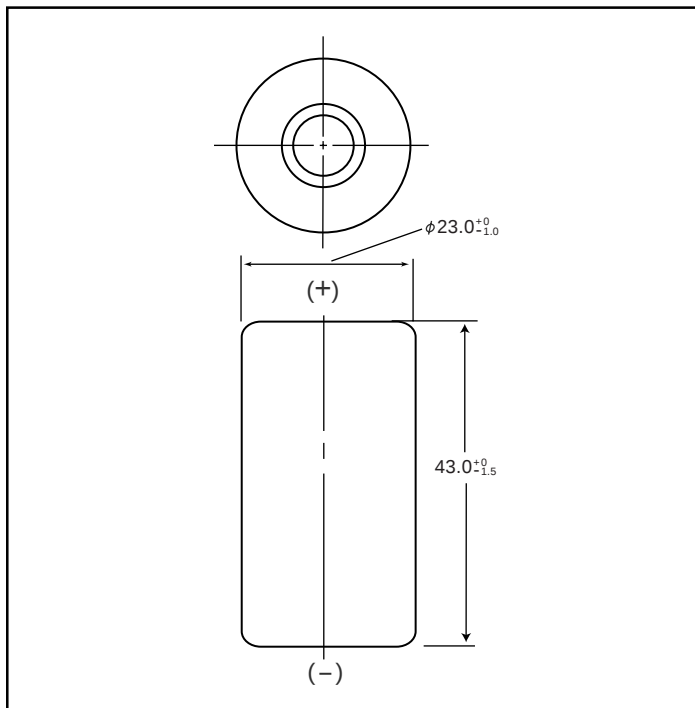
• [C<sub>n</sub>] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR300SCP Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-0.1 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 57          | 2.01         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 3050 mAh                |               |
|                                                        | Rated (Min.) | 2800 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 4mΩ                     |               |
| Charge                                                 | Standard     | 300mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 3000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | °C            |
|                                                        |              |                         | °F            |
| Storage                                                | < 2 years    | -20°C to 35°C           | -4°F to 95°F  |
|                                                        | < 6 months   | -20°C to 45°C           | -4°F to 113°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

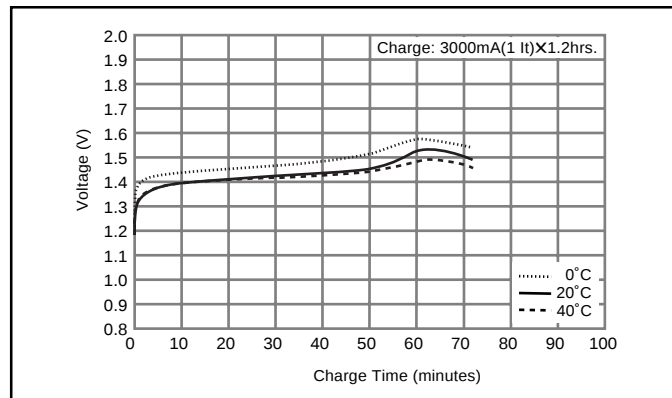
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

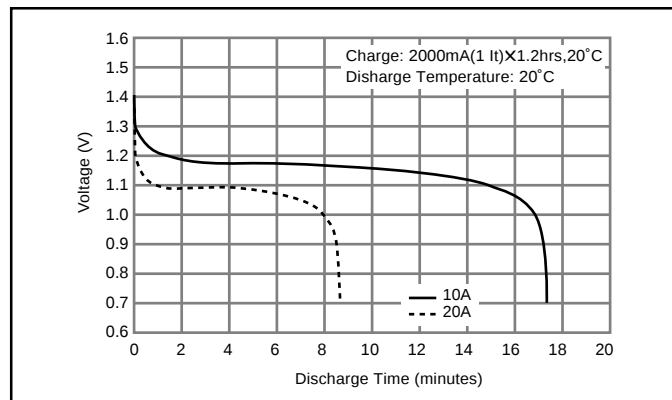
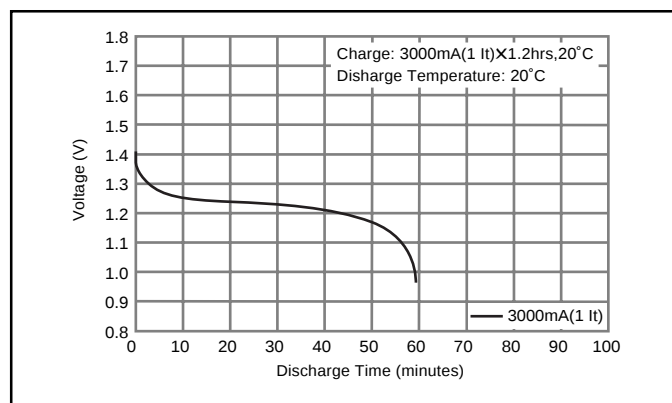
$$It(A) = Cn(Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



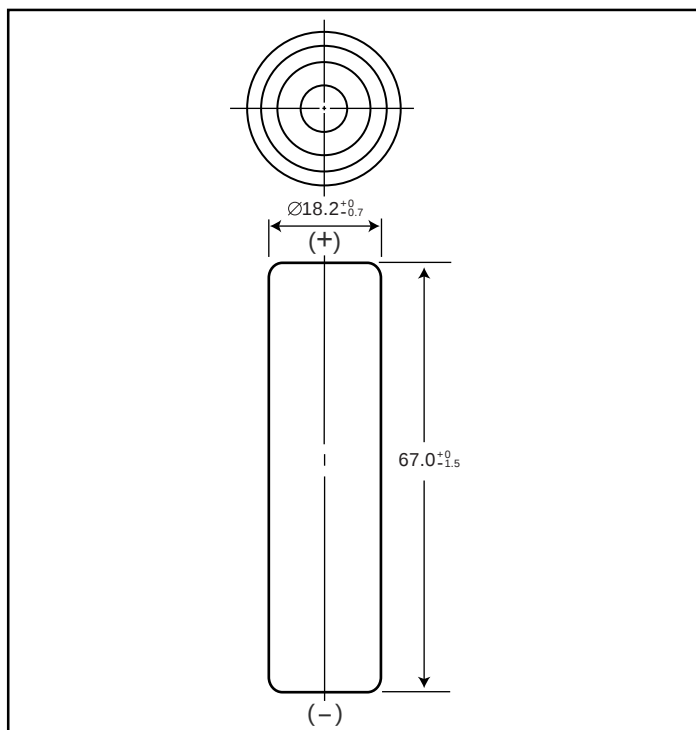
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR330APH Cylindrical L-Fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

|                                                        |           |                      |                                    |               |
|--------------------------------------------------------|-----------|----------------------|------------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                               |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 3300 mAh                           |               |
|                                                        |           | Rated (Min.)         | 3200 mAh                           |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 5.5mΩ                              |               |
| Charge                                                 |           | Standard             | 330mA x 16hrs.                     |               |
|                                                        |           | Rapid <sup>3</sup>   | 1650mA x 2.4 hrs. <sup>4</sup>     |               |
|                                                        |           | Low Rate             | 165mA x 32 hrs.<br>110mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                                 | °F            |
|                                                        |           |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                      | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                      | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                      | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                      | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                      | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

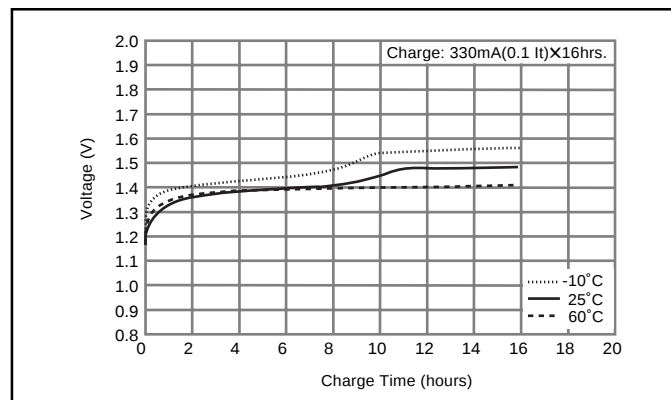
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

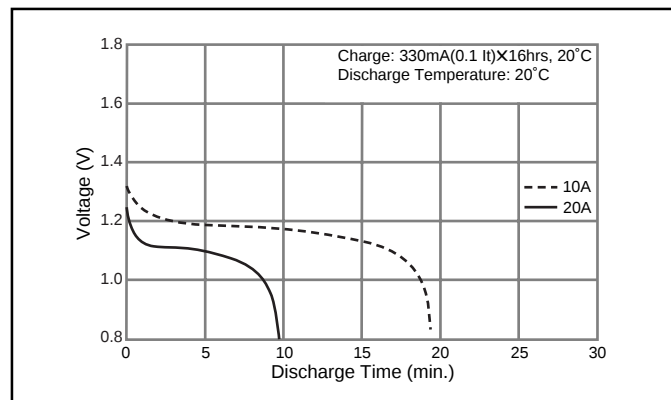
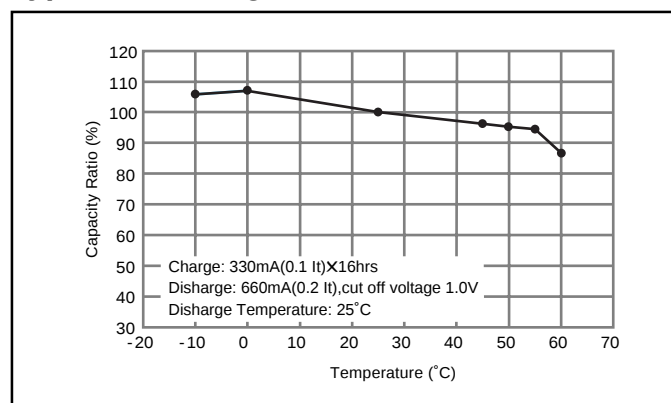
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

• [It] is the reference test current in amperes

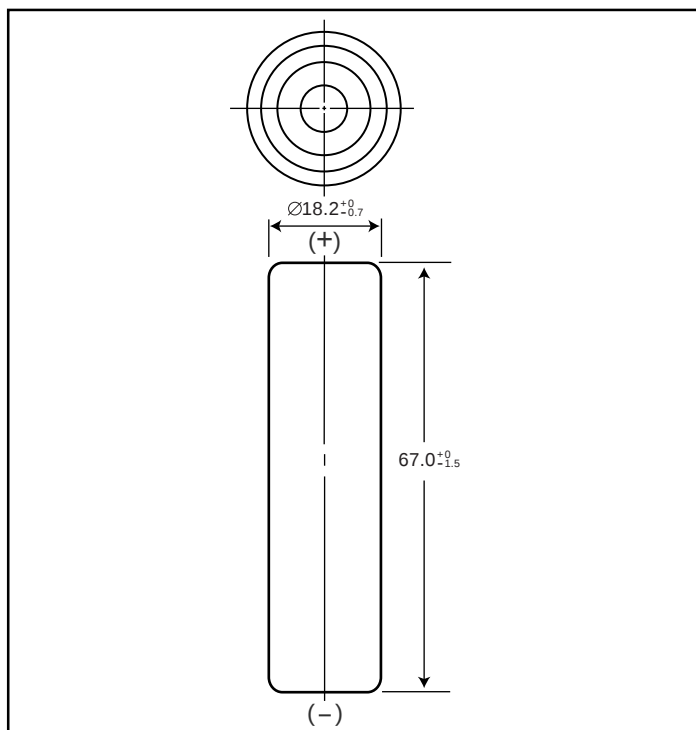
• [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR370AH Cylindrical L-Fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

|                                                        |           |                      |                                    |               |
|--------------------------------------------------------|-----------|----------------------|------------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                               |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 3700 mAh                           |               |
|                                                        |           | Rated (Min.)         | 3500 mAh                           |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 20mΩ                               |               |
| Charge                                                 |           | Standard             | 370mA x 16hrs.                     |               |
|                                                        |           | Rapid <sup>3</sup>   | 1750mA x 2.4 hrs. <sup>4</sup>     |               |
|                                                        |           | Low Rate             | 185mA x 32 hrs.<br>123mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                                 | °F            |
|                                                        |           |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                      | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                      | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                      | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                      | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                      | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

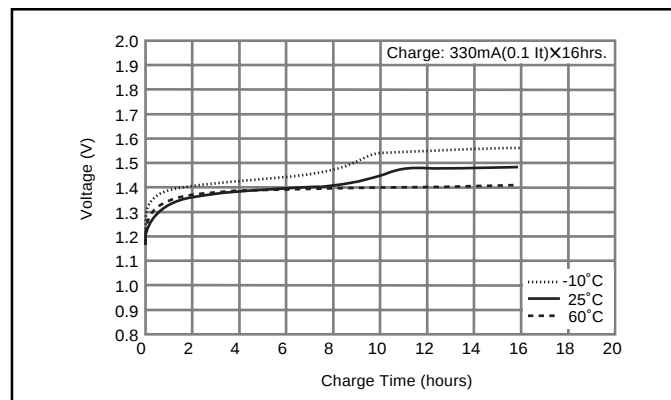
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

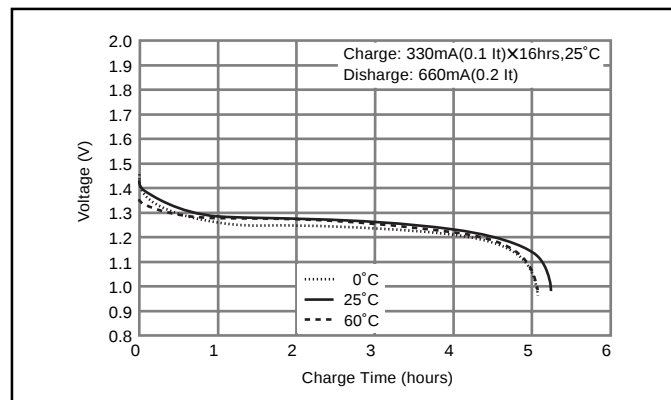
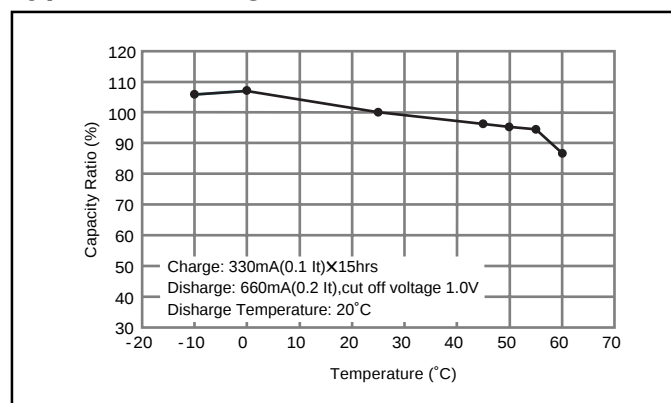
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn (Ah)/1h.$$

• [It] is the reference test current in amperes

• [Cn] is the rated capacity of the cell or battery in Ampere-hours.

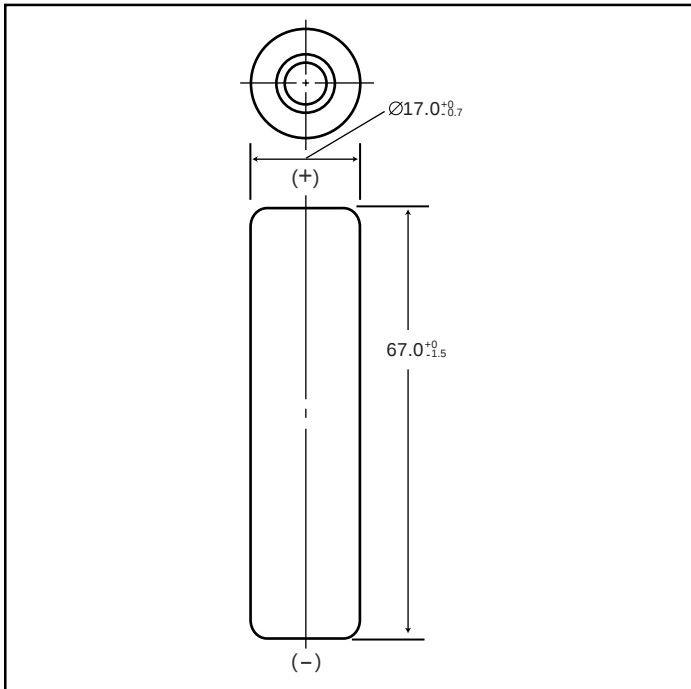
n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

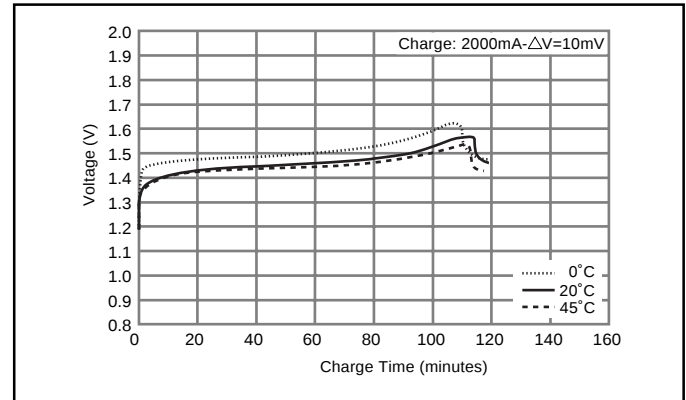
## HHR380A Cylindrical L-A size (HR 17/67)

### Dimensions (with Tube)

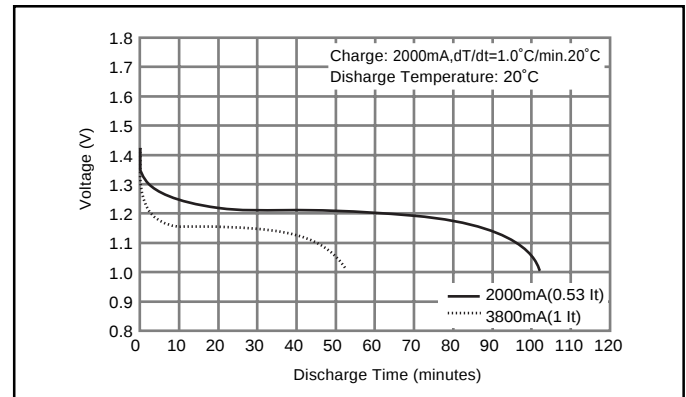
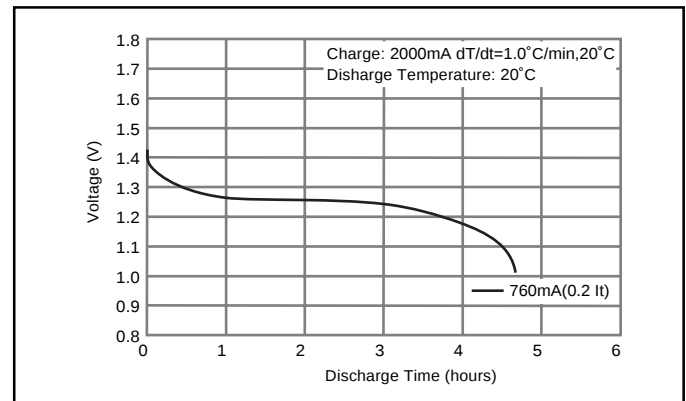
(mm)



### Typical Charge Characteristics



### Typical Discharge Characteristics



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 53          | 1.87         |

|                                                        |              |                        |                    |
|--------------------------------------------------------|--------------|------------------------|--------------------|
| Nominal Voltage                                        |              | 1.2V                   |                    |
| Discharge Capacity*                                    | Average**    | 3800 mAh               |                    |
|                                                        | Rated (Min.) | 3700 mAh               |                    |
| Approx. Internal impedance at 1000Hz at charged state. |              | 25m $\Omega$           |                    |
| Charge                                                 | Standard     | 370mA (0.1It) x 16hrs. |                    |
|                                                        | Rapid***     | 2000mA $dT/dt$         |                    |
| Ambient Temperature                                    | Charge       | Standard               | $^{\circ}\text{C}$ |
|                                                        |              |                        | $^{\circ}\text{F}$ |
|                                                        | Rapid        |                        | $^{\circ}\text{C}$ |
|                                                        |              |                        | $^{\circ}\text{F}$ |
|                                                        | Discharge    |                        | $^{\circ}\text{C}$ |
|                                                        |              |                        | $^{\circ}\text{F}$ |
| Storage                                                | < 1 year     |                        | $^{\circ}\text{C}$ |
|                                                        | < 3 months   |                        | $^{\circ}\text{C}$ |
|                                                        | < 1 month    |                        | $^{\circ}\text{C}$ |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

\*\*\* For rapid charge: use  $dT/dt$  charge termination method. Refer to the Nickel Metal Hydride "Charge Methods" section for further details. Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

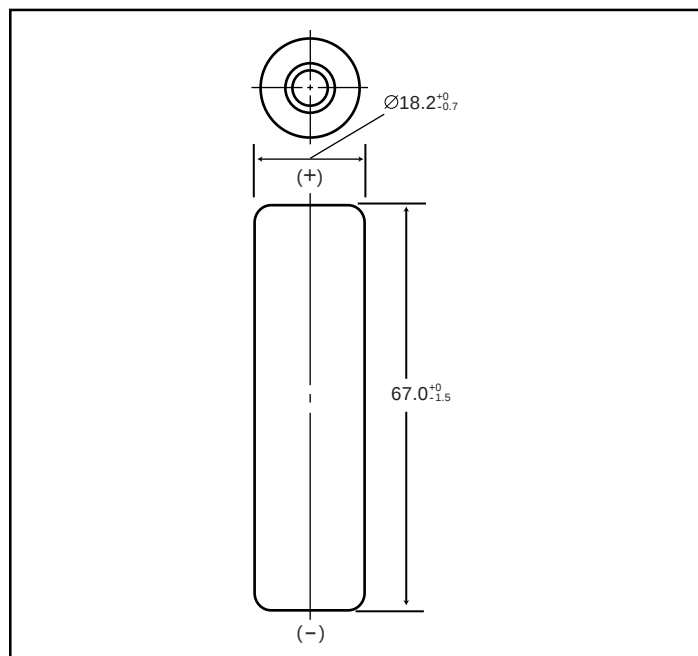
$$It(A) = C_n (Ah)/1h.$$

- [It] is the reference test current in amperes
- [C<sub>n</sub>] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR450A Cylindrical L-fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

|                                                        |              |                        |               |
|--------------------------------------------------------|--------------|------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                   |               |
| Discharge Capacity*                                    | Average**    | 4500 mAh               |               |
|                                                        | Rated (Min.) | 4200 mAh               |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 25mΩ                   |               |
| Charge                                                 | Standard     | 420mA (0.1It) x 16hrs. |               |
|                                                        | Rapid***     | 2000mA dT/dt           |               |
| Ambient Temperature                                    | Charge       | Standard               | °C            |
|                                                        |              |                        | °F            |
|                                                        | Rapid        |                        | °C            |
|                                                        |              |                        | °F            |
|                                                        | Discharge    |                        | °C            |
|                                                        |              |                        | °F            |
| Storage                                                | < 1 year     | -20°C to 35°C          | -4°F to 95°F  |
|                                                        | < 3 months   | -20°C to 45°C          | -4°F to 113°F |
|                                                        | < 1 month    | -20°C to 55°C          | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

\*\*\* For rapid charge: use dT/dt charge termination method. Refer to the Nickel Metal Hydride "Charge Methods" section for further details.

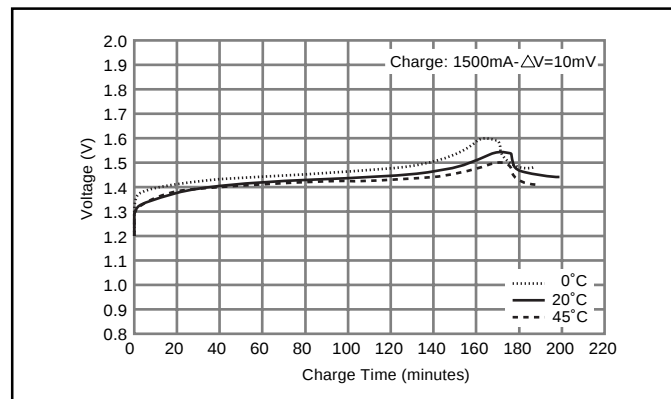
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

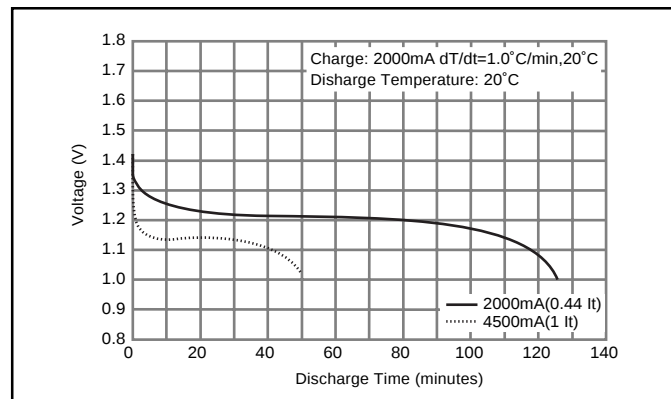
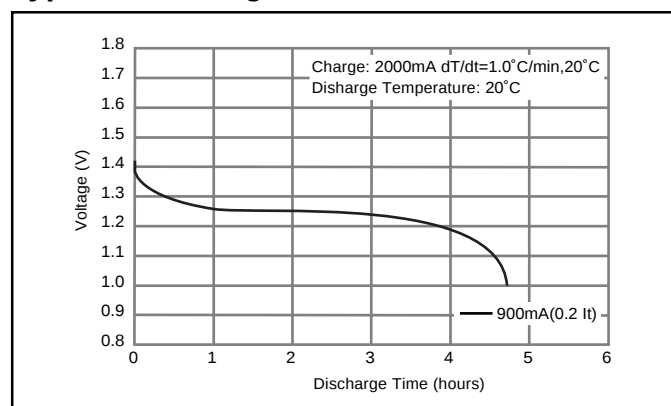
$$It(A) = Cn (Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



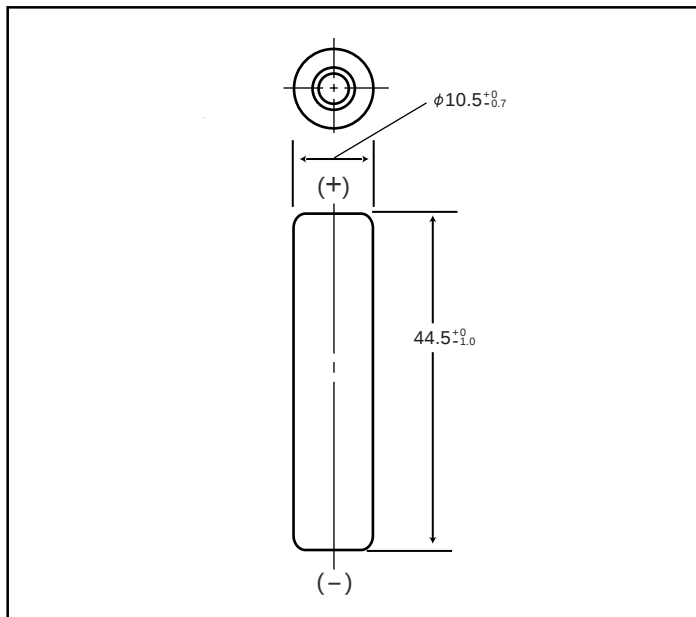
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR60AAAH Cylindrical AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm           | inch          |
|--------------------|--------------|---------------|
| Diameter           | 10.5 +0/-0.7 | 0.41 +0/-0.03 |
| Height             | 44.5 +0/-1.0 | 1.75 +0/-0.04 |
| Approximate Weight | Grams        | Ounces        |
|                    | 13           | 0.46          |

|                                                        |           |                      |                                  |               |
|--------------------------------------------------------|-----------|----------------------|----------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                             |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 550 mAh                          |               |
|                                                        |           | Rated (Min.)         | 500 mAh                          |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 35mΩ                             |               |
| Charge                                                 |           | Standard             | 50mA x 16hrs.                    |               |
|                                                        |           | Rapid <sup>3</sup>   | 250mA x 2.4 hrs. <sup>4</sup>    |               |
|                                                        |           | Low Rate             | 25mA x 32 hrs.<br>17mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                               | °F            |
|                                                        |           |                      | -10°C to 60°C                    | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                    | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                    | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                    | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                    | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                    | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                    | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

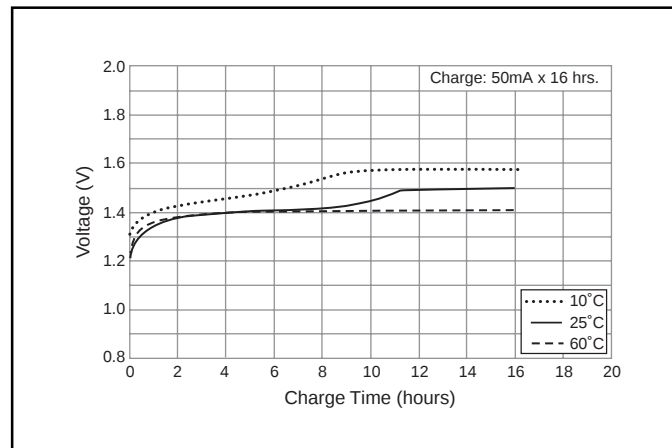
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

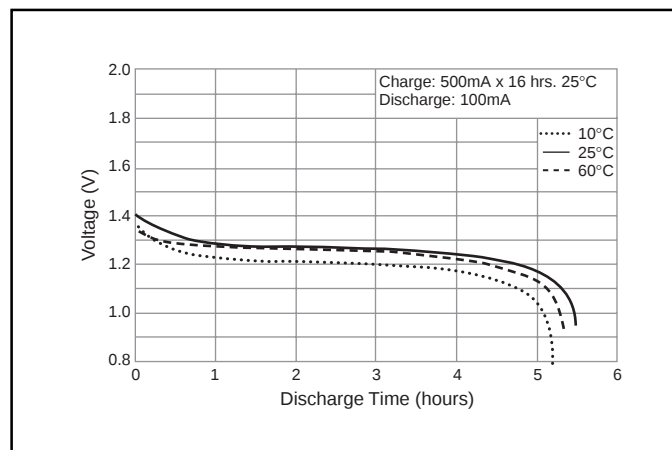
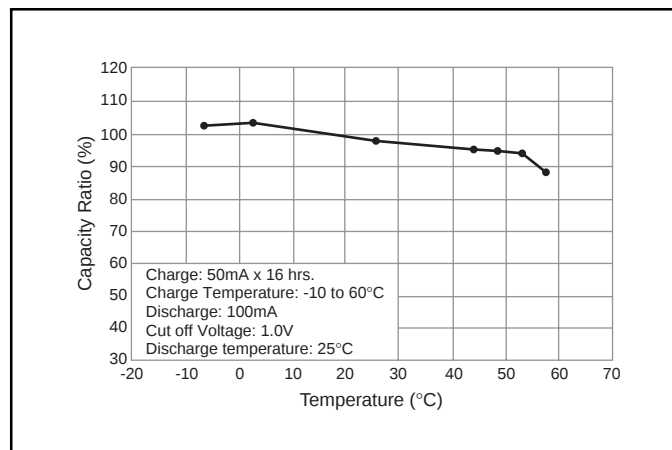
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn (Ah)/1h$$

\* [It] is the reference test current in amperes

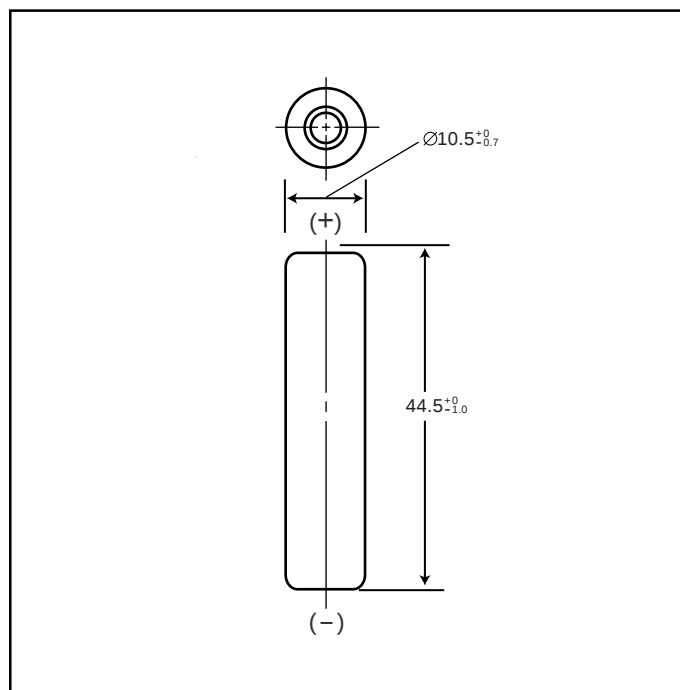
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR70AAAJ Cylindrical HR AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 10.5+0/-0.7 | 0.41+0/-0.03 |
| Height             | 44.5+0/-1.0 | 1.75+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 13          | 0.46         |

|                                                        |              |                        |               |
|--------------------------------------------------------|--------------|------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                   |               |
| Discharge Capacity*                                    | Average**    | 720 mAh                |               |
|                                                        | Rated (Min.) | 700 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 30mΩ                   |               |
| Charge                                                 | Standard     | 70mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 650mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard               | °C            |
|                                                        |              |                        | °F            |
|                                                        | Rapid        |                        | °C            |
|                                                        |              |                        | °F            |
|                                                        | Discharge    |                        | °C            |
|                                                        |              |                        | °F            |
| Storage                                                | < 1 year     |                        | -20°C to 35°C |
|                                                        | < 3 months   |                        | -20°C to 45°C |
|                                                        | < 1 month    |                        | -20°C to 55°C |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

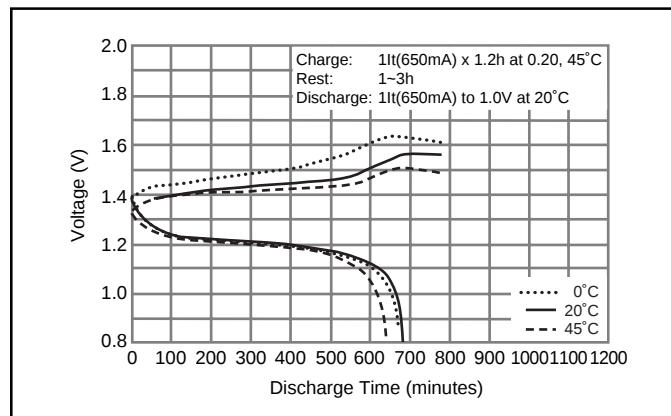
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

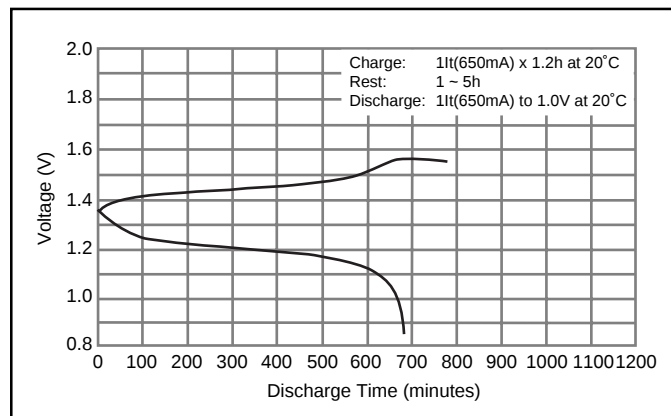
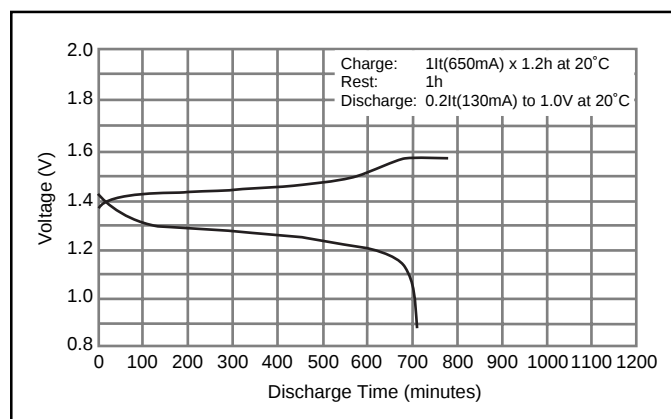
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



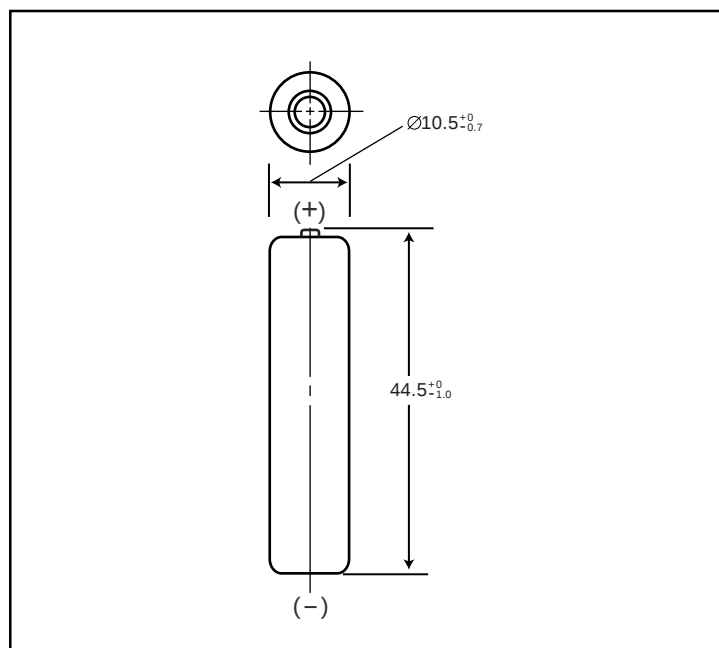
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR75AAA/B Cylindrical AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 10.5+0/-0.7 | 0.41+0/-0.03 |
| Height             | 44.5+0/-1.0 | 1.75+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 12          | 0.42         |

|                                                        |              |                  |               |
|--------------------------------------------------------|--------------|------------------|---------------|
| Nominal Voltage                                        |              | 1.2V             |               |
| Discharge Capacity*                                    | Average**    | 730 mAh          |               |
|                                                        | Rated (Min.) | 700 mAh          |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 35mΩ             |               |
| Charge                                                 | Standard     | 70mA x 16hrs.    |               |
|                                                        | Rapid        | 450mA x 1.7 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard         | °C            |
|                                                        |              |                  | °F            |
|                                                        | Rapid        |                  | 0°C to 45°C   |
|                                                        |              |                  | 32°F to 113°F |
|                                                        | Discharge    |                  | 0°C to 40°C   |
|                                                        |              |                  | 32°F to 104°F |
| Storage                                                | Storage      | < 1 year         | -10°C to 65°C |
|                                                        |              | < 3 months       | 14°F to 149°F |
|                                                        |              | < 1 month        | -20°C to 35°C |
|                                                        |              |                  | -4°F to 95°F  |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

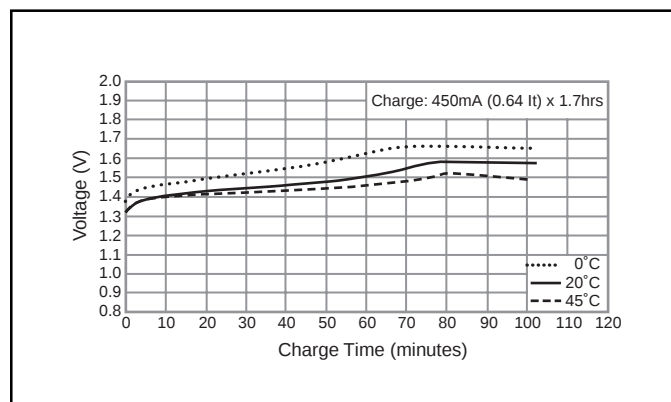
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

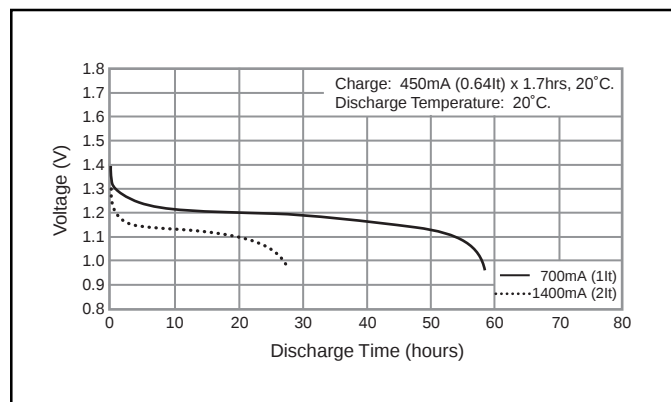
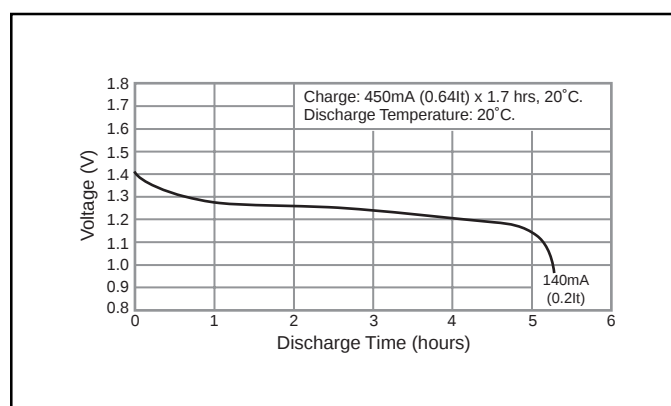
$$It(A) = Cn(Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



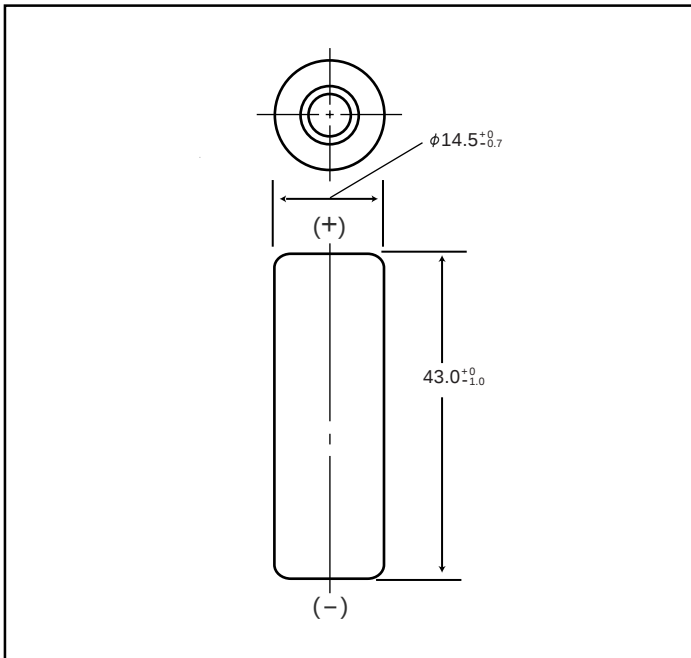
### Typical Discharge Characteristics



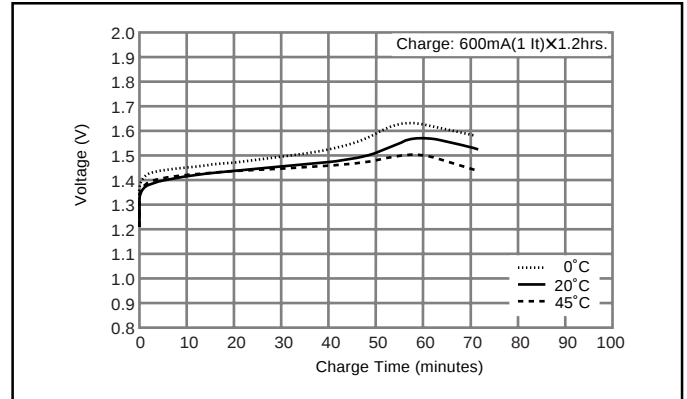
# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR120AA Cylindrical 4/5AA size (HR 15/43)

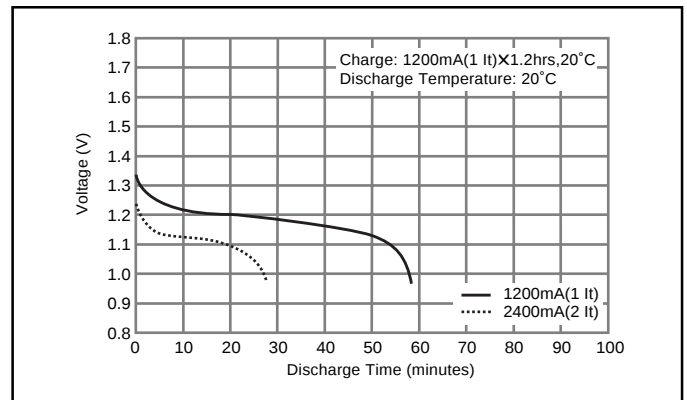
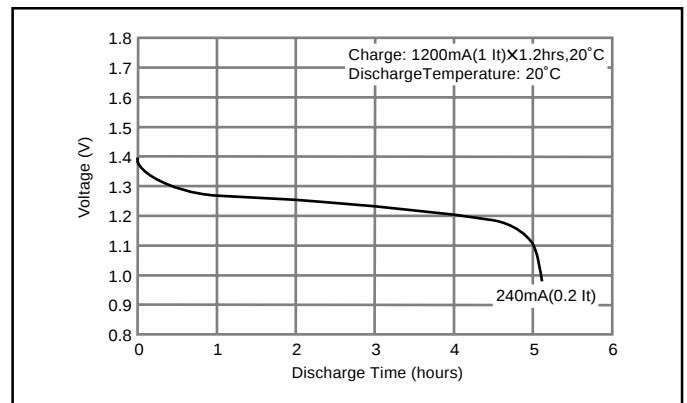
### Dimensions (with Tube) (mm)



### Typical Charge Characteristics



### Typical Discharge Characteristics



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 14.5+0/-0.7 | 0.57+0/-0.03 |
| Height             | 43.0+0/-1.0 | 1.69+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 23          | 0.81         |

|                                                        |              |            |                         |               |
|--------------------------------------------------------|--------------|------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V       |                         |               |
| Discharge Capacity*                                    | Average**    | 1220 mAh   |                         |               |
|                                                        | Rated (Min.) | 1150 mAh   |                         |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 19mΩ       |                         |               |
| Charge                                                 |              | Standard   | 120mA (0.1It) x 16hrs.  |               |
|                                                        |              | Rapid      | 1200mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard   | °C                      | °F            |
|                                                        |              |            | 0°C to 45°C             | 32°F to 113°F |
|                                                        |              | Rapid      | 0°C to 40°C             | 32°F to 104°F |
|                                                        | Discharge    |            | -10°C to 65°C           | 14°F to 149°F |
|                                                        | Storage      | < 1 year   | -20°C to 35°C           | -4°F to 95°F  |
|                                                        |              | < 3 months | -20°C to 45°C           | -4°F to 113°F |
|                                                        |              | < 1 month  | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

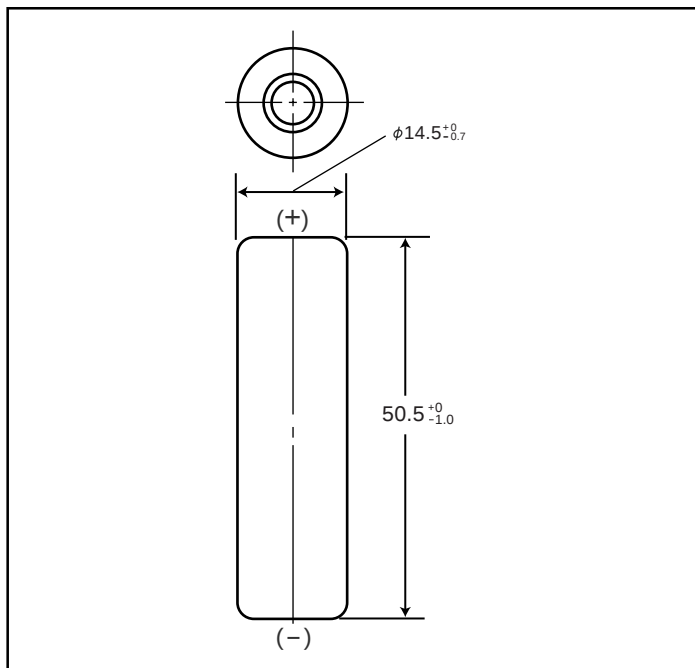
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.  
n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR150AA Cylindrical AA size (HR 15/51)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 14.5+0/-0.7 | 0.57+0/-0.03 |
| Height             | 50.0+0/-1.0 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 26          | 0.92         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 1580 mAh                |               |
|                                                        | Rated (Min.) | 1500 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 20mΩ                    |               |
| Charge                                                 | Standard     | 150mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 1500mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | °C            |
|                                                        |              |                         | °F            |
| Storage                                                | < 1 year     | -20°C to 35°C           | -4°F to 95°F  |
|                                                        | < 3 months   | -20°C to 45°C           | -4°F to 113°F |
|                                                        | < 1 month    | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

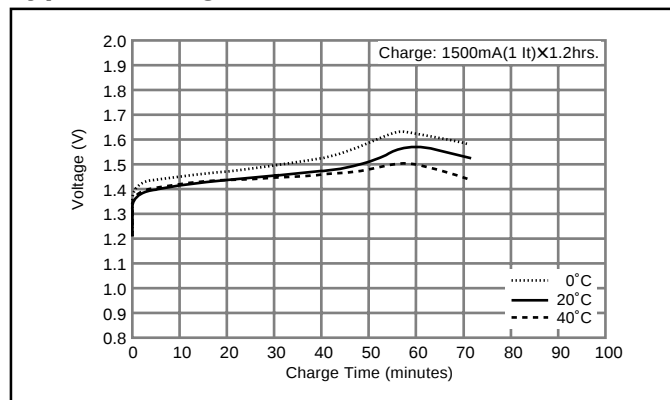
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

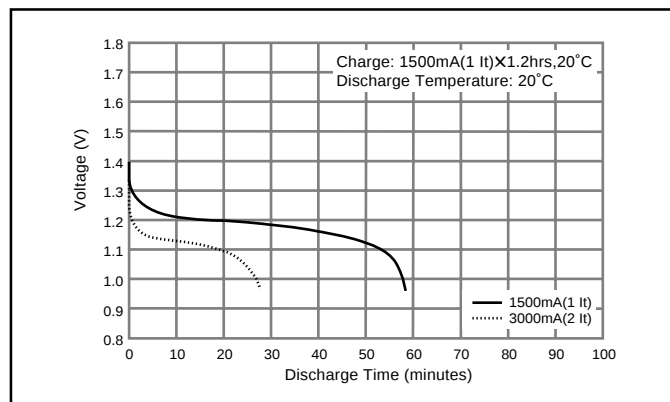
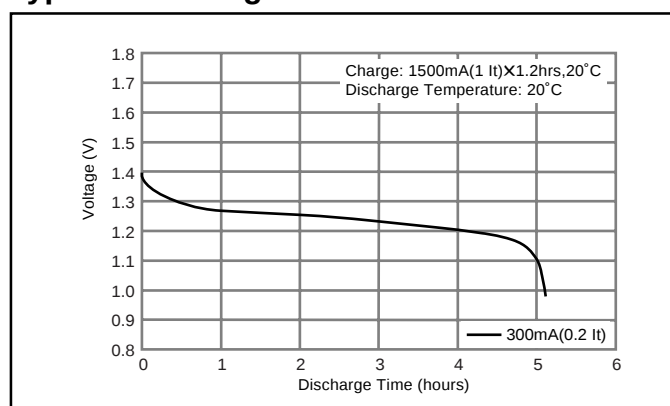
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn (Ah)/1h.$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



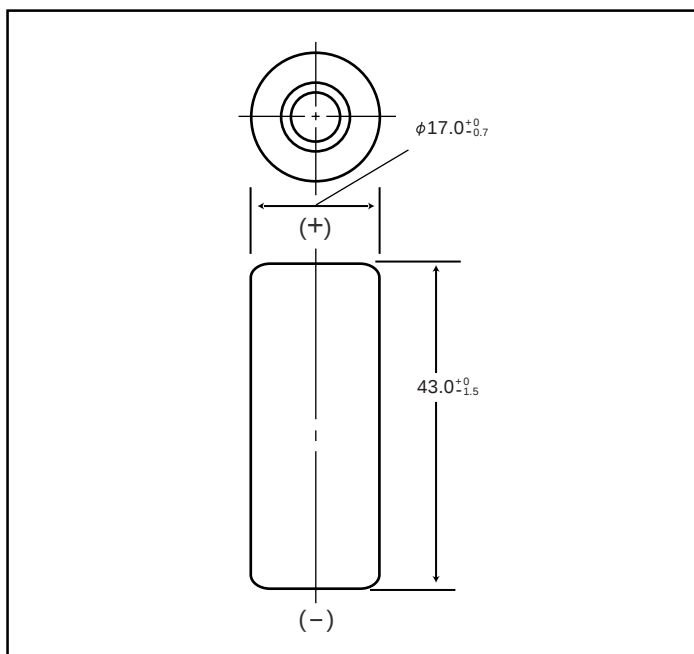
### Typical Discharge Characteristics



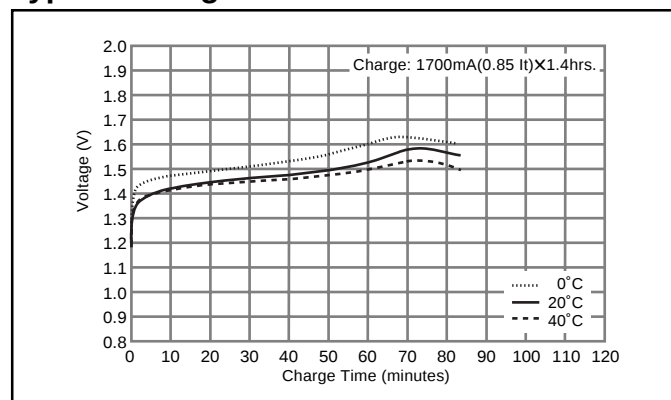
# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR200A Cylindrical 4/5A size (HR 17/43)

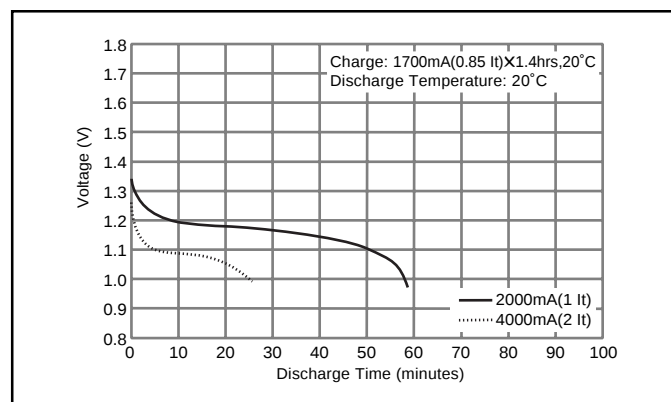
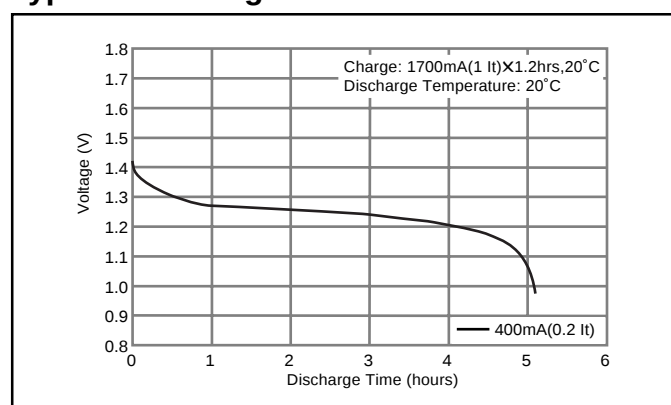
### Dimensions (with Tube) (mm)



### Typical Charge Characteristics



### Typical Discharge Characteristics



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 32          | 1.13         |

|                                                        |              |            |                         |               |
|--------------------------------------------------------|--------------|------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V       |                         |               |
| Discharge Capacity*                                    | Average**    | 2040 mAh   |                         |               |
|                                                        | Rated (Min.) | 2000 mAh   |                         |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 20mΩ       |                         |               |
| Charge                                                 |              | Standard   | 200mA (0.1It) x 16hrs.  |               |
|                                                        |              | Rapid      | 2000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard   | °C                      | °F            |
|                                                        |              |            | 0°C to 45°C             | 32°F to 113°F |
|                                                        |              | Rapid      | 0°C to 40°C             | 32°F to 104°F |
|                                                        | Discharge    |            | -10°C to 65°C           | 14°F to 149°F |
|                                                        | Storage      | < 1 year   | -20°C to 35°C           | -4°F to 95°F  |
|                                                        |              | < 3 months | -20°C to 45°C           | -4°F to 113°F |
|                                                        |              | < 1 month  | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

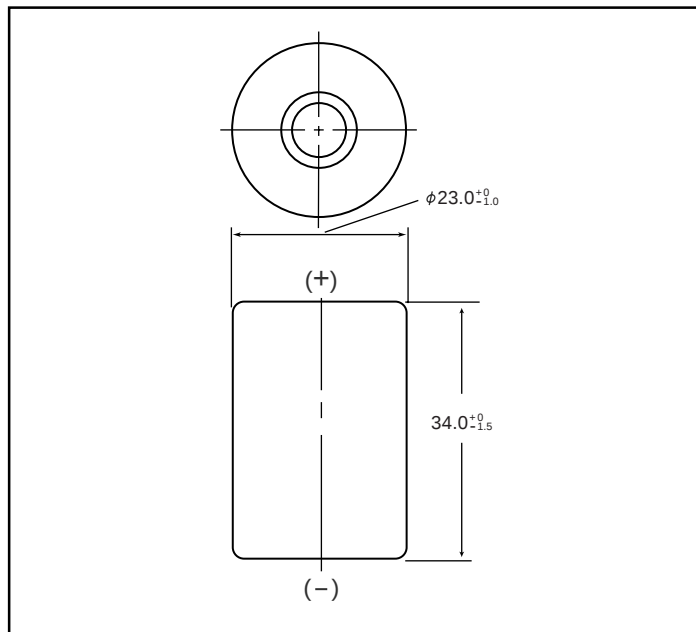
$It(A) = Cn (Ah)/1h.$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR200SCP Cylindrical 4/5SC size (HR 23/34)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-0.1 | 0.91+0/-0.04 |
| Height             | 34.0+0/-1.5 | 1.34+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 42          | 1.48         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 2100 mAh                |               |
|                                                        | Rated (Min.) | 1900 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 5mΩ                     |               |
| Charge                                                 | Standard     | 200mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 2000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | -10°C to 65°C |
|                                                        |              |                         | 14°F to 149°F |
| Storage                                                | < 2 years    |                         | -20°C to 35°C |
|                                                        | < 6 months   |                         | -20°C to 45°C |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

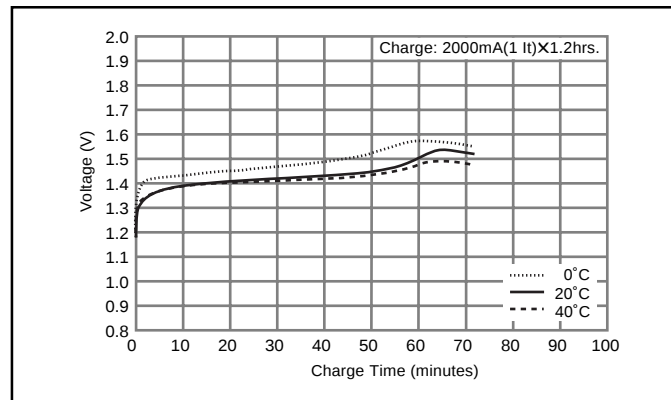
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

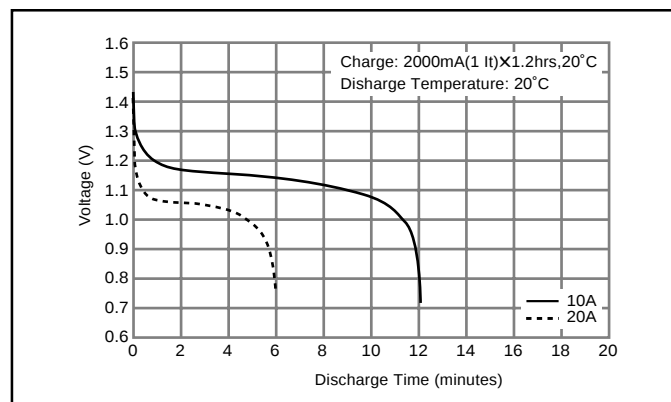
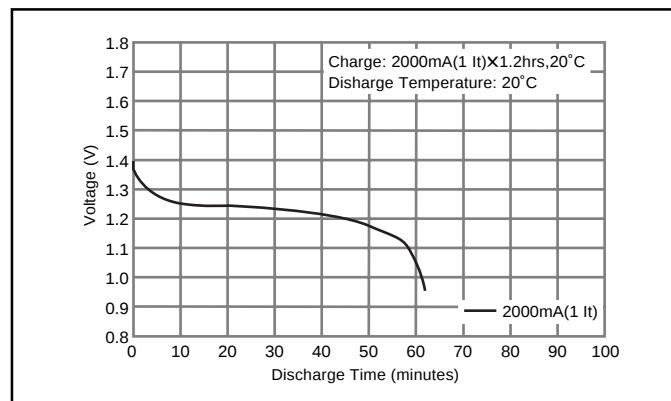
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn(Ah)/1h$ .

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



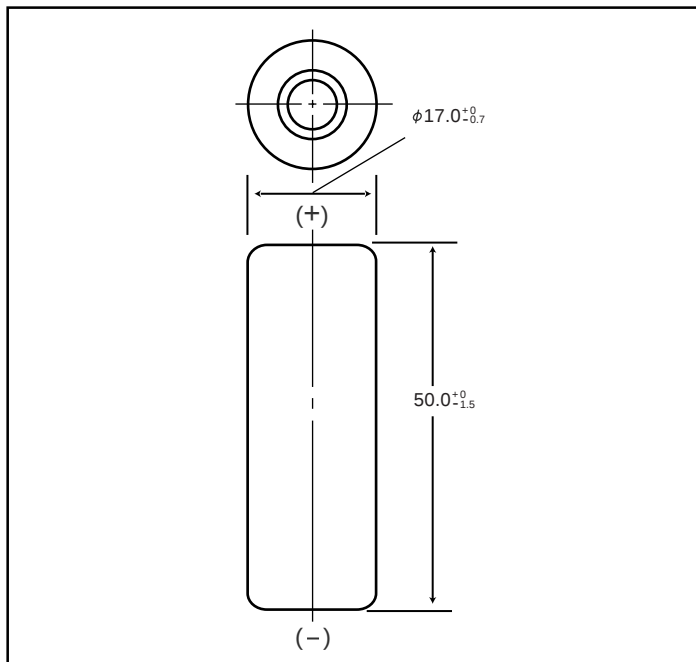
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210A Cylindrical A size (HR 17/50)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 50.0+0/-1.5 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 38          | 1.34         |

|                                                        |           |              |                         |               |
|--------------------------------------------------------|-----------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |           | 1.2V         |                         |               |
| Discharge Capacity*                                    |           | Average**    | 2200 mAh                |               |
|                                                        |           | Rated (Min.) | 2100 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |           | 20mΩ         |                         |               |
| Charge                                                 |           | Standard     | 210mA (0.1It) x 16hrs.  |               |
|                                                        |           | Rapid        | 2100mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard     | °C                      | °F            |
|                                                        |           |              | 0°C to 45°C             | 32°F to 113°F |
|                                                        |           | Rapid        | 0°C to 40°C             | 32°F to 104°F |
|                                                        | Discharge |              | -10°C to 65°C           | 14°F to 149°F |
|                                                        | Storage   | < 1 year     | -20°C to 35°C           | -4°F to 95°F  |
|                                                        |           | < 3 months   | -20°C to 45°C           | -4°F to 113°F |
|                                                        |           | < 1 month    | -20°C to 55°C           | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

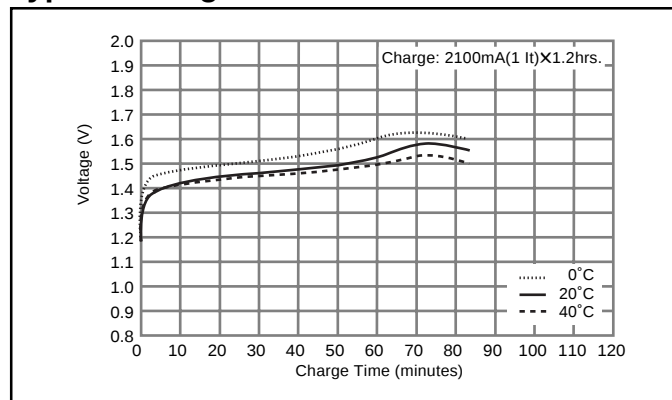
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

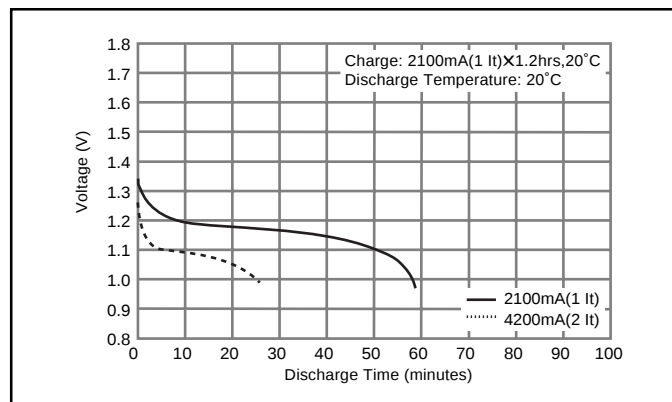
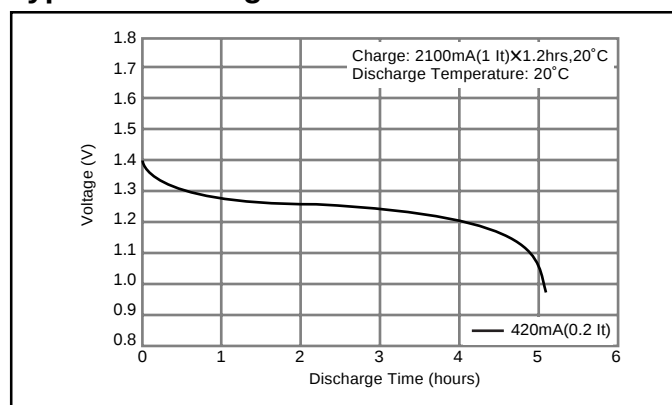
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
 $It(A) = Cn (Ah)/1h.$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



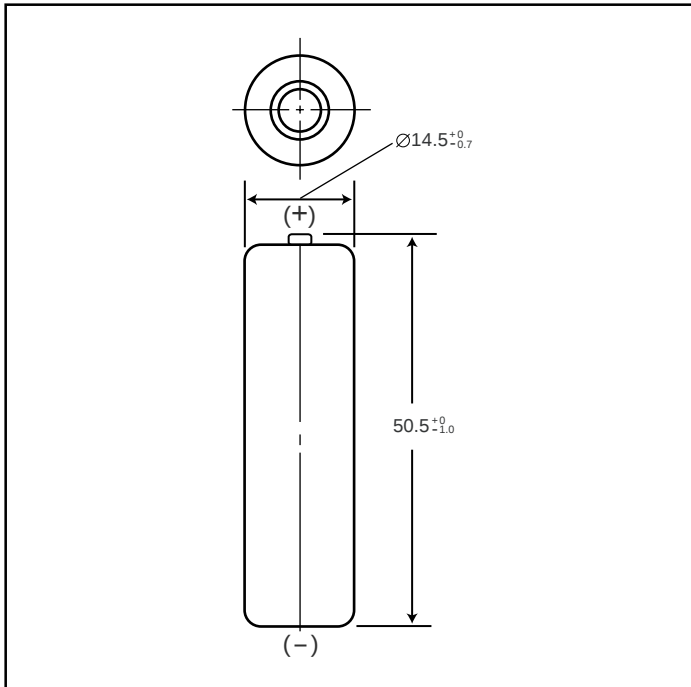
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210AA/B Cylindrical AA size (HR 15/51)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm           | inch         |
|--------------------|--------------|--------------|
| Diameter           | 14.5 +0/-0.7 | 0.57 +0/-0.3 |
| Height             | 50.5 +0/-1.0 | 1.99 +0/-0.5 |
| Approximate Weight | Grams        | Ounces       |
|                    | 29           | 1.02         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 2080mAh                 |               |
|                                                        | Rated (Min.) | 2000mAh                 |               |
| Approx. internal Impedance at 1000Hz at charged state. |              | 25mΩ                    |               |
| Charge                                                 | Standard     | 200mA (0.1It) x 16 hrs. |               |
|                                                        | Rapid        | 1200mA (1It) x 2 hrs.   |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | 0°C to 45°C   |
|                                                        |              |                         | 32°F to 113°F |
|                                                        | Discharge    |                         | 0°C to 40°C   |
|                                                        |              |                         | 32°F to 113°F |
| Storage                                                | Storage      | < 1 year                | -10°C to 65°C |
|                                                        |              |                         | 14°F to 149°F |
|                                                        |              | < 3 months              | -20°C to 35°C |
|                                                        |              |                         | -4°F to 95°F  |
| Storage                                                | Storage      | < 3 months              | -20°C to 45°C |
|                                                        |              |                         | -4°F to 113°F |
|                                                        |              | < 1 month               | -20°C to 55°C |
|                                                        |              |                         | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

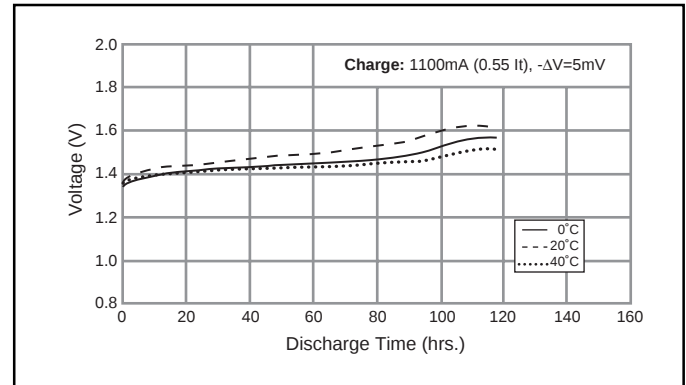
$$It(A) = Cn (Ah)/1h$$

\* [It] is the reference test current in amperes

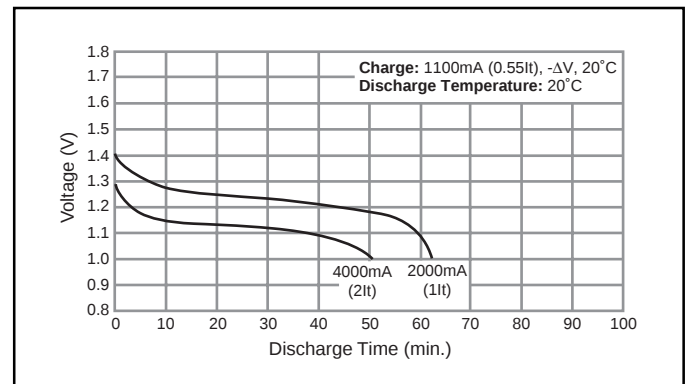
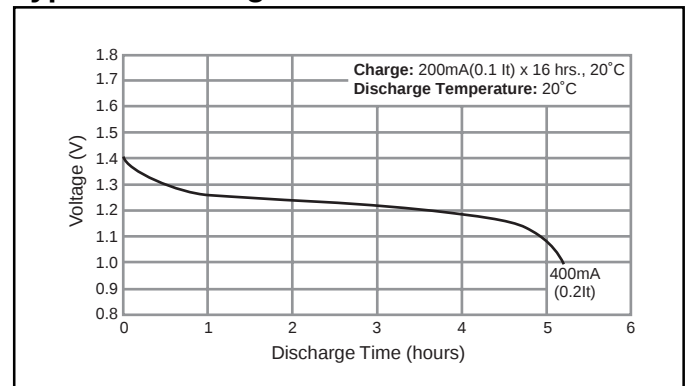
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



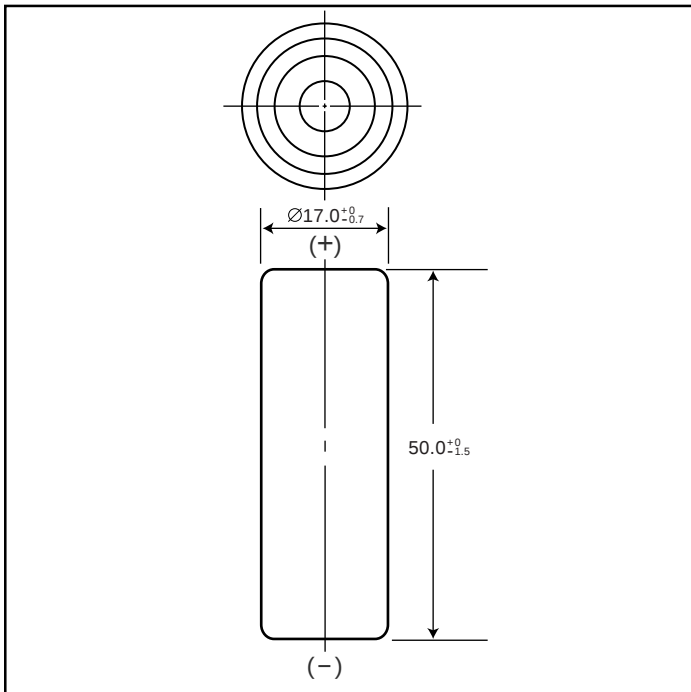
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR210AH Cylindrical A size (HR 17/50)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 50.0+0/-1.5 | 1.97+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 38          | 1.34         |

| Nominal Voltage                                        |                      | 1.2V                    |               |               |
|--------------------------------------------------------|----------------------|-------------------------|---------------|---------------|
| Discharge Capacity <sup>1</sup>                        | Average <sup>2</sup> | 2050mAh                 |               |               |
|                                                        | Rated (Min.)         | 1900mAh                 |               |               |
| Approx. internal Impedance at 1000Hz at charged state. |                      | 20mΩ                    |               |               |
| Charge                                                 | Standard             | 210mA (0.1It) x 16 hrs. |               |               |
|                                                        | Rapid                | -                       |               |               |
| Ambient Temperature                                    | Charge               | Standard                | °C            | °F            |
|                                                        |                      |                         | -10°C to 60°C | 14°F to 140°F |
|                                                        |                      | Rapid                   | -             | -             |
|                                                        | Discharge            |                         | -10°C to 60°C | 14°F to 140°F |
|                                                        | Storage              | < 1 year                | -20°C to 35°C | -4°F to 95°F  |
|                                                        |                      | < 3 months              | -20°C to 45°C | -4°F to 113°F |
|                                                        |                      | < 1 month               | -20°C to 55°C | -4°F to 131°F |
|                                                        |                      | < 1 week                | -20°C to 60°C | -4°F to 140°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

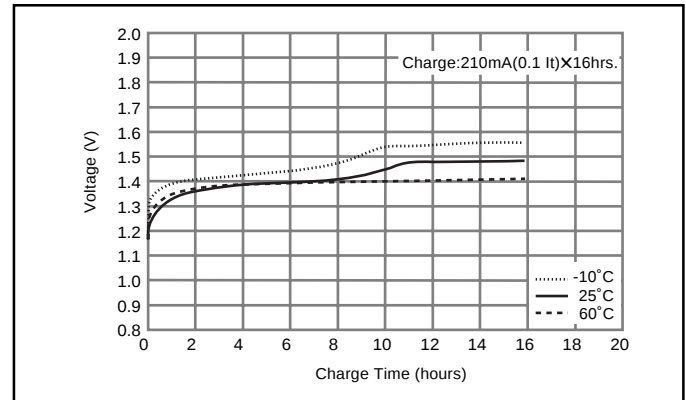
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

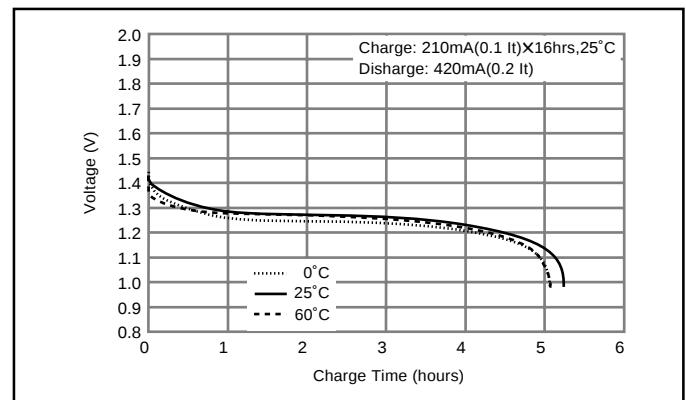
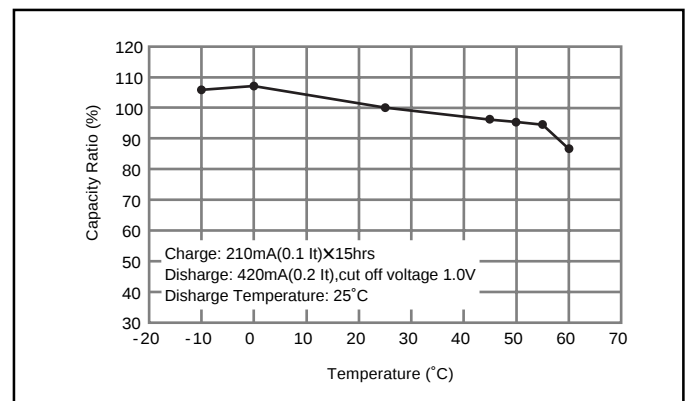
$$It(A) = Cn (Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



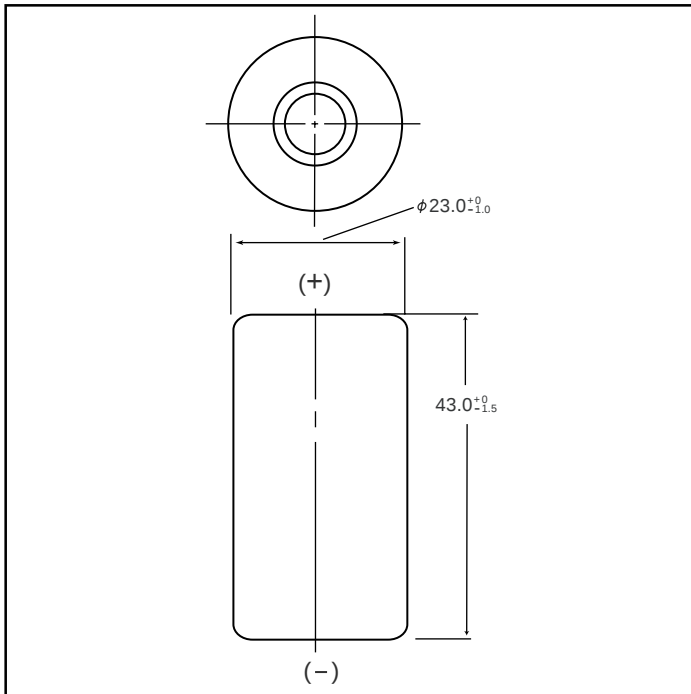
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR250SCH Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-1.0 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 55          | 1.94         |

|                                                        |           |                      |                                   |               |
|--------------------------------------------------------|-----------|----------------------|-----------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                              |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 2650 mAh                          |               |
|                                                        |           | Rated (Min.)         | 2500 mAh                          |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 5mΩ                               |               |
| Charge                                                 |           | Standard             | 250mA x 16hrs.                    |               |
|                                                        |           | Rapid <sup>3</sup>   | 1250mA x 2.4 hrs. <sup>4</sup>    |               |
|                                                        |           | Low Rate             | 125mA x 32 hrs.<br>83mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                                | °F            |
|                                                        |           |                      | -10°C to 60°C                     | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                     | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                     | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                     | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                     | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                     | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                     | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

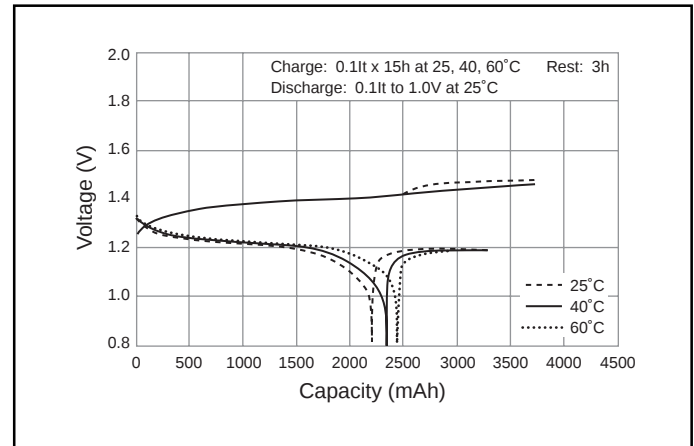
Rapid charger timer; 2.4h (at 1.25A)

Trickle timer; within 2h

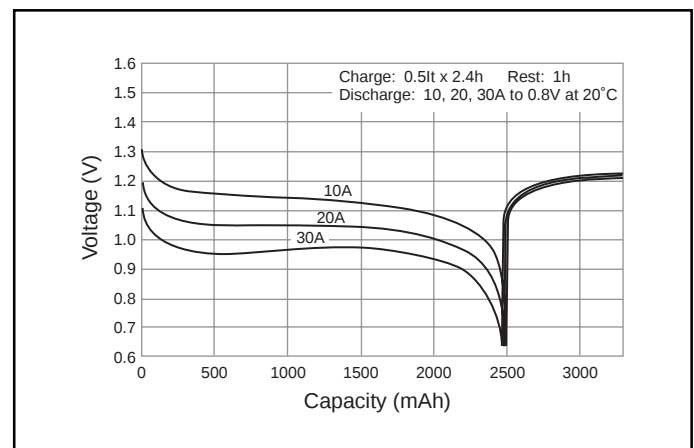
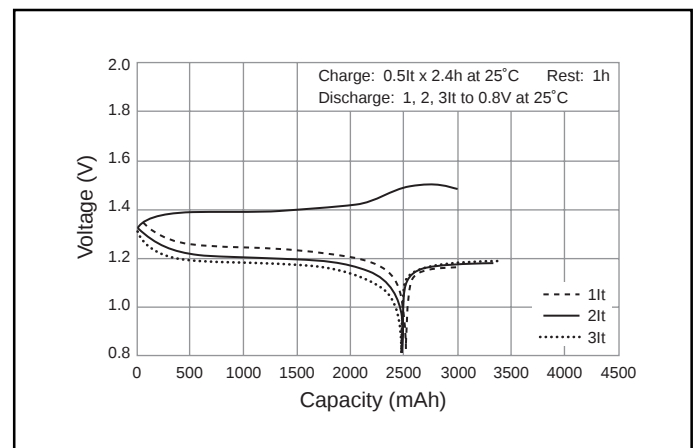
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

It(A) = Cn (Ah)/1h

\* [It] is the reference test current in amperes

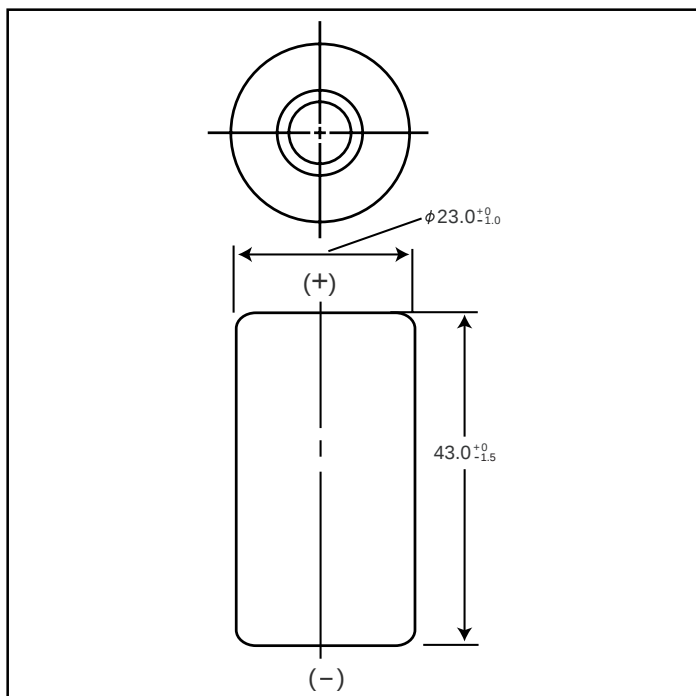
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR260SCP Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-1.0 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 55          | 1.94         |

|                                                        |                      |            |                   |               |
|--------------------------------------------------------|----------------------|------------|-------------------|---------------|
| Nominal Voltage                                        |                      | 1.2V       |                   |               |
| Discharge Capacity <sup>1</sup>                        | Average <sup>2</sup> | 2600 mAh   |                   |               |
|                                                        | Rated (Min.)         | 2450 mAh   |                   |               |
| Approx. Internal impedance at 1000Hz at charged state. |                      | 5mΩ        |                   |               |
| Charge                                                 |                      | Standard   | 260mA x 16hrs.    |               |
|                                                        |                      | Rapid      | 2600mA x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge               | Standard   | °C                | °F            |
|                                                        |                      |            | 0°C to 45°C       | 32°F to 113°F |
|                                                        |                      | Rapid      | 10°C to 40°C      | 50°F to 104°F |
|                                                        | Discharge            |            | -10°C to 65°C     | 14°F to 149°F |
|                                                        | Storage              | < 1 year   | -20°C to 35°C     | -4°F to 95°F  |
|                                                        |                      | < 3 months | -20°C to 45°C     | -4°F to 113°F |
|                                                        |                      | < 1 month  | -20°C to 55°C     | -4°F to 131°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

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Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

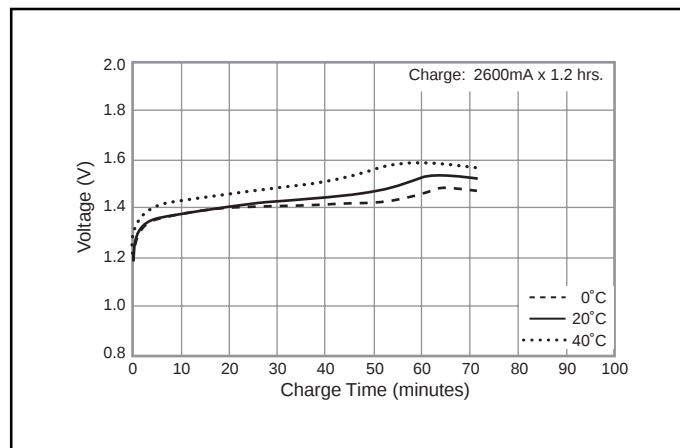
$$It(A) = Cn(Ah)/1h$$

\* [It] is the reference test current in amperes

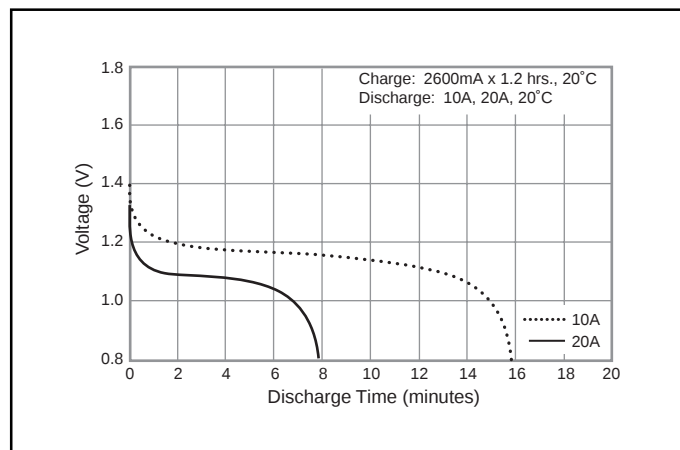
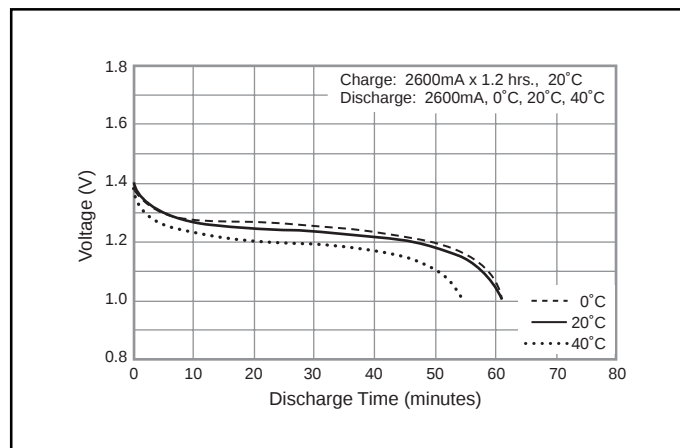
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



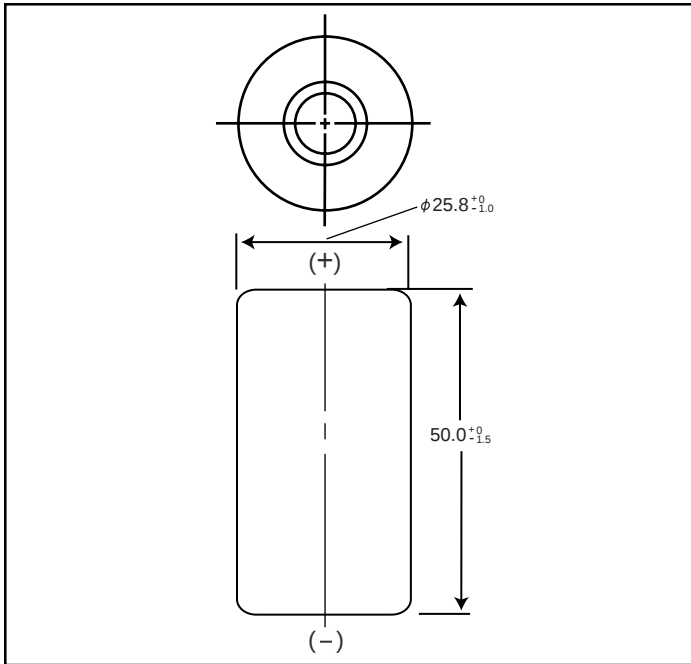
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR300CH Cylindrical C size (HR 26/50) for backup use

### Dimensions (with Tube) (mm)



### Specifications

|                           | mm           | inch          |
|---------------------------|--------------|---------------|
| <b>Diameter</b>           | 25.8+0/-1.0  | 1.02+0/-0.04  |
| <b>Height</b>             | 50.0+0/-1.5  | 1.97+0/-0.06  |
| <b>Approximate Weight</b> | <b>Grams</b> | <b>Ounces</b> |
|                           | 80           | 2.82          |

|                                                        |                      |                                      |               |               |
|--------------------------------------------------------|----------------------|--------------------------------------|---------------|---------------|
| Nominal Voltage                                        |                      | 1.2V                                 |               |               |
| Discharge Capacity <sup>1</sup>                        | Average <sup>2</sup> | 3300 mAh                             |               |               |
|                                                        | Rated (Min.)         | 3100 mAh                             |               |               |
| Approx. Internal impedance at 1000Hz at charged state. |                      | 5mΩ                                  |               |               |
| Charge                                                 | Standard             | 300mA (0.1It) x 16hrs.               |               |               |
|                                                        | Rapid <sup>3</sup>   | 1500mA (1It) x 2.4 hrs. <sup>4</sup> |               |               |
|                                                        | Low Rate             | 155mA x 32 hrs.<br>100mA x 48 hrs.   |               |               |
| Ambient Temperature                                    | Charge               | Standard                             | °C            | °F            |
|                                                        |                      |                                      | 0°C to 45°C   | 32°F to 113°F |
|                                                        |                      | Rapid                                | 10°C to 40°C  | 32°F to 104°F |
|                                                        |                      | Low Rate                             | -10°C to 45°C | 14°F to 149°F |
|                                                        | Discharge            |                                      | -10°C to 65°C | 14°F to 113°F |
|                                                        | Storage              | < 1 year                             | -20°C to 35°C | -4°F to 95°F  |
|                                                        |                      | < 3 months                           | -20°C to 35°C | -4°F to 95°F  |
|                                                        |                      | < 1 month                            | -20°C to 55°C | -4°F to 131°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

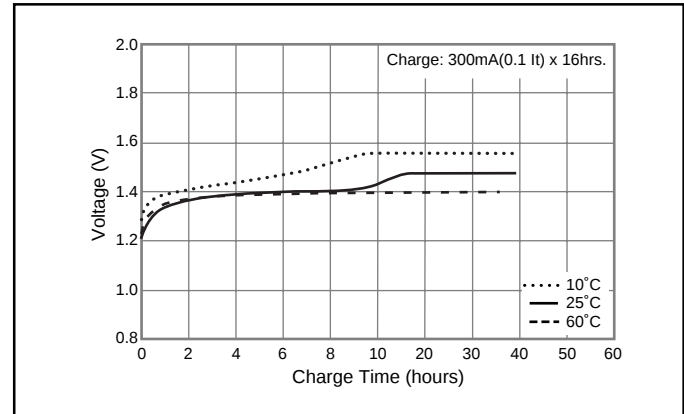
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

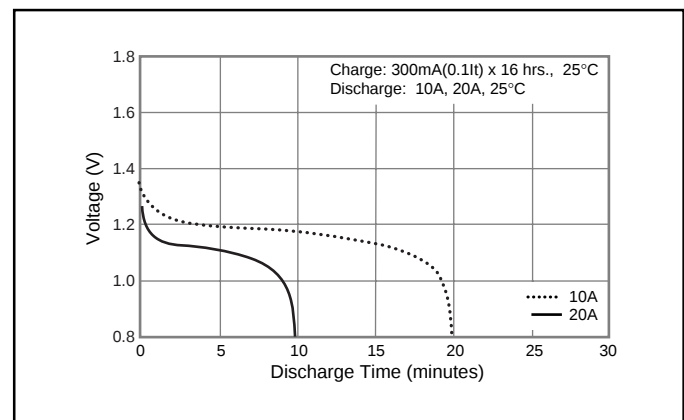
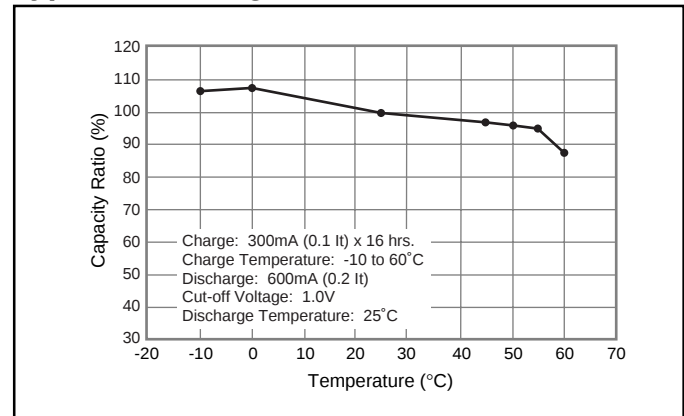
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



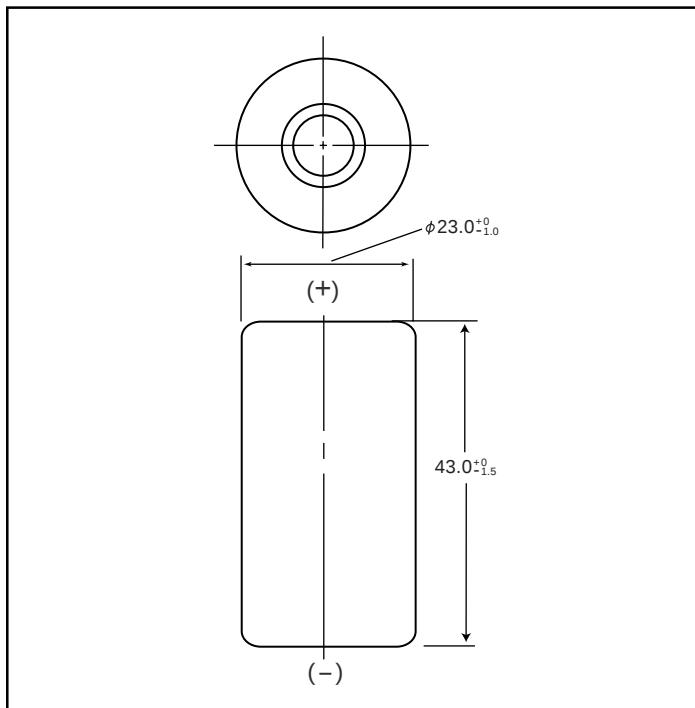
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

- It(A) = Cn (Ah)/1h.
- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR300SCP Cylindrical SC size (HR 23/43)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 23.0+0/-0.1 | 0.91+0/-0.04 |
| Height             | 43.0+0/-1.5 | 1.69+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 57          | 2.01         |

|                                                        |              |                         |               |
|--------------------------------------------------------|--------------|-------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                    |               |
| Discharge Capacity*                                    | Average**    | 3050 mAh                |               |
|                                                        | Rated (Min.) | 2800 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 4mΩ                     |               |
| Charge                                                 | Standard     | 300mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 3000mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard                | °C            |
|                                                        |              |                         | °F            |
|                                                        | Rapid        |                         | °C            |
|                                                        |              |                         | °F            |
|                                                        | Discharge    |                         | °C            |
|                                                        |              |                         | °F            |
| Storage                                                | < 2 years    | -20°C to 35°C           | -4°F to 95°F  |
|                                                        | < 6 months   | -20°C to 45°C           | -4°F to 113°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

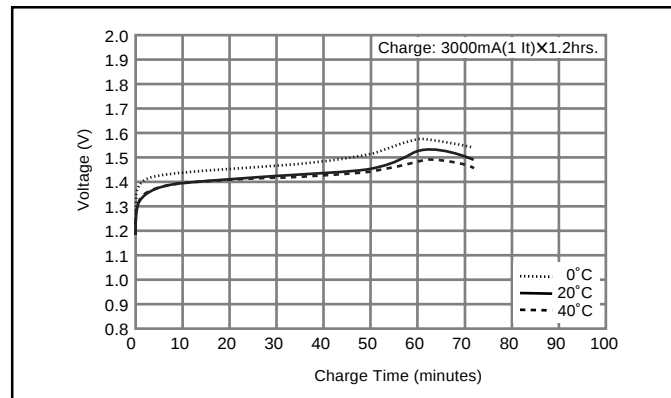
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

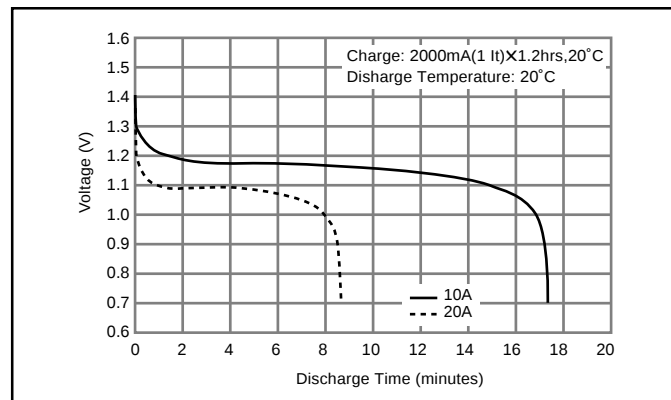
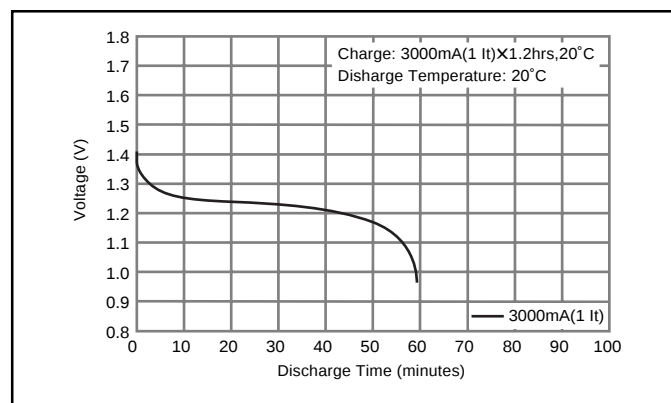
$$It(A) = Cn(Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



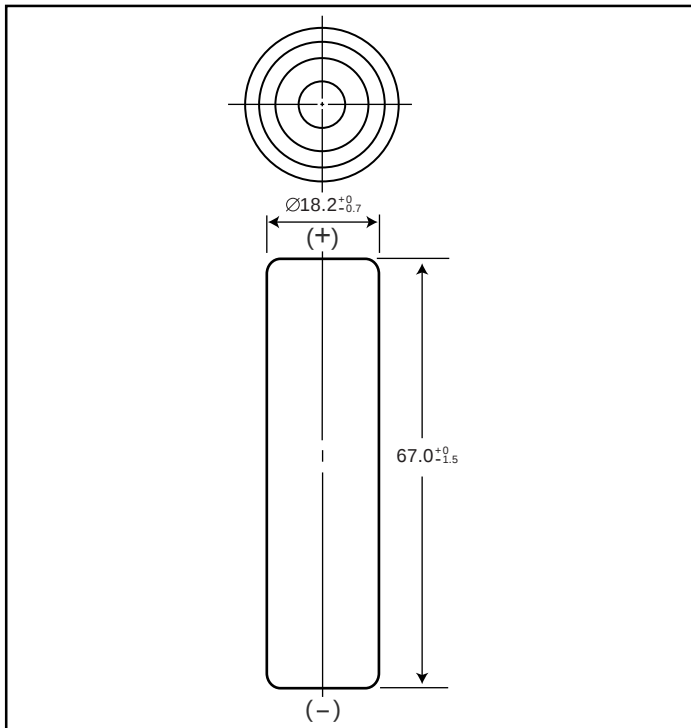
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR330APH Cylindrical L-Fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

| Nominal Voltage                                        |           |                      | 1.2V                               |               |
|--------------------------------------------------------|-----------|----------------------|------------------------------------|---------------|
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 3300 mAh                           |               |
|                                                        |           | Rated (Min.)         | 3200 mAh                           |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 5.5mΩ                              |               |
| Charge                                                 |           | Standard             | 330mA x 16hrs.                     |               |
|                                                        |           | Rapid <sup>3</sup>   | 1650mA x 2.4 hrs. <sup>4</sup>     |               |
|                                                        |           | Low Rate             | 165mA x 32 hrs.<br>110mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                                 | °F            |
|                                                        |           |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                      | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                      | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                      | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                      | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                      | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                      | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

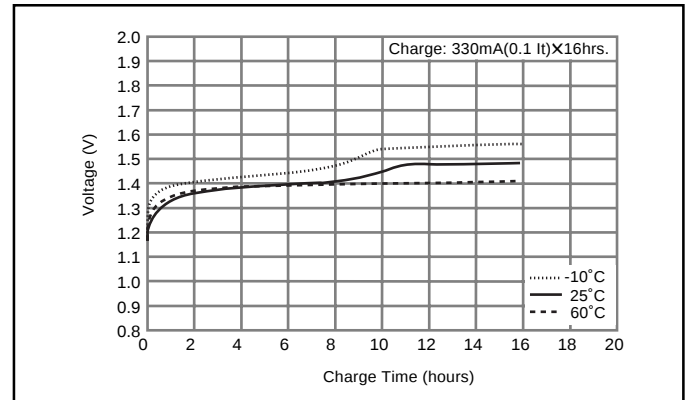
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

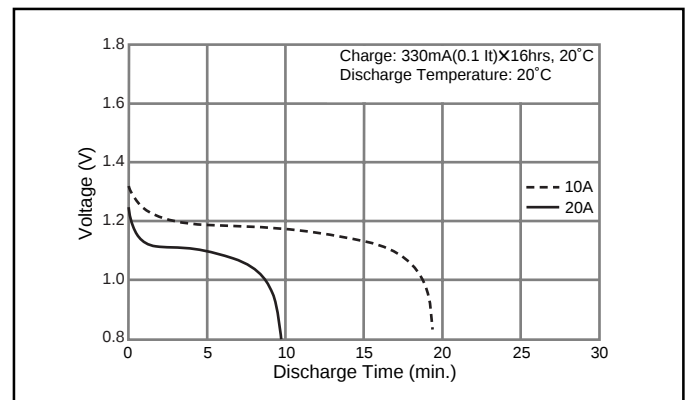
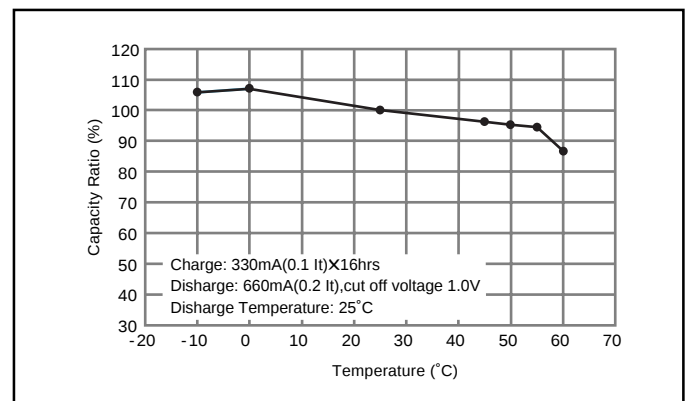
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn (Ah)/1h.$$

• [It] is the reference test current in amperes

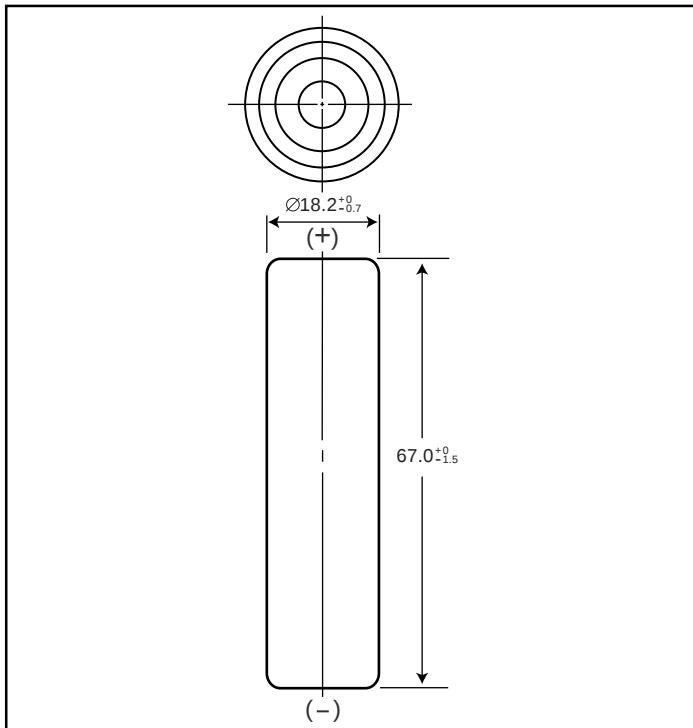
• [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR370AH Cylindrical L-Fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

|                                                        |                 |                      |                                |               |
|--------------------------------------------------------|-----------------|----------------------|--------------------------------|---------------|
| Nominal Voltage                                        |                 |                      | 1.2V                           |               |
| Discharge Capacity <sup>1</sup>                        |                 | Average <sup>2</sup> | 3700 mAh                       |               |
|                                                        |                 | Rated (Min.)         | 3500 mAh                       |               |
| Approx. Internal impedance at 1000Hz at charged state. |                 |                      | 20mΩ                           |               |
| Charge                                                 |                 | Standard             | 370mA x 16hrs.                 |               |
|                                                        |                 | Rapid <sup>3</sup>   | 1750mA x 2.4 hrs. <sup>4</sup> |               |
|                                                        |                 | Low Rate             | 185mA x 32 hrs.                |               |
|                                                        | 123mA x 48 hrs. |                      |                                |               |
| Ambient Temperature                                    | Charge          | Standard             | °C                             | °F            |
|                                                        |                 |                      | -10°C to 60°C                  | 14°F to 140°F |
|                                                        |                 | Rapid                | -10°C to 45°C                  | 14°F to 113°F |
|                                                        | Discharge       |                      | -10°C to 60°C                  | 14°F to 140°F |
|                                                        | Storage         | < 1 year             | -20°C to 35°C                  | -4°F to 95°F  |
|                                                        |                 | < 6 months           | -20°C to 45°C                  | -4°F to 113°F |
|                                                        |                 | < 1 month            | -20°C to 55°C                  | -4°F to 131°F |
|                                                        |                 | < 1 week             | -20°C to 65°C                  | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

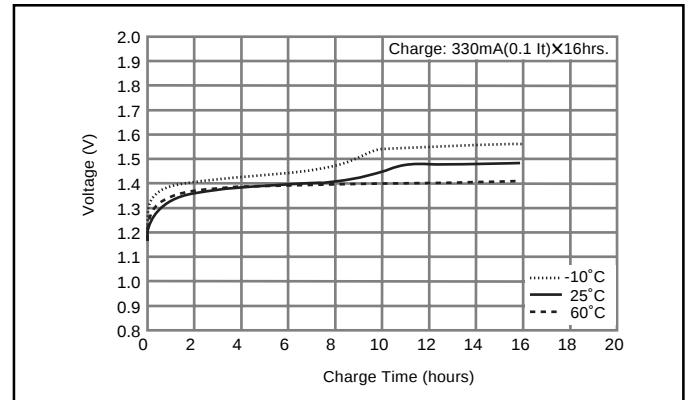
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

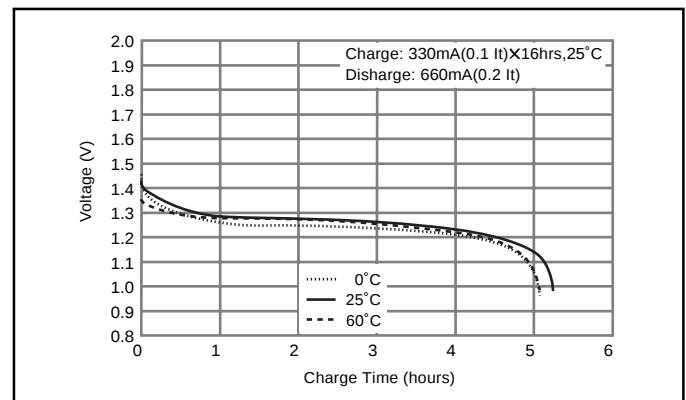
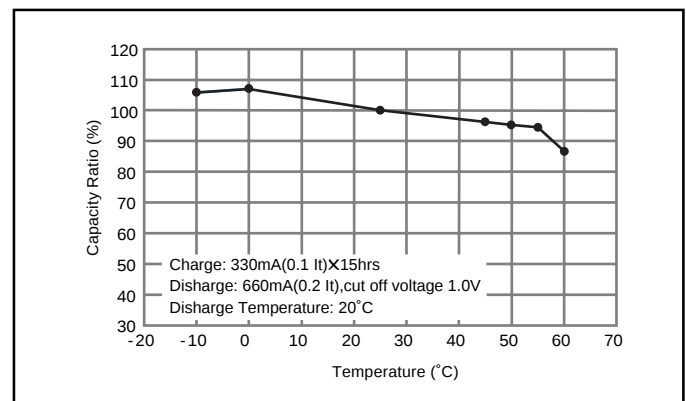
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn (Ah)/1h.$$

• [It] is the reference test current in amperes

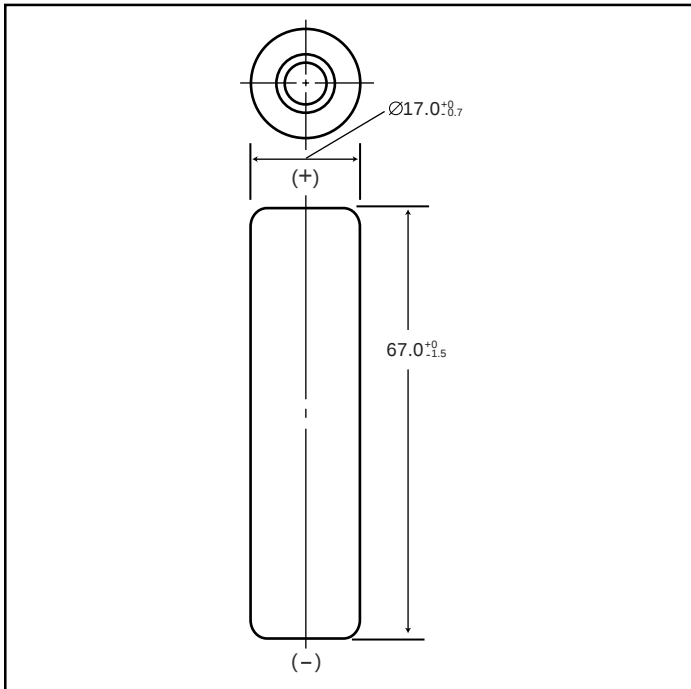
• [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR380A Cylindrical L-A size (HR 17/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 17.0+0/-0.7 | 0.67+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 53          | 1.87         |

|                                                        |              |                        |               |
|--------------------------------------------------------|--------------|------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                   |               |
| Discharge Capacity*                                    | Average**    | 3800 mAh               |               |
|                                                        | Rated (Min.) | 3700 mAh               |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 25mΩ                   |               |
| Charge                                                 | Standard     | 370mA (0.1It) x 16hrs. |               |
|                                                        | Rapid***     | 2000mA dT/dt           |               |
| Ambient Temperature                                    | Charge       | Standard               | °C            |
|                                                        |              |                        | 0°C to 45°C   |
|                                                        |              |                        | 32°F to 113°F |
|                                                        | Rapid        |                        | 0°C to 40°C   |
|                                                        |              |                        | 32°F to 104°F |
|                                                        | Discharge    |                        | -10°C to 65°C |
| Storage                                                | < 1 year     |                        | 14°F to 149°F |
|                                                        |              |                        | -20°C to 35°C |
|                                                        |              |                        | -4°F to 95°F  |
|                                                        |              |                        | -20°C to 45°C |
| < 3 months                                             |              |                        | -4°F to 113°F |
|                                                        |              |                        | -20°C to 55°C |
| < 1 month                                              |              |                        | -4°F to 131°F |
|                                                        |              |                        | -20°C to 55°C |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

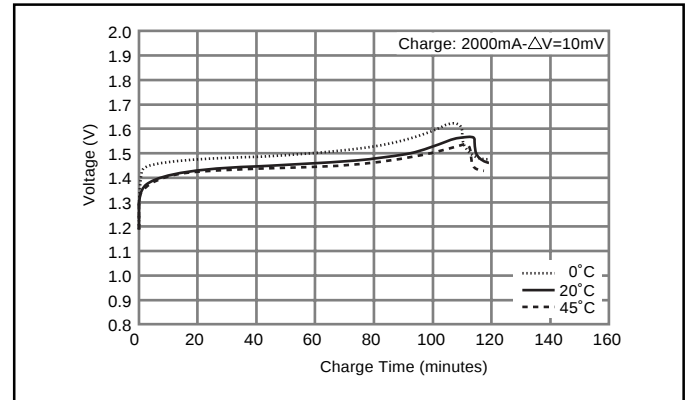
\*\*\* For rapid charge: use dT/dt charge termination method. Refer to the Nickel Metal Hydride "Charge Methods" section for further details. Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

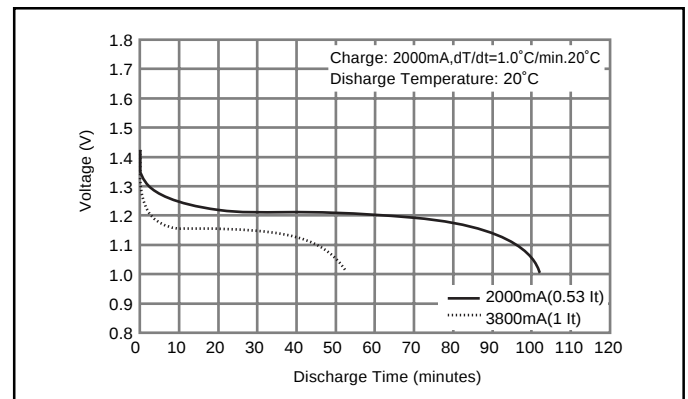
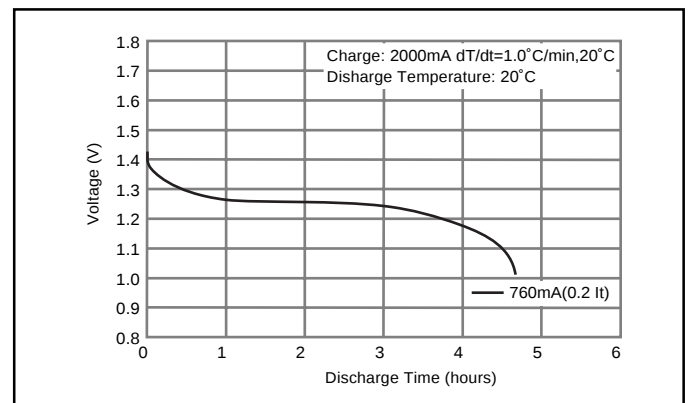
$$It(A) = C_n (Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



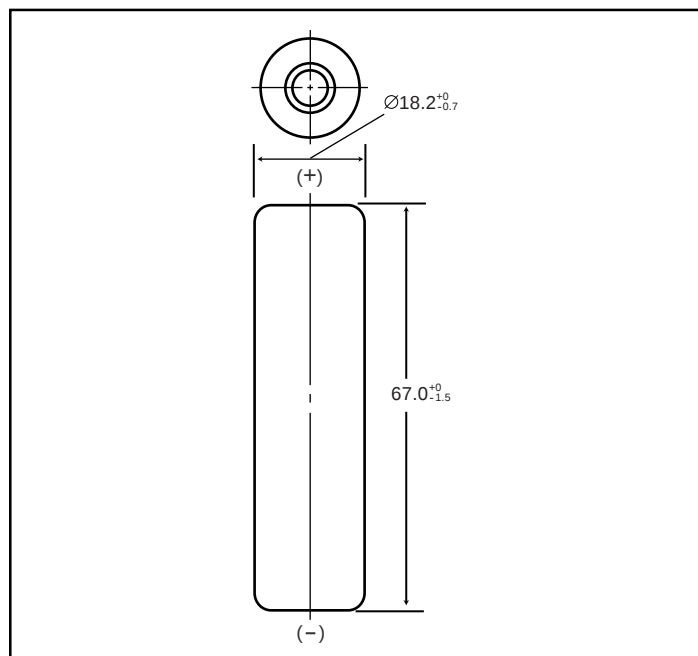
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR450A Cylindrical L-fat A size (HR 18/67)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 18.2+0/-0.7 | 0.72+0/-0.03 |
| Height             | 67.0+0/-1.5 | 2.64+0/-0.06 |
| Approximate Weight | Grams       | Ounces       |
|                    | 60          | 2.12         |

|                                                        |              |                        |               |
|--------------------------------------------------------|--------------|------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                   |               |
| Discharge Capacity*                                    | Average**    | 4500 mAh               |               |
|                                                        | Rated (Min.) | 4200 mAh               |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 25mΩ                   |               |
| Charge                                                 | Standard     | 420mA (0.1It) x 16hrs. |               |
|                                                        | Rapid***     | 2000mA dT/dt           |               |
| Ambient Temperature                                    | Charge       | Standard               | °C            |
|                                                        |              |                        | °F            |
|                                                        | Rapid        |                        | °C            |
|                                                        |              |                        | °F            |
|                                                        | Discharge    |                        | °C            |
|                                                        |              |                        | °F            |
| Storage                                                | < 1 year     | -20°C to 35°C          | -4°F to 95°F  |
|                                                        | < 3 months   | -20°C to 45°C          | -4°F to 113°F |
|                                                        | < 1 month    | -20°C to 55°C          | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

\*\*\* For rapid charge: use dT/dt charge termination method. Refer to the

Nickel Metal Hydride "Charge Methods" section for further details.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

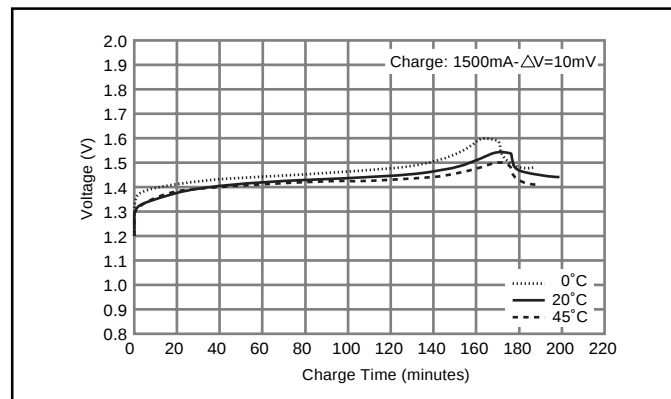
$$It(A) = Cn (Ah)/1h.$$

• [It] is the reference test current in amperes

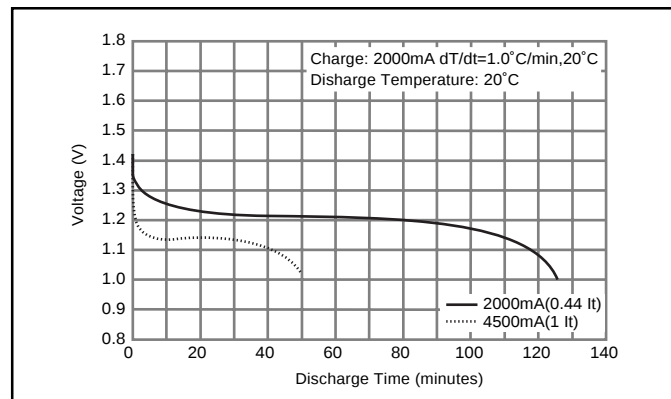
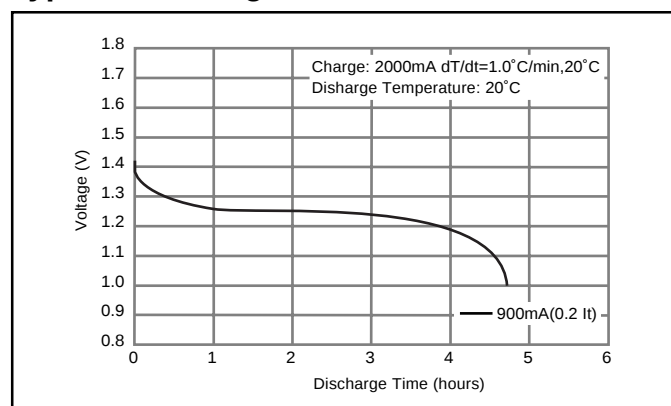
• [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



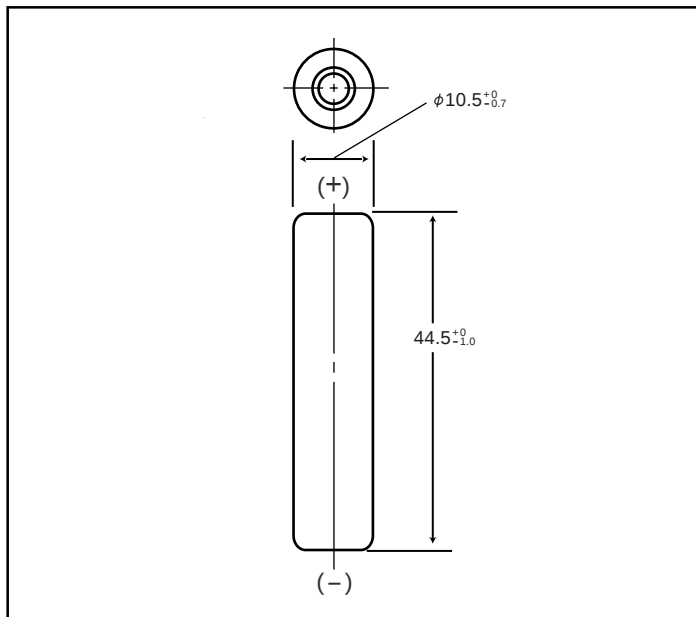
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR60AAAH Cylindrical AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm           | inch          |
|--------------------|--------------|---------------|
| Diameter           | 10.5 +0/-0.7 | 0.41 +0/-0.03 |
| Height             | 44.5 +0/-1.0 | 1.75 +0/-0.04 |
| Approximate Weight | Grams        | Ounces        |
|                    | 13           | 0.46          |

|                                                        |           |                      |                                  |               |
|--------------------------------------------------------|-----------|----------------------|----------------------------------|---------------|
| Nominal Voltage                                        |           |                      | 1.2V                             |               |
| Discharge Capacity <sup>1</sup>                        |           | Average <sup>2</sup> | 550 mAh                          |               |
|                                                        |           | Rated (Min.)         | 500 mAh                          |               |
| Approx. Internal impedance at 1000Hz at charged state. |           |                      | 35mΩ                             |               |
| Charge                                                 |           | Standard             | 50mA x 16hrs.                    |               |
|                                                        |           | Rapid <sup>3</sup>   | 250mA x 2.4 hrs. <sup>4</sup>    |               |
|                                                        |           | Low Rate             | 25mA x 32 hrs.<br>17mA x 48 hrs. |               |
| Ambient Temperature                                    | Charge    | Standard             | °C                               | °F            |
|                                                        |           |                      | -10°C to 60°C                    | 14°F to 140°F |
|                                                        |           | Rapid                | -10°C to 45°C                    | 14°F to 113°F |
|                                                        | Discharge |                      | -10°C to 60°C                    | 14°F to 140°F |
|                                                        | Storage   | < 1 year             | -20°C to 35°C                    | -4°F to 95°F  |
|                                                        |           | < 6 months           | -20°C to 45°C                    | -4°F to 113°F |
|                                                        |           | < 1 month            | -20°C to 55°C                    | -4°F to 131°F |
|                                                        |           | < 1 week             | -20°C to 65°C                    | -4°F to 149°F |

<sup>1</sup> After charging at 0.1It for 16 hours, discharging at 0.2It.

<sup>2</sup> For reference only.

<sup>3</sup> Need specially designed control system

#### Control System:

dT/dt cut-off; 1 to 2°C/min

-ΔV cut-off; -ΔV per cell = 5 to 10 mV

T-control; T=65°C

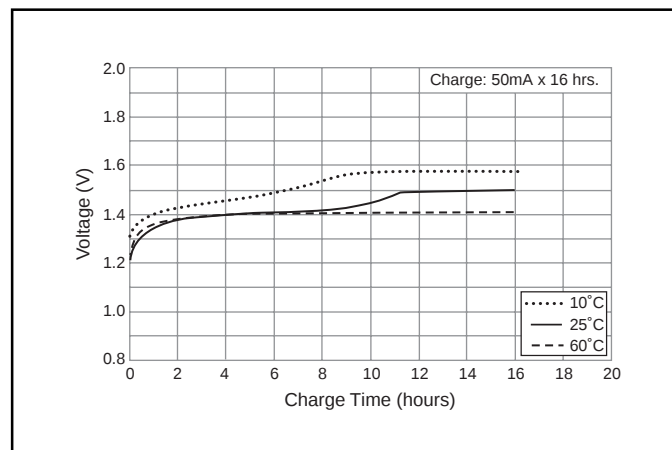
Rapid charger timer; 2.4h (at 1.25a)

Trickle timer; within 2h

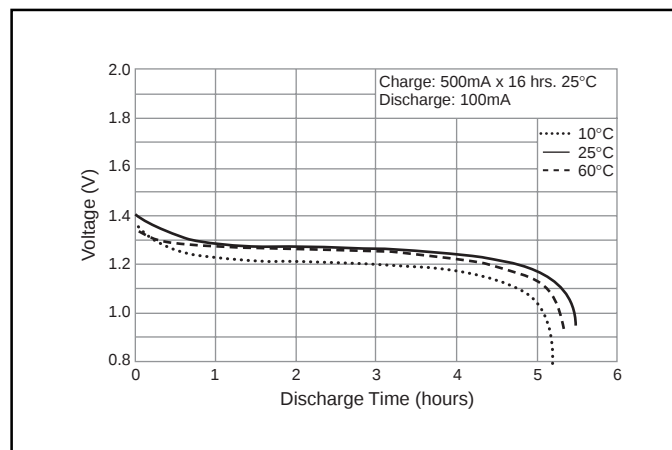
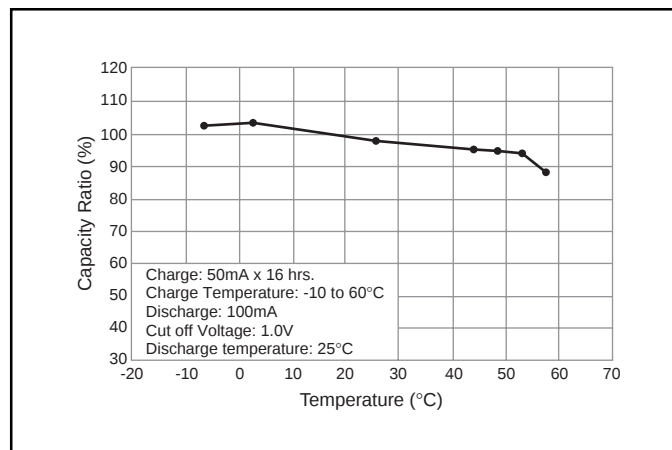
<sup>4</sup> With control system

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

### Typical Charge Characteristics



### Typical Discharge Characteristics



Note: [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn (Ah)/1h$$

\* [It] is the reference test current in amperes

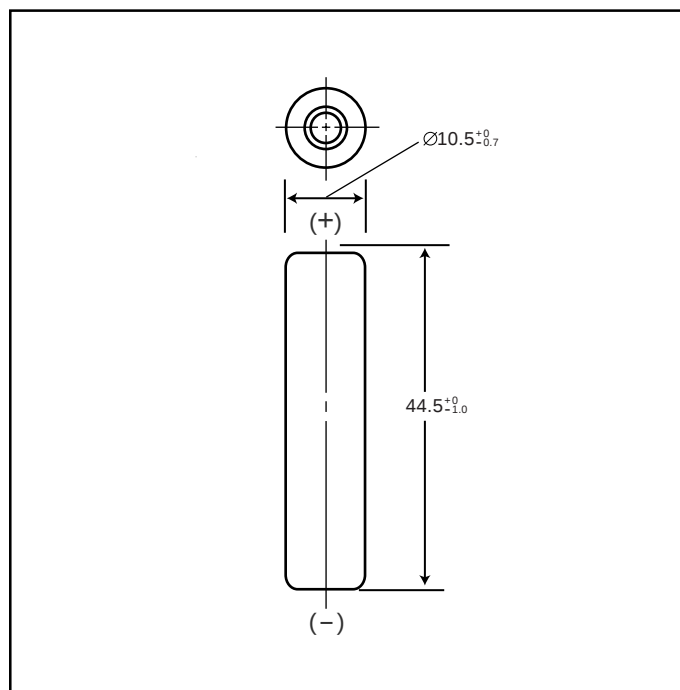
\* [Cn] is the rated capacity of the cell or battery in Ampere-hours.

n = the time base [hours] for which the rated capacity is declared

# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR70AAAJ Cylindrical HR AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 10.5+0/-0.7 | 0.41+0/-0.03 |
| Height             | 44.5+0/-1.0 | 1.75+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 13          | 0.46         |

|                                                        |              |                        |               |
|--------------------------------------------------------|--------------|------------------------|---------------|
| Nominal Voltage                                        |              | 1.2V                   |               |
| Discharge Capacity*                                    | Average**    | 720 mAh                |               |
|                                                        | Rated (Min.) | 700 mAh                |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 30mΩ                   |               |
| Charge                                                 | Standard     | 70mA (0.1It) x 16hrs.  |               |
|                                                        | Rapid        | 650mA (1It) x 1.2 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard               | °C            |
|                                                        |              |                        | °F            |
|                                                        | Rapid        |                        | °C            |
|                                                        |              |                        | °F            |
|                                                        | Discharge    |                        | °C            |
|                                                        |              |                        | °F            |
| Storage                                                | < 1 year     |                        | -20°C to 35°C |
|                                                        | < 3 months   |                        | -20°C to 45°C |
|                                                        | < 1 month    |                        | -20°C to 55°C |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

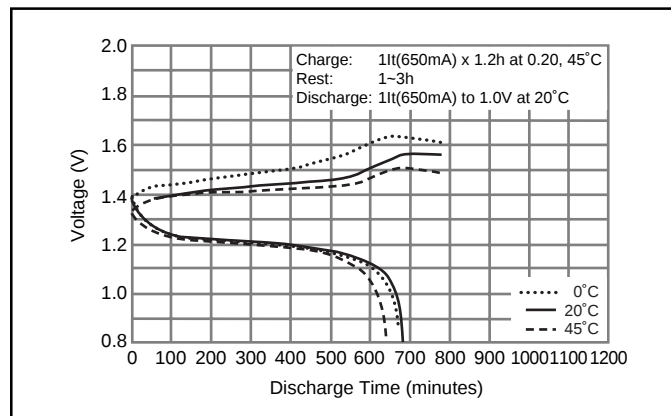
\*\* For reference only.

Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

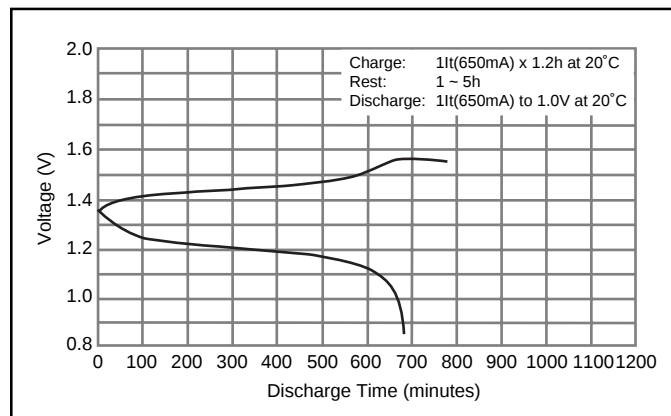
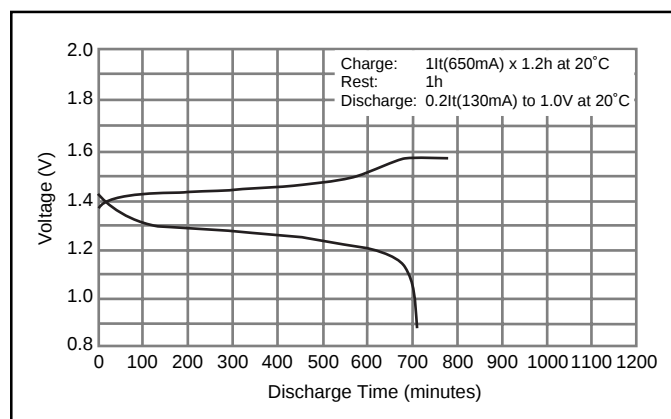
**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:  
It(A) = Cn (Ah)/1h.

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



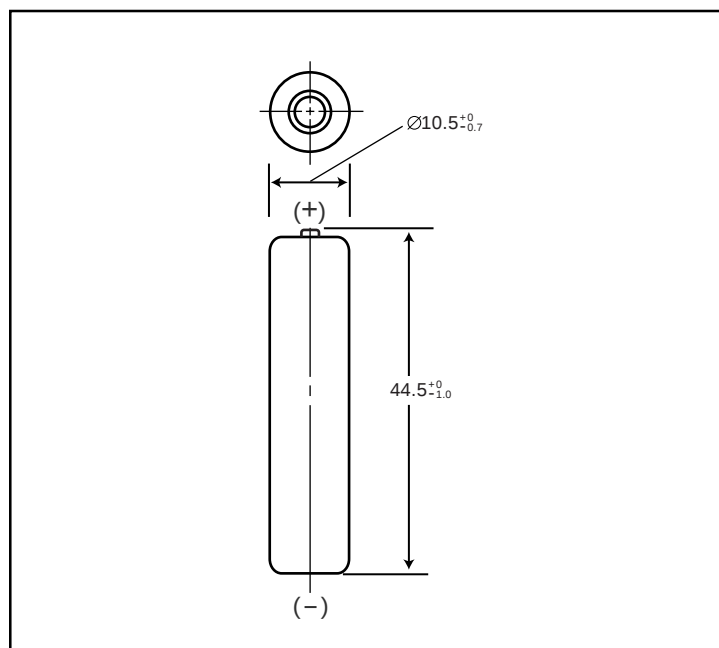
### Typical Discharge Characteristics



# NICKEL METAL HYDRIDE BATTERIES: INDIVIDUAL DATA SHEET

## HHR75AAA/B Cylindrical AAA size (HR 11/45)

### Dimensions (with Tube) (mm)



### Specifications

|                    | mm          | inch         |
|--------------------|-------------|--------------|
| Diameter           | 10.5+0/-0.7 | 0.41+0/-0.03 |
| Height             | 44.5+0/-1.0 | 1.75+0/-0.04 |
| Approximate Weight | Grams       | Ounces       |
|                    | 12          | 0.42         |

|                                                        |              |                  |               |
|--------------------------------------------------------|--------------|------------------|---------------|
| Nominal Voltage                                        |              | 1.2V             |               |
| Discharge Capacity*                                    | Average**    | 730 mAh          |               |
|                                                        | Rated (Min.) | 700 mAh          |               |
| Approx. Internal impedance at 1000Hz at charged state. |              | 35mΩ             |               |
| Charge                                                 | Standard     | 70mA x 16hrs.    |               |
|                                                        | Rapid        | 450mA x 1.7 hrs. |               |
| Ambient Temperature                                    | Charge       | Standard         | °C            |
|                                                        |              |                  | °F            |
|                                                        | Rapid        |                  | 0°C to 45°C   |
|                                                        |              |                  | 32°F to 113°F |
|                                                        | Discharge    |                  | 0°C to 40°C   |
|                                                        |              |                  | 32°F to 104°F |
| Storage                                                | Storage      | < 1 year         | -10°C to 65°C |
|                                                        |              | < 3 months       | 14°F to 149°F |
|                                                        |              | < 1 month        | -20°C to 35°C |
|                                                        |              |                  | -4°F to 95°F  |
| Storage                                                | Storage      | < 3 months       | -20°C to 45°C |
|                                                        |              | < 1 month        | -4°F to 113°F |
|                                                        |              |                  | -20°C to 55°C |
|                                                        |              |                  | -4°F to 131°F |

\* After charging at 0.1It for 16 hours, discharging at 0.2It.

\*\* For reference only.

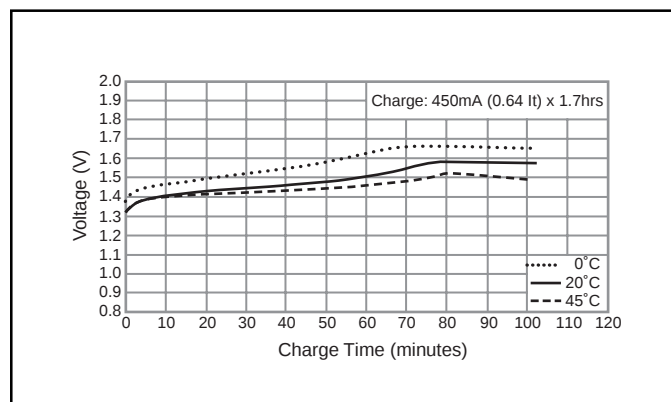
Battery performance and cycle life are strongly affected by how they are used. In order to maximize battery safety, please consult Panasonic when determining charge / discharge specs, warning label contents and unit design.

**Note:** [It] was previously expressed as [C]. [It] is an IEC standard expression for the amount of charge or discharge current and is expressed as:

$$It(A) = Cn(Ah)/1h.$$

- [It] is the reference test current in amperes
- [Cn] is the rated capacity of the cell or battery in Ampere-hours.
- n = the time base [hours] for which the rated capacity is declared

### Typical Charge Characteristics



### Typical Discharge Characteristics

