



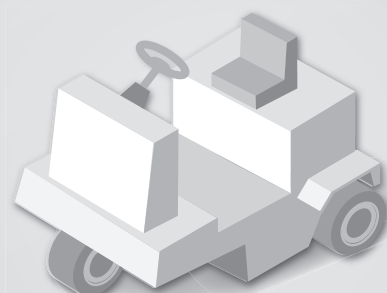
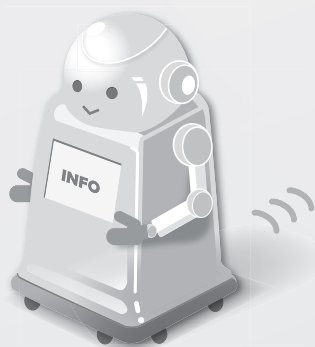
# TOSHIBA

Rechargeable Lithium-ion Battery

## **SCiB™** Industrial Pack



New Battery Solution for  
AGV (automated guided vehicle) etc.



# Let the “SCiB™ Industrial Pack” solve all the inconveniences caused by lead-acid batteries

## Before

## After

1

It takes 8 to 10 hours to charge a battery.

Two sets of battery for charging and discharging have to be prepared for continuous operation.



1-hour quick charging improves the operation rate!

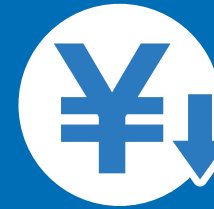
20-minute charging is even possible!\*  
With 1 hour lunch break, one set of battery is just enough for 24/7 operation.

\* Depending on battery charger (20 minutes quick charging can be realized.)

2

Battery needs to be replaced every one to three years...

Frequent replacement increases the maintenance cost...



10 years long life reduces the total cost!

10 years long life contributes to total cost reduction. Moreover, this is a maintenance-free battery!

3

Replacement of large and heavy battery is quite taxing...

Space for charging battery is also a waste.



Compact and light battery can be replaced easily and smoothly.

Battery weights reduced to one-quarter of lead acid battery for same operation time.

4

The place for charging battery is limited due to safety reasons.

Unmanned charging could result in serious incident by possible hydrogen gas generation.



This battery has no risk of fuming or ignition.

This battery does not produce hydrogen gas. Users can charge the battery anytime and anywhere!

Lead acid battery



SCiB™ Industrial Pack



Lead-acid batteries can be replaced easily with “SCiB™ Industrial Pack” which has unique features.

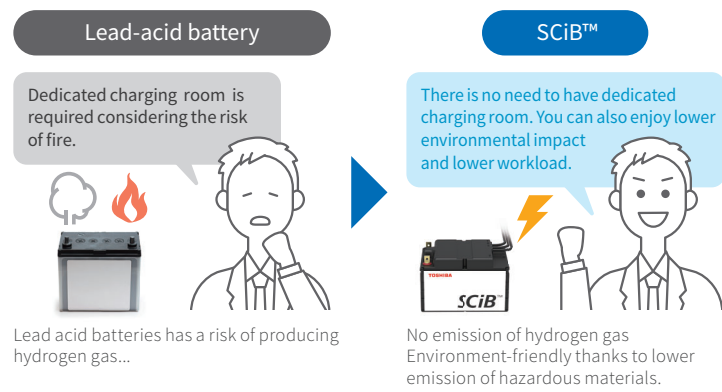
Note: The values do not guarantee the product performance.



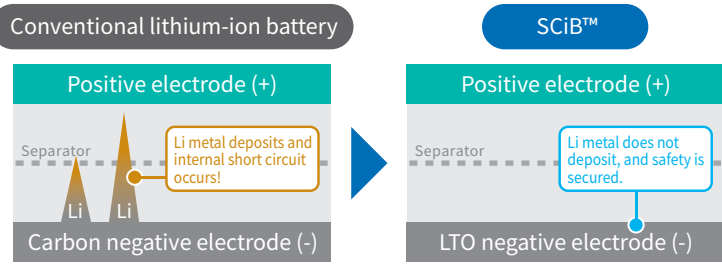
# The reasons why “SCiB™” is chosen rather than lead-acid batteries or other lithium-ion batteries

## Safety

No emission of hydrogen gas  
No need to have dedicated charging room



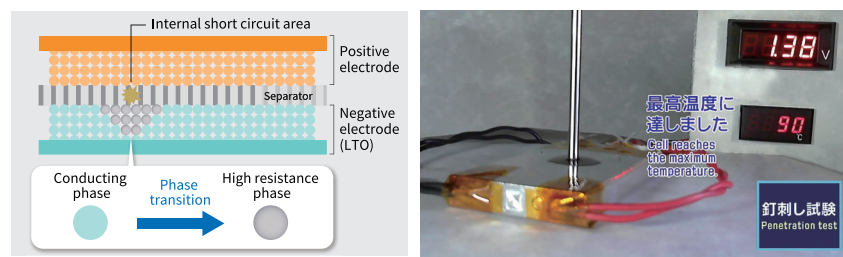
Highly safe LTO\*  
There is lower risk of lithium deposition



In case of conventional lithium-ion batteries, there is a risk of lithium metal deposition, which could break separator and cause internal short circuit when it is used for long period of time, under very cold temperature or with high charging current. There is lower risk of lithium metal deposition in case of SCiB™.

Resistance of an internally-short-circuited area increases to reduce the short-circuit current.

Even in case of internal short circuit, there is lower risk of smoke or ignition on SCiB™ because it reduces short circuit current due to increase of resistance around internal short circuit area.



Compliance with safety standards

<Examples>

| Organization | 23Ah cell  | SCiB™ Industrial Pack   |
|--------------|--|---|
|              | <ul style="list-style-type: none"> <li>UL 1642</li> <li>UL 62133-2</li> <li>CSA C22.2#62133-2</li> </ul> | <ul style="list-style-type: none"> <li>UL 62133-2</li> <li>CSA C22.2#62133-2</li> </ul> |
|              | <ul style="list-style-type: none"> <li>JIS C 8715-2:2012</li> </ul>                                      | -   |

Protection function

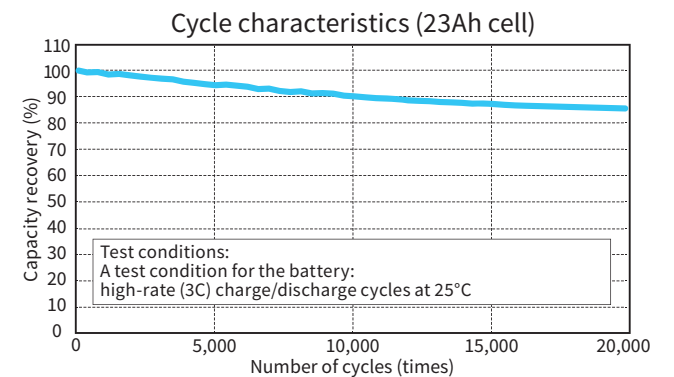
SCiB™ Industrial Pack is equipped with BMU\*\* which monitors voltage, current, temperature and others to protect the battery from abnormalities.

\* LTO : Lithium Titanium Oxide  
\*\*BMU : Battery Management Unit

## Long life

Continuous  
20,000 cycles or more

SCiB™ cell has a long lifespan even with repeated charge-discharge cycles, and keep more than 80% of capacity after 20,000 times of SOC\* 50% -90% charge-discharge cycles.



Notice: SCiB™ Industrial Pack uses 23Ah cells. Cycle life also depends on the operating conditions.  
\* SOC: State of Charge

## Rapid charging / Large current discharging

Charging completes within  
1 hour

One eighth of a lead-acid battery  $\frac{1}{8}$

It takes 8 hours to charge a lead acid battery. On the other hand, SCiB™ reduces charging time significantly. With customized charger, 20 minutes charging becomes available.

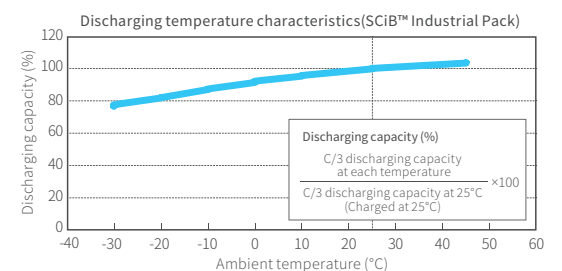
SCiB™ Industrial Pack also can be used for starting current of a motor, etc.

For starting a motor, the maximum current could be three times as large as the rated current. However, SCiB™ Industrial Pack can apply to a large current, up to 125A - 200 seconds\*.

\* A single unit of SCiB™ Industrial Pack(24V/48V): 125A - 200 seconds/Two units of SCiB™ Industrial Pack(24V) in parallel: 150A - 200 seconds

## Resistance to low temperature

SCiB™ outputs 70%\* or higher capacity even when the surrounding temperature is at -30°C

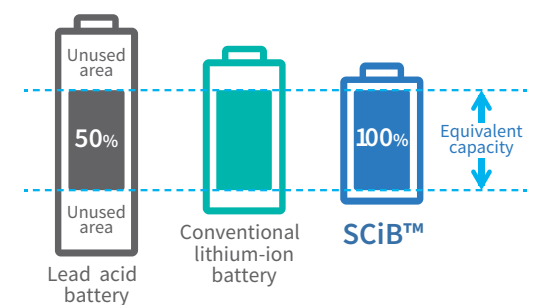


SCiB™ exhibits low degradation even when it is charged and discharged at -30°C

\* Discharging capacity reaches 100% at 25°C

## Using 100% of discharging depth(DOD)\*

100% of DOD\* is available



A lead-acid battery is commonly used at approx. 50% of DOD in order to prevent degradation. However, SCiB™ is available at 100% of DOD.

\* DOD: Depth of Discharge

# Case Study : AGV (automated guided vehicle) powered by SCiB™

## In case of two 8-hours shifts operation

|  | Production Line Layout   | Operational Image   | Quantity  | Weight  | Workload for Charging  | Life                   |
|--|--|---|---|---|--|------------------------|
| <b>Lead-acid battery</b>                 | <p>There needs to be dedicated charging room separated from production line.</p> | <p>Swapping set A and set B between shifts</p>                                  | <p>Set A: 19kg + 19kg = 12V×2=24V<br/>Set B: 19kg + 19kg = 12V×2=24V</p> <p>AGV power (24V)<br/>2 series connection of 12V lead-acid battery<br/>→ 4 batteries are required in total.</p> | <p>Per Set: 19kg 12V-50Ah + 19kg 12V-50Ah = 24V-50Ah</p> <p><b>38 kg in total</b></p>   | <p>Since Lead-acid batteries are large and heavy, charging and replacing is hard work....</p>  | <p>1 to 3 years</p>    |
| <b>SCiB™</b>                             | <p>Installing quick battery chargers in the production line</p>                  | <p>SCiB™ can be charged on board (the AGV) during 1-hour break.</p>             | <p>Two batteries can be reduced to one if charging is done during 1-hour break.</p> <p>Set A: 24V 1 unit<br/>Set B: Can be reduced</p>  | <p>Equivalent capacity: Lead-acid batteries 50Ah = SCiB™ 22Ah</p> <p>AGV power (24V): Lead-acid batteries 24V = SCiB™ 24V</p> <p>Weight: Lead-acid batteries 38kg &gt; SCiB™ 8kg</p> <p><b>About a quarter of the weight</b> of a lead-acid battery for same operation time</p> | <p>Battery replacement is not required if batteries are charged on board during a break. Even if you remove batteries for charging, SCiB™ Industrial Pack can be lifted easily thanks to small size and lightweight.</p> | <p><b>10 years</b></p> |
| <b>SCiB™ + Automatic charging system</b> | <p>Installing an automatic charging system in the production line</p>            | <p>24-hours continuous operation can be realized by charging on short stops</p> | <p>One battery operation is available.</p> <p>Set A: 24V 1 unit<br/>Set B: Not required</p>   | <p><b>About a quarter of the weight</b> of a lead-acid battery for same operation time</p>  | <p>Unmanned charging is possible!</p>  |                        |

## 4 advantages to adopt SCiB™

**Heart icon: Safety and environment**

No emission of hydrogen gas  
Environment-friendly thanks to lower emission of hazardous materials

There is no need to have dedicated charging room. You can also enjoy lower environmental impact and lower workload.

**Bar chart icon: Higher operational efficiency**

Operational rate of AGVs improves by rapid charging

Downtime of AGVs: 8h (Lead-acid battery) → 1h (SCiB™) → 5min (SCiB™ + Automatic charging system) x shot stops

Downtime for charging can be drastically reduced, which can also lead to the reduction of AGVs to be owned.

**Headset icon: Reducing the workload**

The smaller size reduces the workload when replacing the battery

Since lead-acid batteries are large and heavy, charging and replacing is hard work. However, the weight of SCiB™ is a quarter (8 kg) of a lead battery.

**Yen symbol icon: Reduction of TCO\***

Total cost is lower because of long life

Although lead-acid battery is cheaper if only considering the initial cost, you can enjoy lower total cost of ownership by SCiB™ Industrial Pack in the long run.

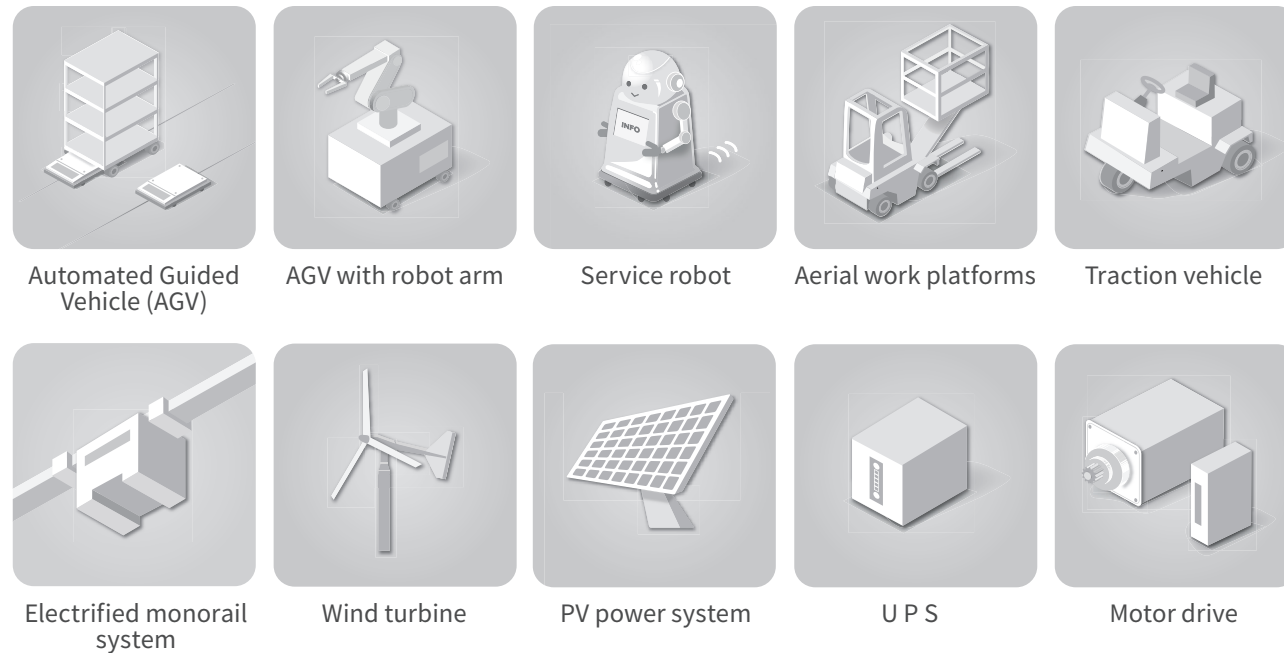
\* TCO: Total cost of ownership

Note: The values described on this page are the reference values based on the simulation performed by Toshiba under the conditions assuming the AGV application. The values do not guarantee the product performance.

# Various applications and voice of customers

## Applications suitable for SCiB™ Industrial Pack

- Rapid charging
- Continuous and frequent operation
- Reliability/ Safety
- Cold temperature
- Frequency regulation
- Power regeneration



Automated Guided Vehicle (AGV)    AGV with robot arm    Service robot    Aerial work platforms    Traction vehicle

Electrified monorail system    Wind turbine    PV power system    UPS    Motor drive

## Voice of customers

### Automated guided vehicle manufacturer A



We proposed the quick charge with automatic charging systems to an automobile manufacturer and our proposal was adopted.

### Leasing company B



Cost-effectiveness of a long-life (15,000 times) and maintenance-free battery was a determining factor.

### Electronic device manufacturer C



We couldn't find a battery appropriate to the inductive(wireless) charging, and we were at a loss. However, we finally encountered the SCiB™ Industrial Pack.

### Automobile manufacturer D



It was a harsh task to remove and install heavy lead-acid battery. However, SCiB™ Industrial Pack made our work much easier.

## AGV (automated guided vehicle) For AGVs and robots in factories

AGVs are increasingly used for transportation between processes, supplying parts to production lines, and working on assembly lines.

### Benefits of replacing lead-acid batteries

- 1 Safe and long life
- 2 Contributes to the improvement of AGV power costs and the reduction of size and weight
- 3 Reduces the workload of battery replacement

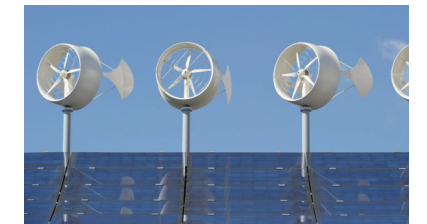


## Renewable energy For small-scale wind and solar power generation systems

It can be used to store electricity from renewable energy, which is in high demand around the world.

### Benefits of replacing lead-acid batteries

- 1 Stable supply of electricity by handling large fluctuations in output
- 2 Equipped with BMU and sends battery information to the host computer through communication function
- 3 Long-life even after frequent and repeated charge/discharge



## Service robot For guide robots in shopping malls and AMRs in medical sites

Demand is rising due to a shortage of labor and multilingual support for foreign travelers.

### Benefits of replacing lead-acid batteries

- 1 Can operate without leaving the site because charging time is short
- 2 Highly safe for charging in commercial areas
- 3 Small size and lightweight reduce the burden on the robot



## Facility For power sources for roads, parks, factories, facilities, and other equipment

It can be used for a variety of applications such as digital signage, traffic lights, street lights, surveillance cameras, portable power supplies, and security devices.

### Benefits of replacing lead-acid batteries

- 1 Low potential for smoke and fire, safe and widely applicable
- 2 Small and lightweight, so it can be mounted on small devices
- 3 It can be used in extreme outdoor temperatures (-30~45°C)



# You can easily replace lead-acid batteries with SCiB™ Industrial Pack

SCiB™ Industrial Pack equips BMU (battery management unit) which monitors cell voltage, current and temperature, detects errors, and protects by itself. You can easily handle and use as replacement of lead-acid batteries.

## SCiB™ Industrial Pack (24V/48V)

Lithium-ion battery appropriate for frequent and repeated charging and discharging

Up to 125A (200 seconds) charge and discharge are available.

SCiB™ Industrial Pack is appropriate for the motor drive or AGVs, which repeat frequent charging and discharging.

Easy replacement from lead-acid batteries

SCiB™ Industrial Pack is smaller and lighter than lead-acid batteries. They also can be handled more easily than other lithium-ion batteries. Therefore, you can replace your battery with SCiB™ Industrial Pack without difficulty.



## Features

|                    |   |
|--------------------|---|
| Safety             | Built-in BMU* <sup>1</sup> protects the battery from errors.  |
| Rapid charging     | Thanks to shorter charging time, you can adopt automatic charging system.                               |
| External interface | Warning, error message, and SOC* <sup>2</sup> status are output by CAN communication.                   |
| Weight reduction   | The weight of SCiB™ Industrial Pack is about a quarter* <sup>3</sup> of lead-acid battery (approx. 8kg) |

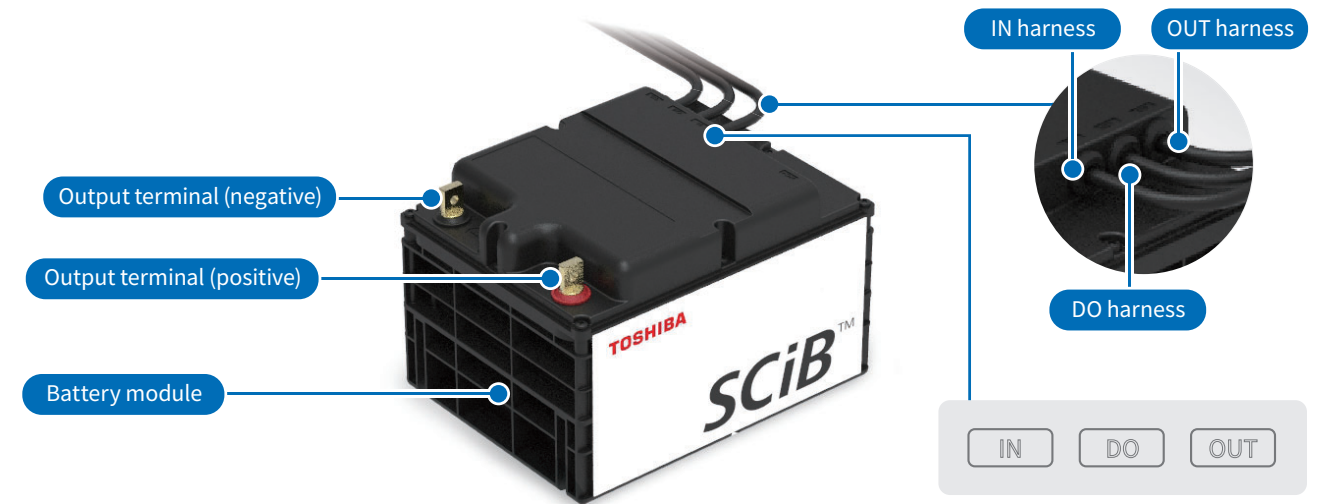
\*<sup>1</sup> BMU: Battery Management Unit  
 \*<sup>2</sup> SOC: State of Charge  
 \*<sup>3</sup> Values based on the simulation uniquely performed by TOSHIBA under a certain condition

## Product specifications

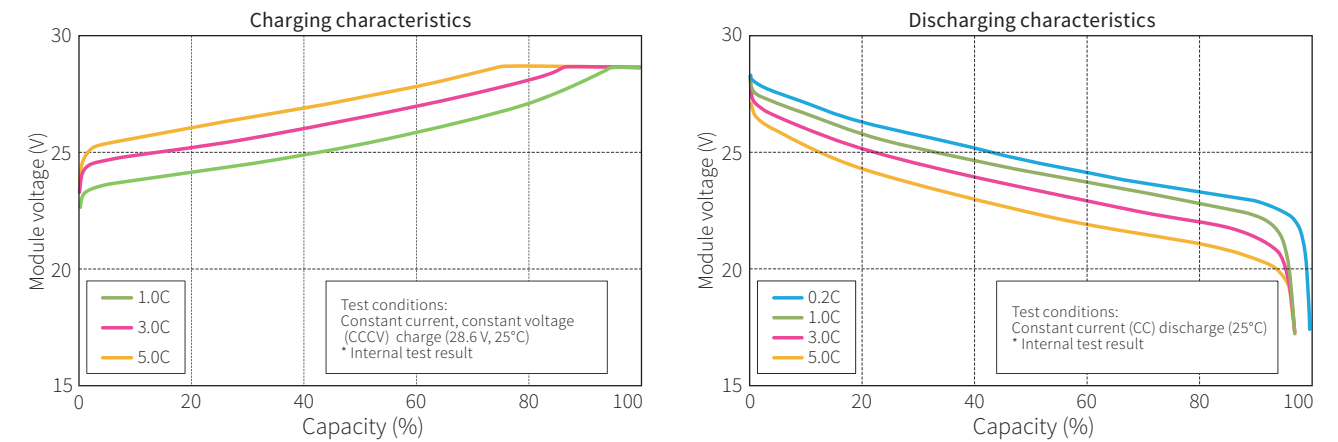
| Product name                    | SCiB™ Industrial Pack (24V)   |  | SCiB™ Industrial Pack (48V)                     |
|---------------------------------|---|--|---|
| Model name                      | FP01101MCB01A   | FP01101MCB01A×2unit                        | FP01101MCB02A×2unit                             |
| Module configuration            | Single configuration  | 2 in parallel                              | 2 in series                                     |
| Module configuration image      |   |  |   |
| Nominal voltage                 | DC25.3V   |  | DC50.6V   |
| Voltage range                   | DC16.5 to 29.7V   |  | DC33.0 to 59.4V                                 |
| Rated capacity                  | 22Ah  | 44Ah                                       | 22Ah  |
| Nominal energy                  | 556Wh   | 1113Wh                                     | 1113Wh  |
| Maximum allowable current       | 125A(200 seconds)   | 150A(200 seconds)                          | 125A(200 seconds)                               |
| Charging method                 | CCCV constant current/constant voltage(V=28.6V)   |  | CCCV constant current/constant voltage(V=57.2V) |
| Dimensions                      | W247×D188×H165mm  | Using two batteries (W247 x D188 x H165mm) |   |
| Weight                          | Approx. 8kg   | Approx. 16kg                               | Approx. 16kg                                    |
| Ambient temperature for use     | -30 to 55°C (35°C or less is recommended)   |  |   |
| Ambient temperature for storage | -30 to 55°C (35°C or less is recommended)   |  |   |
| Humidity                        | 85%RH or less (without dew condensation)  |  |   |
| Dust-/Water-proof               | IP53 or equivalent  |  |   |
| Protection function             | over charge protection, over discharge protection, over current protection, high temperature protection, and low temperature protection |  |   |

Confirm the module configuration above when placing an order. SCiB™ Industrial Pack is available only for the module configuration described above.

## Product outline



## Charging/discharging characteristics(SCiB™ Industrial Pack (24V))

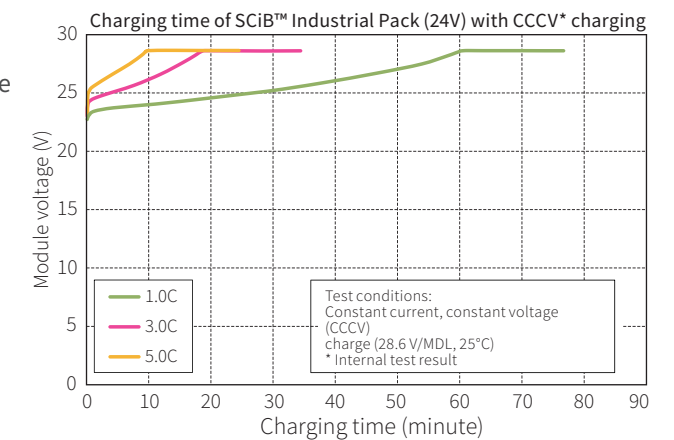


## Charging method and charging time

CCCV\* charging, which is the normal method for lithium-ion batteries, is recommended for charging of the SCiB™ Industrial Pack.




For SCiB™ Industrial Pack (24V): CV = 28.6V  
 For SCiB™ Industrial Pack (48V): CV = 57.2V

\* CCCV: Constant Current Constant Voltage



Note: The graphs and data above do not guarantee the product performance. These are the reference data obtained under a certain condition.

# External interface specifications

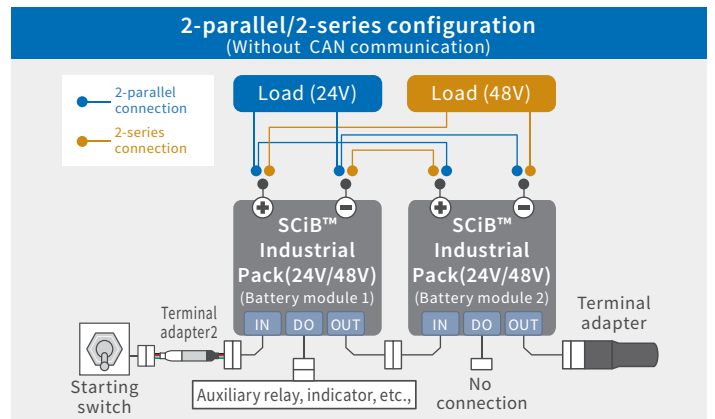
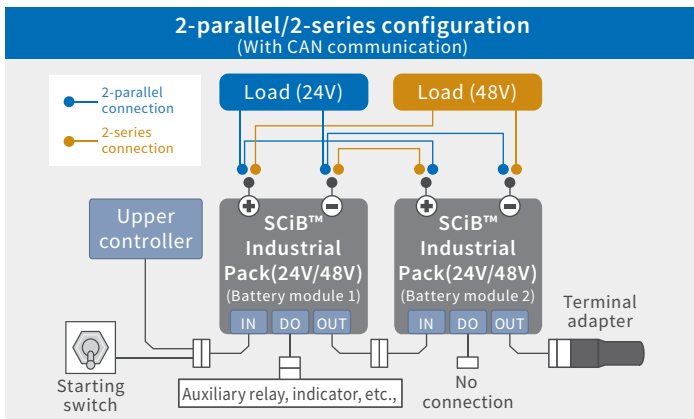
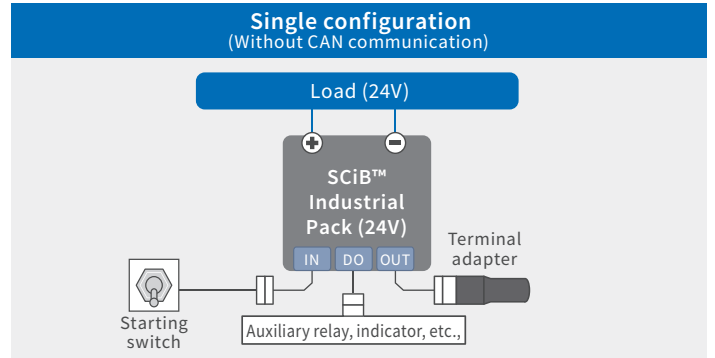
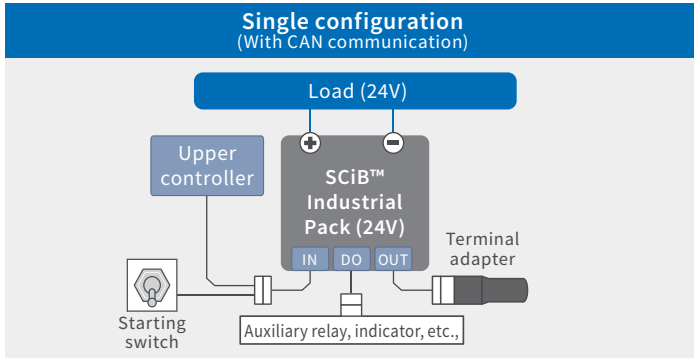
| Shape                     | Connector  | Specifications   | Remarks  |
|---------------------------|--|--|--|
| Main circuit terminal     | -  | Bolt/Nut (M6)  | To be prepared by customer   |
| IN harness<br>(250±30mm)  | Manufacturer : JST (8-pin)<br>Pack side : 08R-JWPF-VSLE-D<br>System side : 08T-JWPF-VSLE-D*1                             | Upstream transmission, digital input<br>1ch: CAN communication (CAN2.0B, 250 kbps)<br>3-point: Starting signal, CAN address assignment, module number recognition  | If the CAN communication is not used, connect the terminal adapter 2. <br>Terminal adapter 2 (FMW-GAA0064 (Option))<br>(This is not required for SCiB™ Industrial Pack (24V) single configuration.) |
| DO harness<br>(250±30mm)  | Manufacturer : JST (6-pin)<br>Pack side : 06R-JWPF-VSLE-D<br>System side : 06T-JWPF-VSLE-D*1                             | Digital output (FET output: Up to 30V, 20mA), power source<br>2-point: SOC output (The remaining SOC appears in four steps (2 bits).)<br>3-point: Warning output*3 (low voltage, overvoltage, high temperature)<br>1-point: DC 5V power source (up to 25 mA) | You can connect auxiliary relay or indicators. If you use the external power source other than the DC 5V internal power source, No.5 pin of the IN harness is the GND.                              |
| OUT harness<br>(250±30mm) | Manufacturer : JST (8-pin)<br>Pack side : 08T-JWPF-VSLE-D<br>System side: Terminal adapter (supplied with the product)*2 | Output to the Battery module 2<br>1ch: CAN communication (CAN2.0B, 250 kbps)<br>3-point: Starting signal, CAN address assignment, module number recognition  | Connect the terminal adapter to the module for single use or Battery module 2 for two series or parallel use. <br>Terminal adapter (FMW-GAA0059 (Option))   |

\*1 Connectors on the device side shall be prepared by customer.

\*2 For two series or parallel use, connect the OUT harness on the Battery module 1 to IN harness on the Battery module 2, then connect the terminal adapter to OUT harness on the Battery module 2.

\*3 We recommend customer to equip the circuit on system side to shut down the current when detecting DO warning output.

## System configuration



\* When you use CAN communication, prepare the terminating resistor on the upper controller side.

## Safety precautions

- Do not use this product for facilities in which there is a risk to human life or a disruption to public functionality if the product fails or malfunctions (nuclear power generator controls, aerospace applications, traffic equipment, life support equipment, safety equipment, and others).
- This product is produced under strict quality controls, however it may malfunction depending on the operating environment and conditions. Please consider countermeasure design (redundancies, failsafe measures, etc.) if using this product in facilities in which failure of the product would be expected to cause a great loss or accident.
- The operating environment must be within the range of specifications noted in the catalog and instruction manuals. Using the product outside the specified range may cause injury a fire or some other accident.
- Be sure to carefully read the instruction manuals before using this product so that you can use it correctly.
- Toshiba is not responsible for any losses related to malfunctions or abnormalities in equipment or devices connected to the product when the product fails or malfunctions, including losses from other secondary repercussions.
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<Agent>

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