

Assist Wheel Drive  
EW1A Series  
User Manual  
**DRAFT**

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# Chapter 1 General Information

This chapter provides an overview of assist wheel drives.

## Assist wheel drive

The Assist wheel drive makes it easy to convert carts and trolleys to electric assisted system, reducing the load for transporting heavy loads.

## List of product reference and function

### Assist wheel drive main unit reference and function

Product description	Reference	Wheel diameter	External brake
EZW150I Main unit (without external brake)	EW1A-150SNA	150mm	-
EZW150I Main unit (with external brake)	EW1A-150SNB	150mm	✓
EZW160M Main unit (without external brake)	EW1A-160MNA	158mm	-

### Controller reference and function

Product description	Reference	Power button	Stop pushbutton	status indication light
Assist wheel drive controller with stop pushbutton (non-illuminated)	EW9Z-1AC1R	✓	✓ (non-illuminated)	✓
Assist wheel drive controller with stop pushbutton (illuminated)	EW9Z-1AC2R	✓	✓ (illuminated)	✓
Handle-type controller with battery charge status LED indicator	EW9Z-1ARH2	✓	-	✓
Handle-type controller without battery charge status LED indicator	EW9Z-1ARH1	-	-	-

### Battery reference and type

Product description	Reference	Internal/External	Battery type	Capacity
Internal battery 3 Ah (*1)	EW9Z-1BINT03V	Internal Battery	NiMH battery	3Ah
External battery 9Ah	EW9Z-1BEXT09A	External Battery	NiMH battery	9Ah
External battery 15 Ah	EW9Z-1BEXT15A	External Battery	NiMH battery	15Ah

(\*1) Up to two 3Ah internal batteries can be installed in the main unit of the assist wheel drive.

### Accessory reference and function

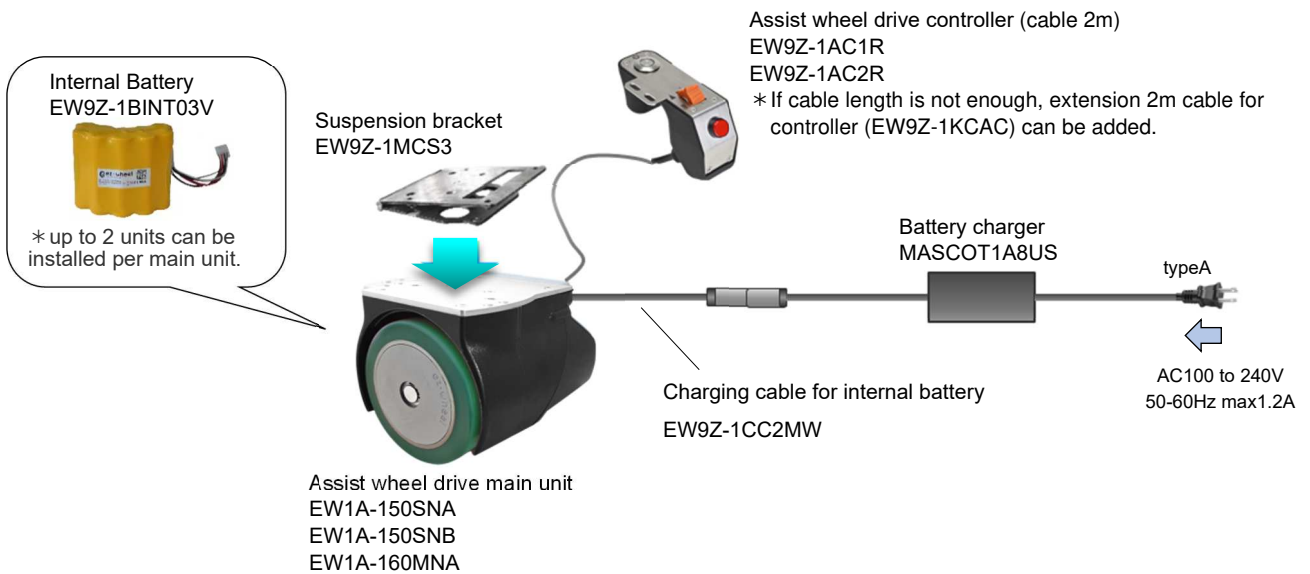
Product description	Reference	Detail description
Suspension bracket	EW9Z-1MCS3	Suspension for main unit

Joystick	EW9Z-1JY3140	Joystick for driving operation
Illuminated Pushbutton Switches	EW9Z-1PBD	Illuminated pushbutton switch for power ON/OFF
Emergency reverse button	EW9Z-1ERB2M	Push button for preventing Caught-between
Cable for handle-type controller	EW9Z-1AC3M	3m cable for connection between main unit and handle type controller (EZARH-BD, EZARH)
Extension cable for controller (2m)	EW9Z-1KCAC	Controller extension cable for Assist wheel drive controller 2m
Battery charger	MASCOT1A8US	Battery charger with cables 3.6m Input: AC100-240V, Output: DC24V 1.8A
Charging cable for internal battery	EW9Z-1CC2MW	Charging cable for internal battery 2m
Connection cable for external battery	EW9Z-1BCEXT3M	3m cable for connection between external battery and main unit
Connection cable for external battery (not an option)	EW9Z-1BCEXT2MF	3m cable for connecting an external battery (not an option) to the main unit

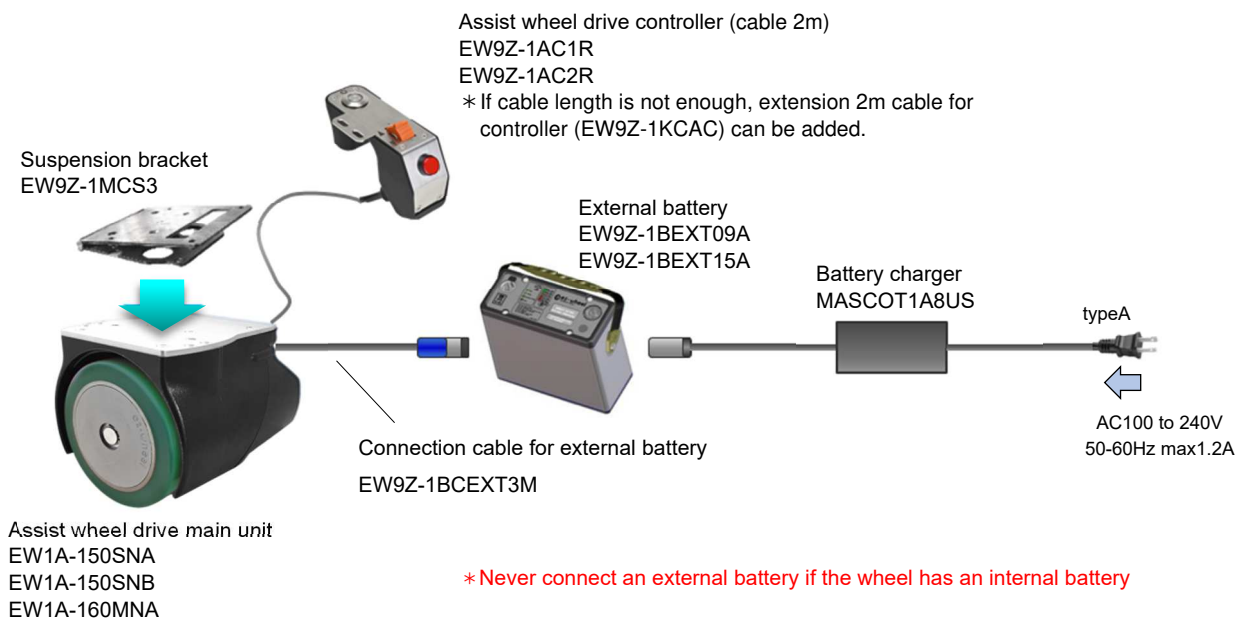
## System configuration

This section describes the basic system configuration for assist wheel drives.

### Assist wheel drive controller + Internal battery

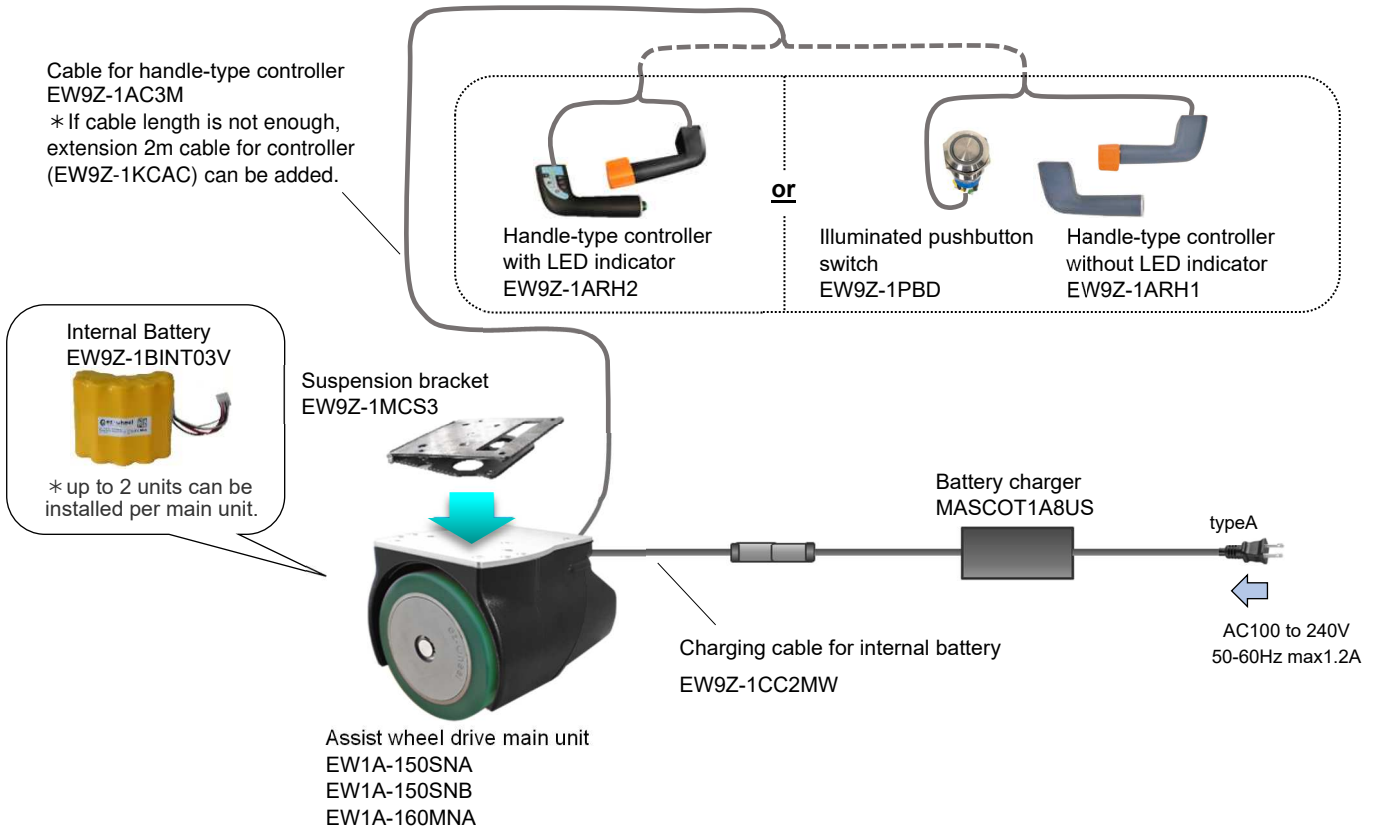


### Assist wheel drive controller + External battery

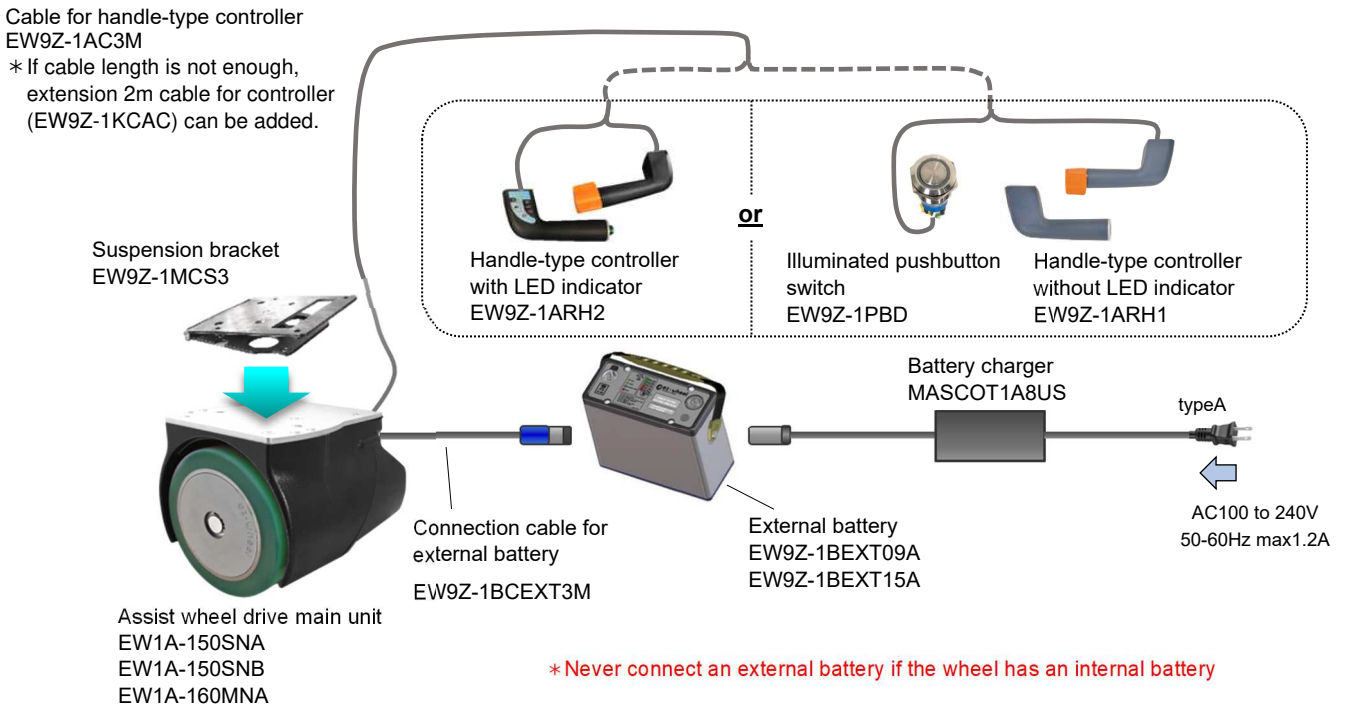




## Handle-type controller + Internal battery



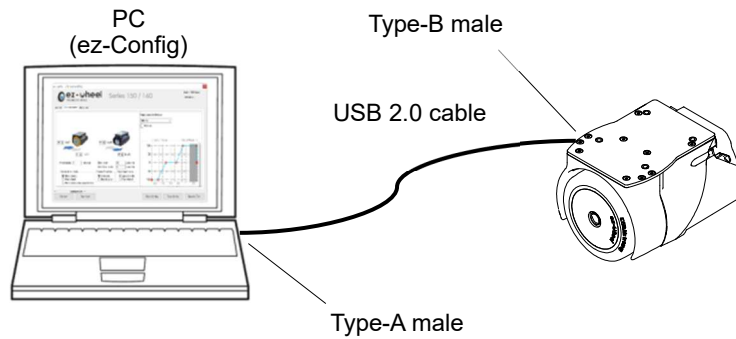
## Handle-type controller + external battery



## ez-Config

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ez-Config is software that allows you to configure the speed and interface settings of the assist wheel drive and the controllers. Setting data can be read and written by connecting a PC and the assist wheel drive with a USB cable (commercially available). Please use a USB 2.0 Type-A male to Type-B male USB cable (commercially available).





## Chapter 2 Specification

This chapter describes the specifications of each part of the assist wheel drive.

### Technical specification

The specifications of products are as follows.

#### Assist wheel drive main unit specification

Reference	EW1A-150SNA	EW1A-150SNB	EW1A-160MNA
Wheel diameter	150mm		158mm
Wheel Material	Soft polyurethane (Hardness: Shore A63)		Polyurethane (Hardness: Shore A70)
Rated voltage	DC24V		
Operating voltage range	DC 16 to 30V		
Rated current / nominal	13A, at 170W (S3, 15% duty cycle, 5 min max)		10A, at 130W (S1)
Maximum current	20A		16A
Nominal power	170W		130W
Speed range (traction)	0 to 5km/h		
Rated speed	166rpm		167rpm
Rated driving force (conveying force)	15daN at 4km/h		9daN at 5km/h
Peak pushing effort	35daN		27daN
Peak torque	27Nm		22Nm
Brake torque (external brake)	-	32Nm (*1)	-
Max. transport load	1000kg(*2)		750kg(*2)
Max. vertical load	400kg		50kg
Motor type	DC Brushless Motor		
Gearbox	2-stage helical gear		
Optional Connectors	DC5V output x 1, DC24V output x 2		
USB port	Type-B (ez-Config connection)		
Ambient operating temperature	-10°C to +40°C (with no icing)		
Atmosphere of use	No corrosive gases in the surrounding area		
IP index	IP43		IP66 (*3)
Location of use	indoor		
Indicative lifespan (*4)	3,000 hours/10,000km		2,000 hours/5,000 km
Product weight	10kg	11kg	6kg

(\*1) The external brake is a non-excitation actuated type. (It is released when excitation voltage is applied.)

(\*2) Indicative values, but depending on the environment/integration

(\*3) Excluding interface part

(\*4) Values for reference, based on standard condition testing, may vary with different application cases.

## Battery specification for Assist wheel drive

Reference	EW9Z-1BINT03V	EW9Z-1BEXT09A	EW9Z-1BEXT15A
Internal/External (*1)	Internal Battery	External Battery	
Battery type	NiMH battery		
Capacity	3Ah (70Wh)	9Ah (210Wh)	15Ah (350Wh)
Continuous mileage (*2)	2.8 km (0.7 hours)	8.4 km (2.1 hours)	14 km (3.5 hours)
Charging time	1.5 hours	4.5 hours	7.5 hours
Ambient operating temperature	-10°C to +40°C (with no icing)		
Atmosphere of use	No corrosive gases in the surrounding area		
Indicative lifespan (*3)	2-3 years or 650 cycles (100% DOD)	2 years or 500 cycles (70% DOD)	
Product weight	1.2kg	4.9kg	6.5kg

(\*1) Up to two 3Ah internal batteries can be installed in the main unit of the assist wheel drive.

(\*2) Reference value based on continuous driving at 4 km/h.

(\*3) Values for reference, based on standard condition testing, may vary with different application cases.

## Assist wheel drive controller specification

Reference	EW9Z-1AC1R	EW9Z-1AC2R
Units	Power button	AV320220000840
	Thumb wheel	HRS209B0
	Stop button	XA1E-BV3U01Y LB1L-A1T21R
Outer Diameter of Mounting Point	φ 20 to 35mm	
Operating temperature	-25°C to +55°C (without freezing)	
Atmosphere of use	No corrosive gases in the surrounding area	
IP index	IP20	
Location of use	indoor	

## Unit specification

### Power button

Reference & Manufacturer	AV320220000840 IDEC (APEM)
Maximum voltage	DC30V
Current rating	1A (resistive load)
Illumination color	Red, green, orange (red/green mixture)
Rated voltage (illuminated part)	DC24V
Current consumption (illuminated part)	20mA

### Thumbwheel

Reference & Manufacturer	HRS209B0 IDEC (APEM)
Operating voltage range	DC5±0.5V
Current Consumption	16mA

### Stop button (in the case of EW9Z-1AC1R)

Reference & Manufacturer	XA1E-BV3U01Y IDEC
Rated insulation voltage	250V
Rated current	5A

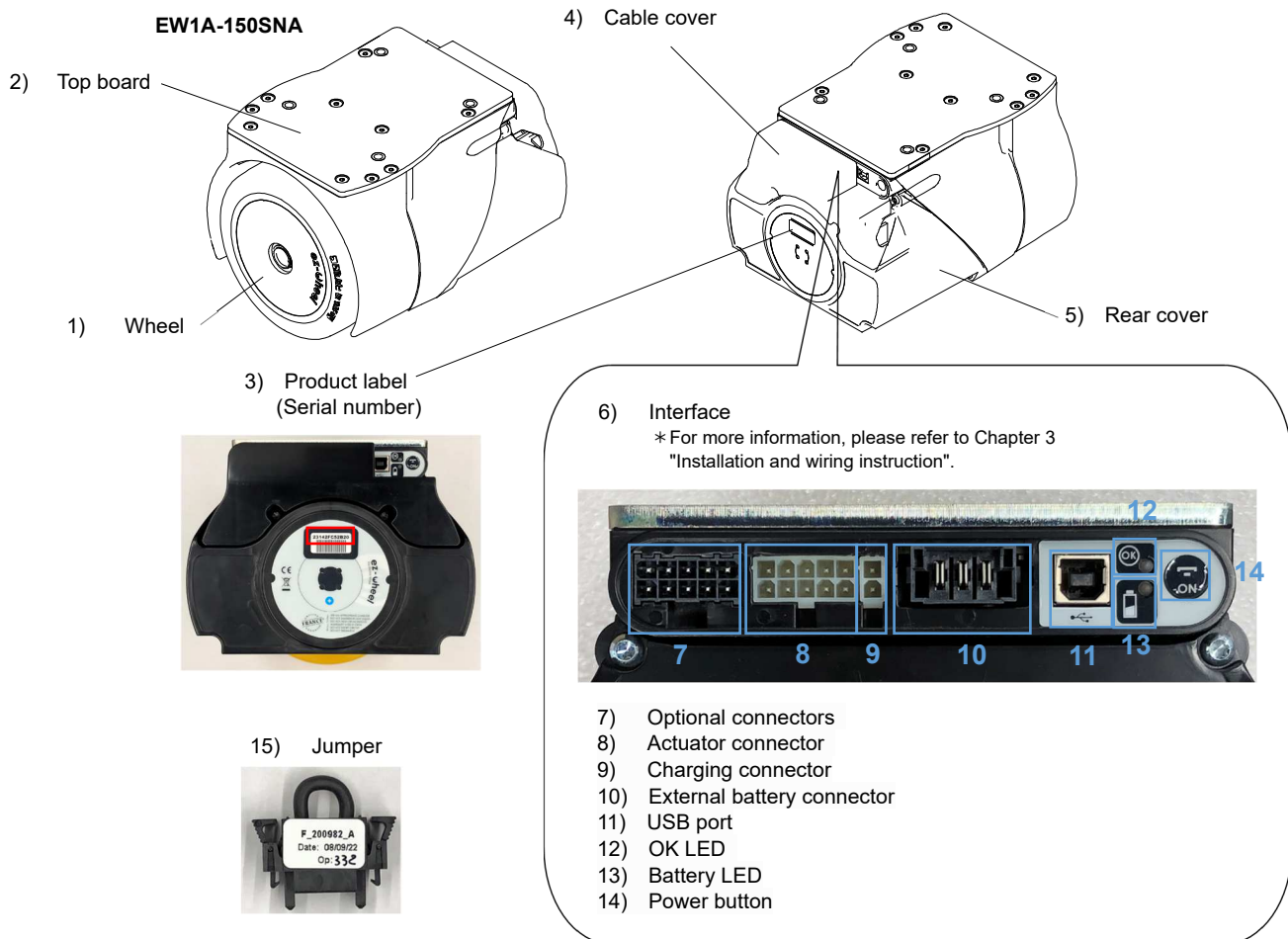
### Stop button (in the case of EW9Z-1AC2R)

Model No. (Manufacturer)	LB1L-A1T21R IDEC
Rated insulation voltage	250V
Rated current	3A
Illumination color	Red (R)
Rated voltage (illuminated part)	DC5V
Current consumption (illuminated part)	18mA (R)

## Parts description

This section describes each part of the product.

### Assist wheel drive main unit



#### 1) Wheel

It transmits the motor's power to the ground and assists in advancing or stopping a cart or other vehicle with an assist wheel drive attached.

#### 2) Top board

A top board for attaching an assist wheel drive to a cart or other equipment.

#### 3) Product label

The serial number is listed.

#### 4) Cable cover

A cover for the interface section.

#### 5) Rear cover

Covers motors and other drive units and internal batteries.

## 6) Interface

There are various connector connection ports, LED lamps, and a power button.  
For detail information, please see Chapter 3 "Installation and wiring instruction".

## 7) Optional connector

This connector can supply power from the main unit, etc.

## 8) Actuator connector

Connector for connecting the controller cable.

\* Please be sure to connect the controller to the actuator connector.  
Connecting the controller to the optional connector may cause malfunction.

## 9) Charging connector

This connector is used to connect the charging cable for the internal batteries.

## 10) External battery connector

This connector is used to connect the connection cable for the external battery when an external battery is used.

\* When using the internal battery, please install the jumper. Jumper is attached at the time of factory shipment.  
\* Never connect an external battery if the wheel has an internal battery.

## 11) USB port

This port is used to connect to a PC when configuring the assist wheel drive in ez-Config.  
Use a USB cable (USB 2.0 Type-A male - Type-B male) for connection.

## 12) OK LED

LEDs indicate the status of the assist wheel drive and other information.

Status	LED indication	Description
Normal	● green	Assist wheel drive is working properly.
Error	●● green/red blinking	Error or low battery.

## 13) Battery LED

LEDs indicate battery status and other information.

Status	LED indication	Description
Battery level high	● green	Battery level is 51% to 100%.
Battery level middle	● orange	Battery level is 31% to 50%.
Battery level low	● red	Battery level is below 30%.
Battery level 0%.	●○ red blinking	Battery level is 0%.
Charging	●○ orange blinking	Charging the battery.
Charging complete	●○ green blinking	Charging is complete. (Charger is connected.)

## 14) Power button

Power button for assist wheel drive. When a controller is connected, power can also be turned ON/OFF from the controller (except ref. EW9Z-1ARH1).

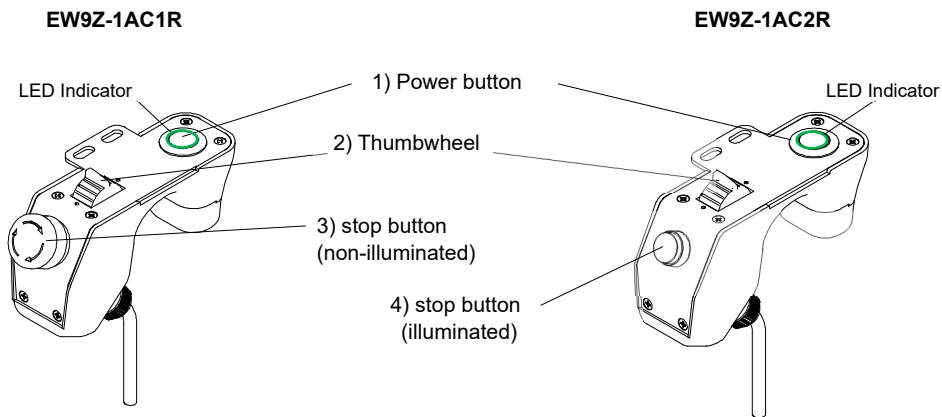
\* If you activate the assist wheel drive with the power button on the wheel, please press briefly to activate. If pressed too long, it will enter boot loader mode (OK LED: off, battery LED: red light on). In this case, you will need to wait about 30 seconds for it to start up. It is preferred to turn on/off the wheel with the controller button to avoid triggering boot loader mode.

## 15) Jumper

When using an internal battery, attach the jumper to the external battery connector. If not installed, the assist wheel drive will not operate.

# Controller

## Assist wheel drive controller



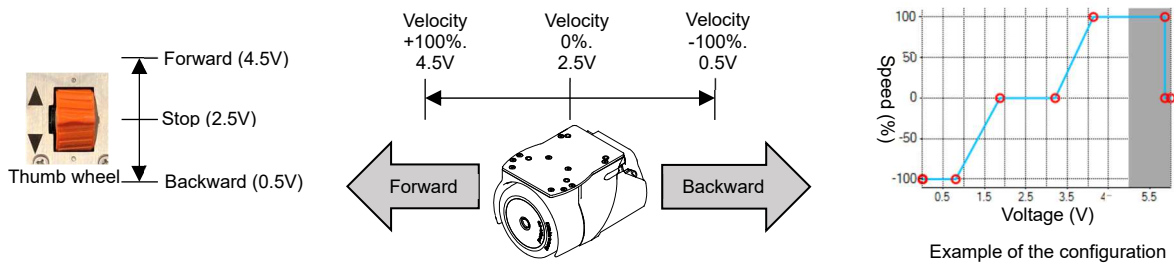
### 1) Power button

This button turns the power of the assist wheel drive on and off. The power button has LED indicator that can be used to display the status of the assist wheel drive or the remaining battery charge. Configuration is done by ez-Config. Please see ez-Config instruction manual for details.

### 2) Thumbwheel

This thumbwheel controls the rotation of the wheel on the assist wheel drive. Forward/Backward control and speed can be adjusted by tilting the lever. Detailed settings such as maximum speed and acceleration/deceleration are made in ez-Config. Please see ez-Config instruction manual for details".

Speed is controlled by changing the voltage input by operating the thumbwheel.



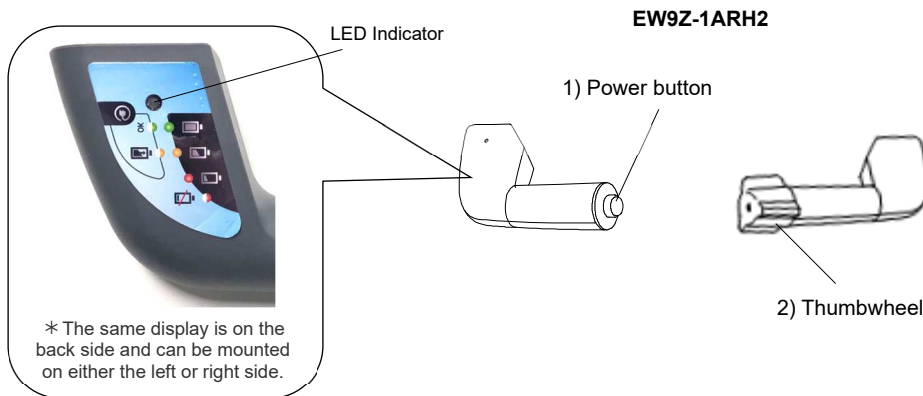
### 3) Stop button (non-illuminated) EW9Z-1AC1R

This is an alternate type button that stops the operation of the wheel on the assist wheel drive. The button is yellow mushroom-shaped. The stop is released by pull-reset (pulling) or turn-reset (rotating).

### Stop button (illuminated) EW9Z-1AC2R

This is an alternate type button that stops the operation of the wheel on the assist wheel drive. The button lights up red when the button is pressed.

## Handle-type controller



### 1) Power button

Non-illuminated button to turn on/off the assist wheel drive.  
 Alternate and momentary operation can be switched by setting ez-Config.  
 Momentary is useful to use this button as a dead men switch.  
 Please refer to Chapter ez-Config instruction manual for details.

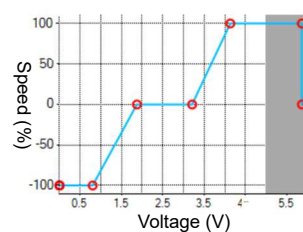
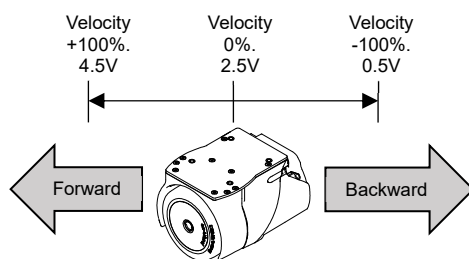
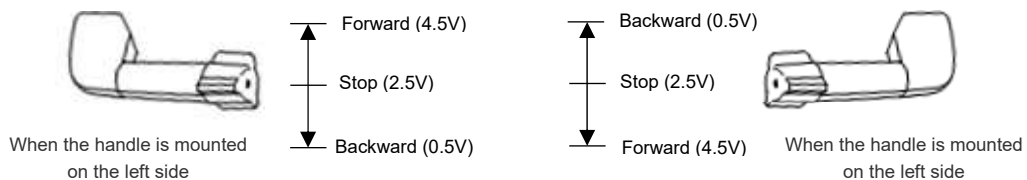
### 2) Thumbwheel

This thumbwheel controls the rotation of the wheel on the assist wheel drive. Forward/Backward control and speed can be adjusted by tilting the lever. Detailed settings such as maximum speed and acceleration/deceleration are made in ez-Config.  
 Please see ez-Config instruction manual for details".

Speed is controlled by changing the voltage input by operating the thumbwheel.

The direction of rotation of the assist wheel drive relative to thumbwheel operation varies depending on the orientation of the controller mounting.

It is possible to change the direction of Forward/Backward movement by setting ez-Config.  
 Please see ez-Config instruction manual for details.

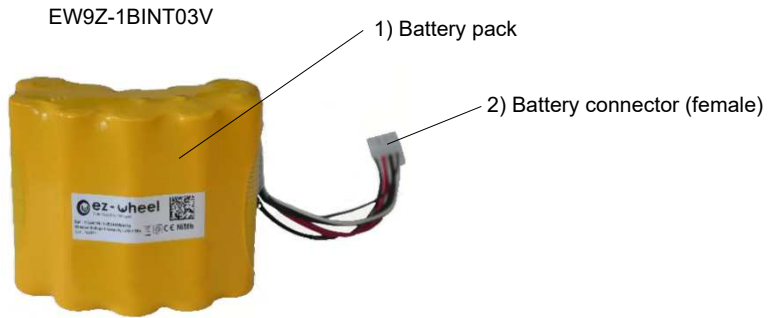


Example of the configuration

### 3) Indicator light

Assist wheel drive status display or battery level display. Configuration is done by ez-Config. Please see ez-Config instruction manual for details.

## Internal Battery



### 1) Battery pack

Battery cells are packed in the battery pack.

### 2) Battery connector (female)

Connector to connect to the main unit of the assist wheel drive.

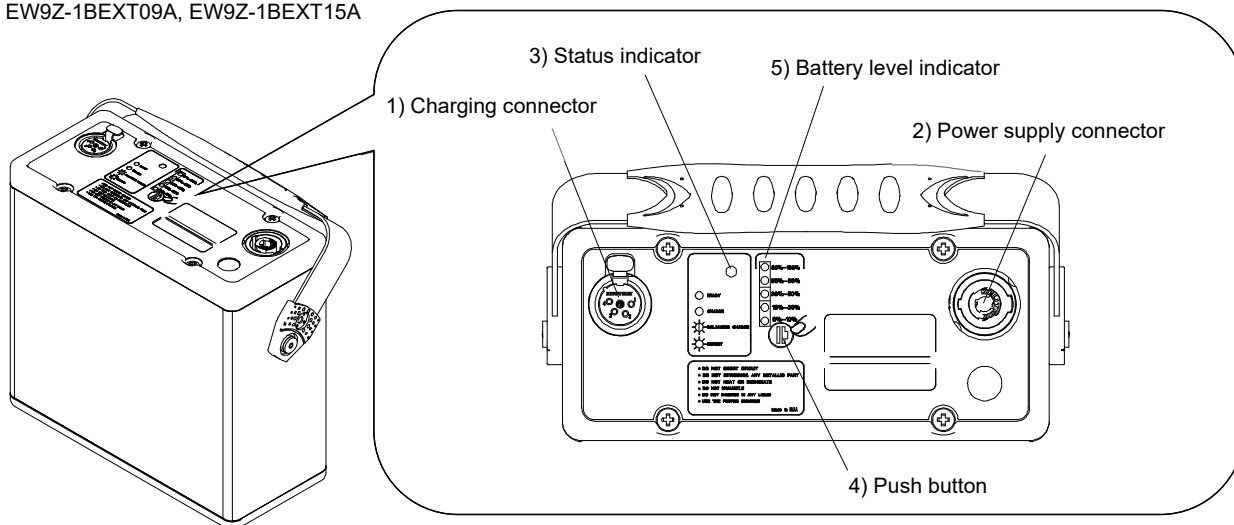


The charge level of battery must be maintained even in the event of non-use.  
Failure to maintain the battery may reduce its performance or damage it irreversibly.  
Monthly charging is recommended. Never exceed 50 days storage without charging.  
Always charge the wheel before a prolonged shutdown.  
Never leave an unused wheel totally be discharged.

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## External Battery

EW9Z-1BEXT09A, EW9Z-1BEXT15A



### 1) Charging connector

Connector for connecting a battery charger.

### 2) Power supply connector

Connector for external battery connection cable.

### 3) Status indicator

Indicates battery status with LED.

#### ■ Charging state

Status	LED indication	Description
Charging	● orange	Charging the battery.
Balancing charge	●● orange/green blinking	Battery is more than 95% charged. The current value of the charge is reduced to balance all battery cells in the battery.
Charging complete	● green	Battery is 100% charged. To compensate for natural discharge, the battery is charged by means of a minute current.
Failure	●○ red blinking	Malfunction.

#### ■ Using state

Status	LED indication	Description
Normal	● green	Power is supplied to the assist wheel drive.
Receiving regenerative current	● orange	Charging current is flowing to the battery.
Unused	○ Lights out	Battery being not used.

### 4) Pushbutton

This button is pressed to display the battery level indicator LEDs. Press once to display for about 5 seconds.



### 5) Battery level indicator

The remaining battery charging level is indicated by an LEDs.

		Battery level %				
		%	0 to10	10 to 30	30 to 50	50 to 80.
<b>LED display</b> 	80 to 100					● red
	50 to 80				● red	● red
	30 to 50			● red	● red	● red
	10 to 30		● red	● red	● red	● red
	0 to 10	● red	● red	● red	● red	● red



The charge level of battery must be maintained even in the event of non-use.

Failure to maintain the battery may reduce its performance or damage it irreversibly.

Monthly charging is recommended. Never exceed 50 days storage without charging.

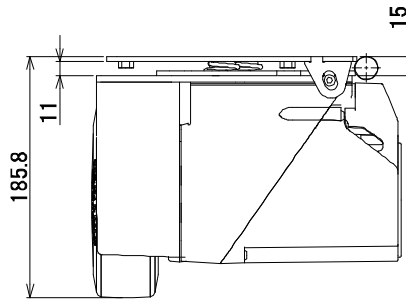
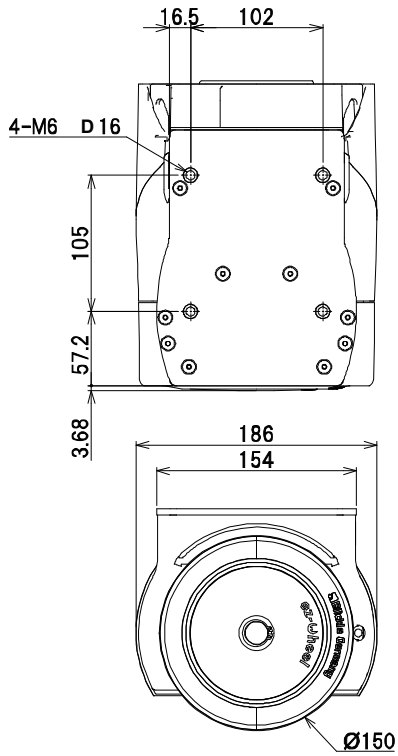
Always charge the wheel before a prolonged shutdown.

Never leave an unused wheel totally be discharged.

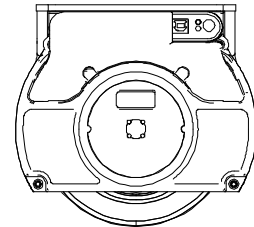
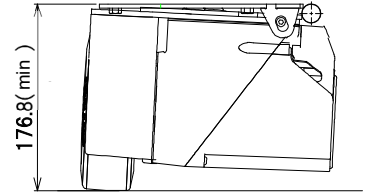
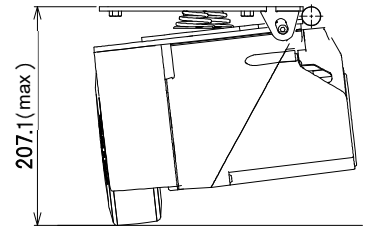
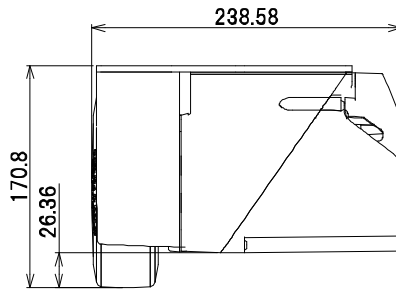
# Dimensions

## Assist wheel drive main unit

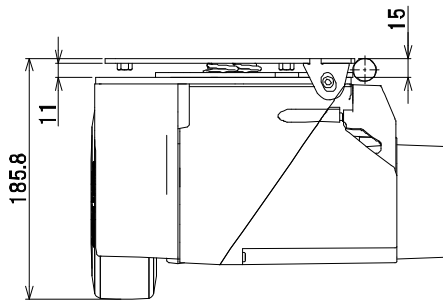
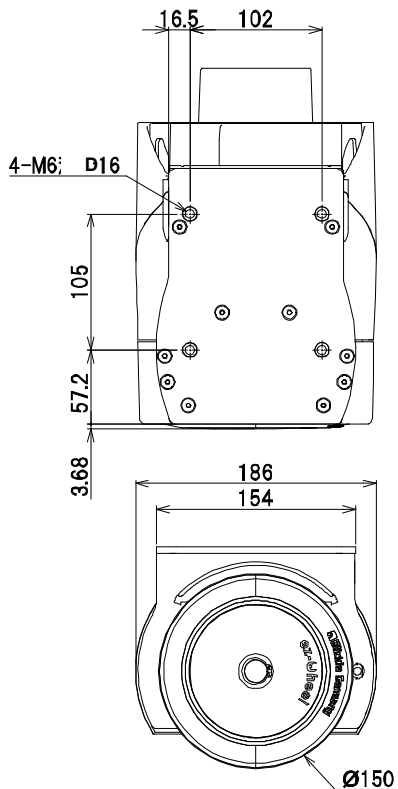
EW1A-150SNA



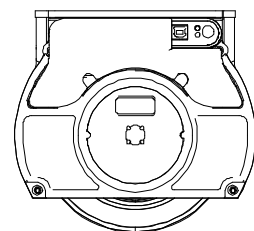
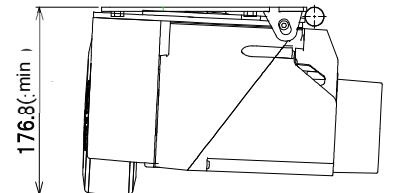
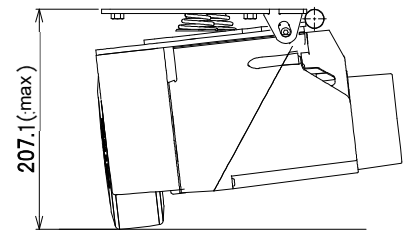
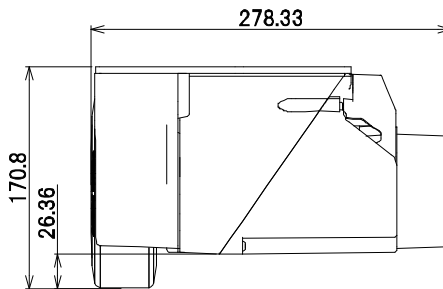
In nominal position  
with suspension bracket



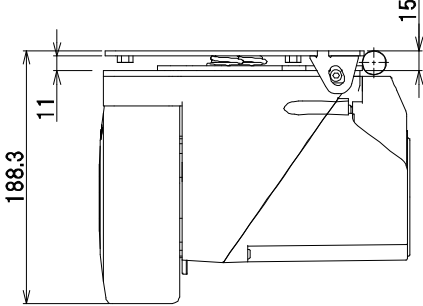
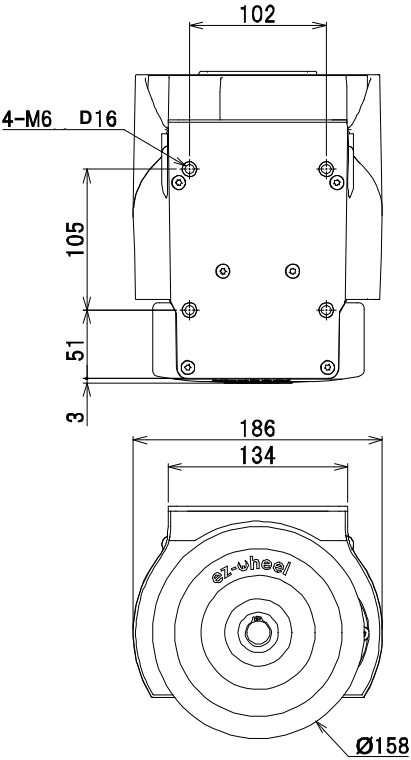
EW1A-150SNB



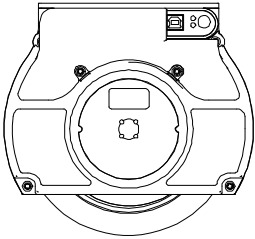
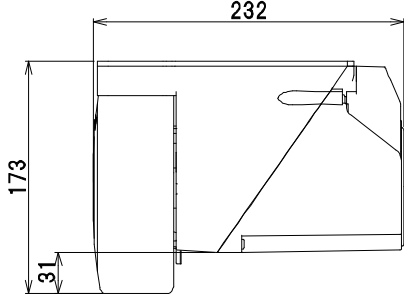
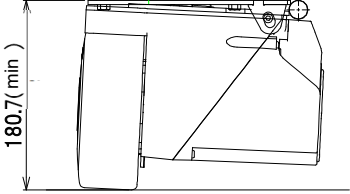
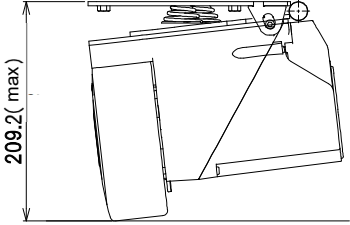
In nominal position  
with suspension bracket



EW1A-160MNA

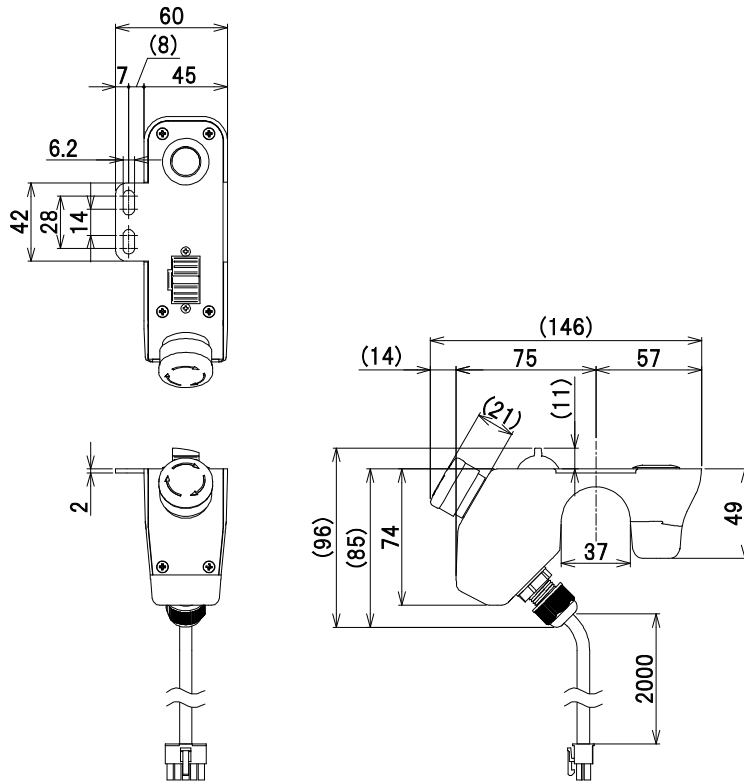


In nominal position with suspension bracket

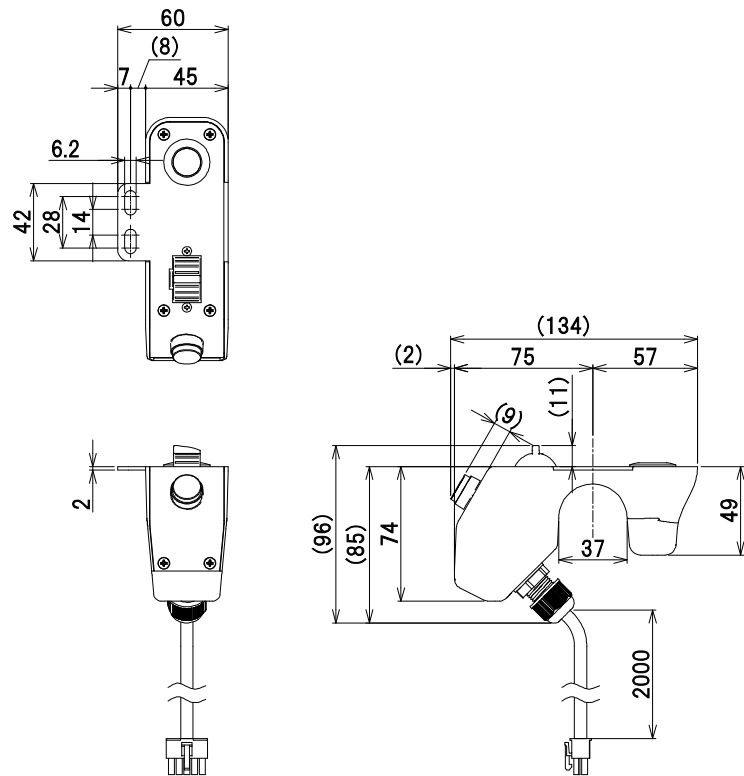


# Controller

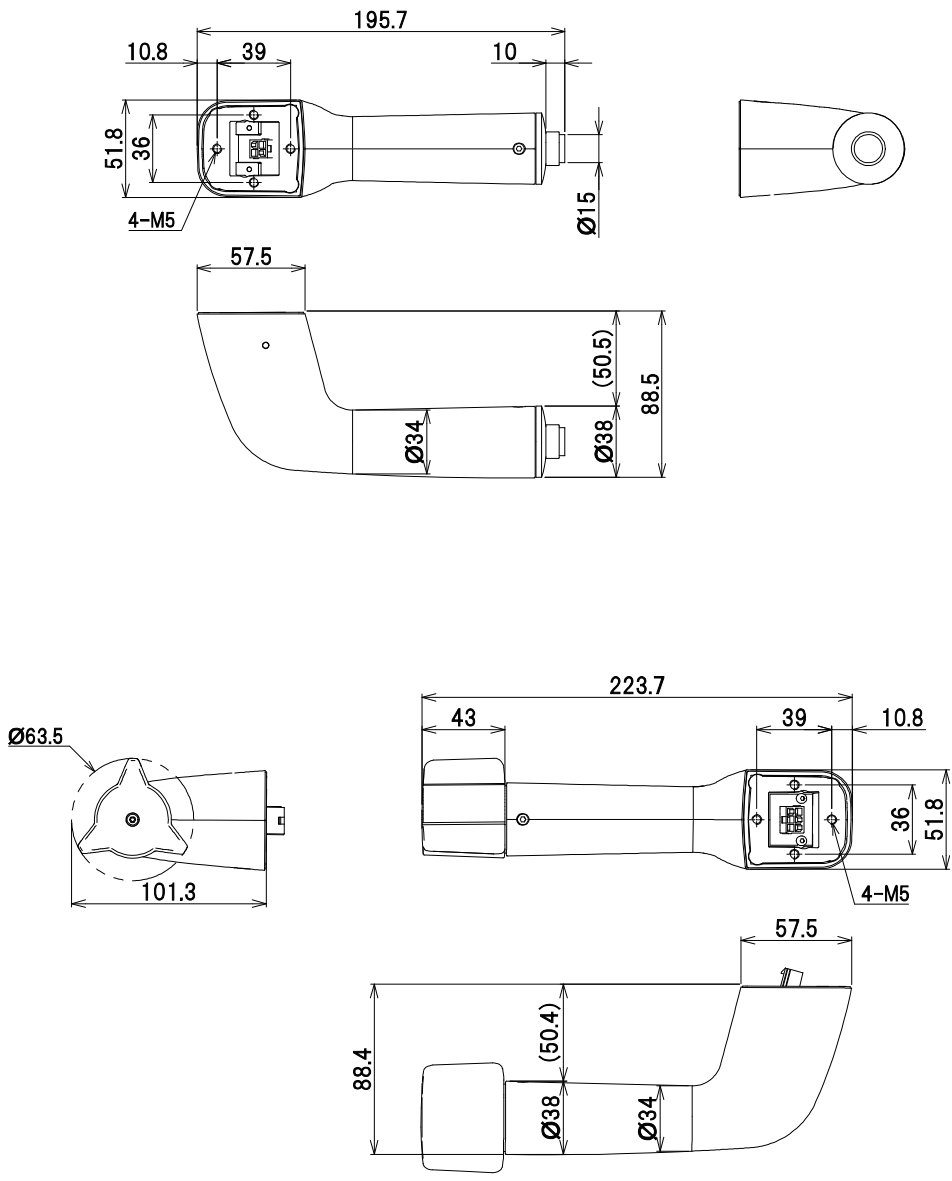
## Assist wheel drive controller: EW9Z-1AC1R



## Assist wheel drive controller: EW9Z-1AC2R

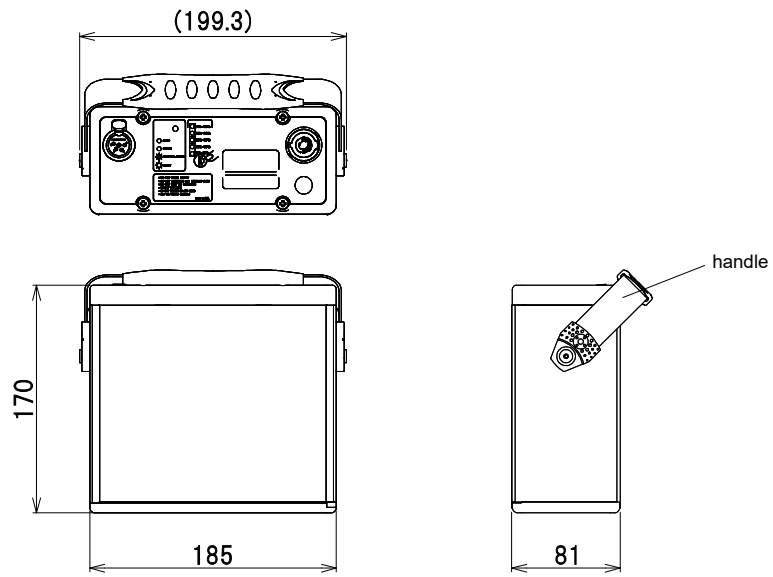


Handle-type Controller: EW9Z-1ARH2

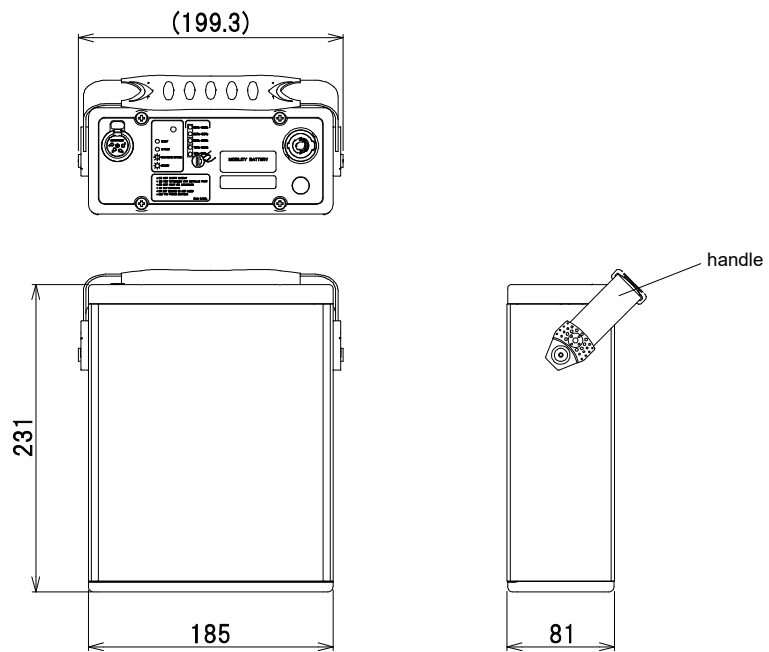


## Battery

### External battery 9Ah: EW9Z-1BEXT09A



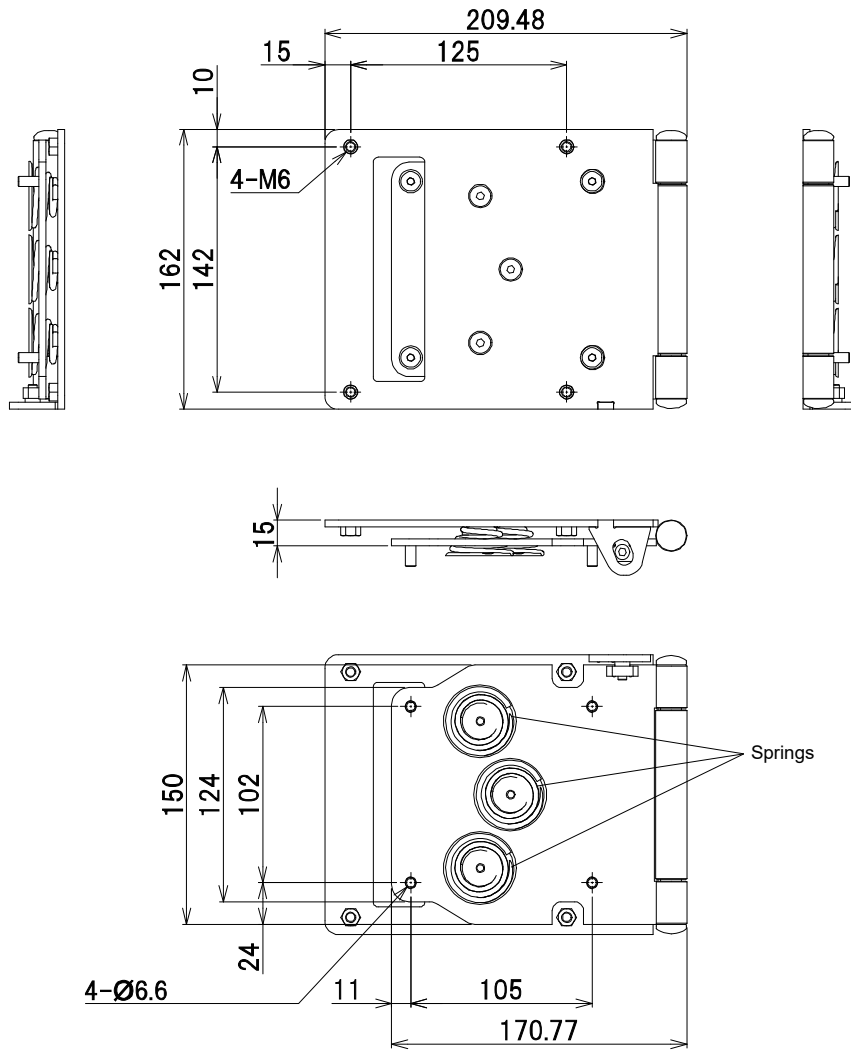
### External battery 15Ah: EW9Z-1BEXT15A



## Accessory

### Suspension Bracket: EW9Z-1MCS3

Four M6x16 hexagon socket countersunk screws for mounting on the main body of the assist wheel drive are included.



# Chapter 3 Installation and wiring instructions

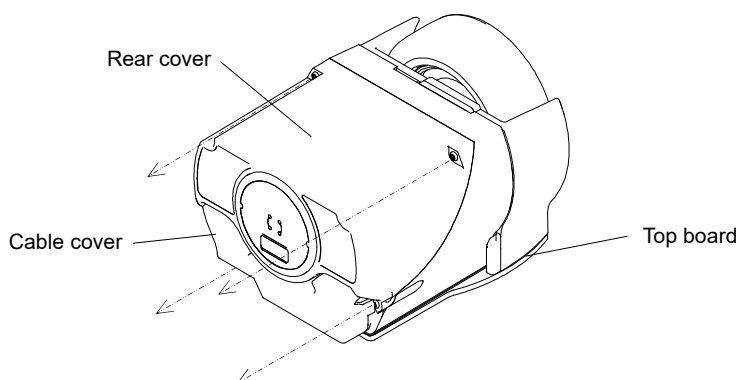
This chapter describes how to install and wire the assist wheel drive.  
Please be sure to correctly understand the contents and use the assist wheel drive properly.

## Internal battery installation instructions

This section describes how to install the internal battery.

### 1. remove the cable cover & rear cover

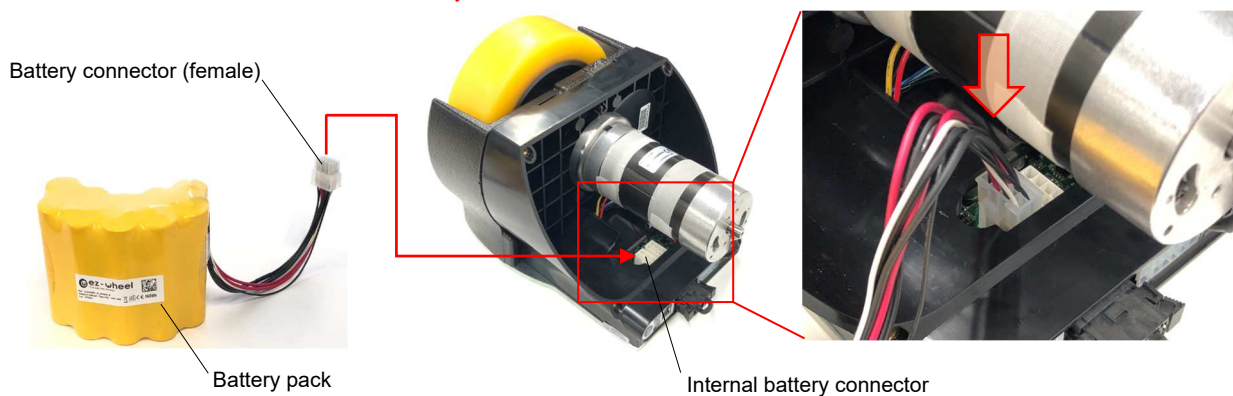
With the top board side of the assist wheel drive unit down, remove the cable cover (Two M4x12 torx screws) first to be able to remove the rear cover screws, remove the screws (four M4x30 torx screws) holding the rear cover in place, and remove the rear cover. Please use a torque screwdriver of size T15.



### 2. internal battery connection

Connect the battery connector (female) of the internal battery to the internal battery connector of the assist wheel drive body.

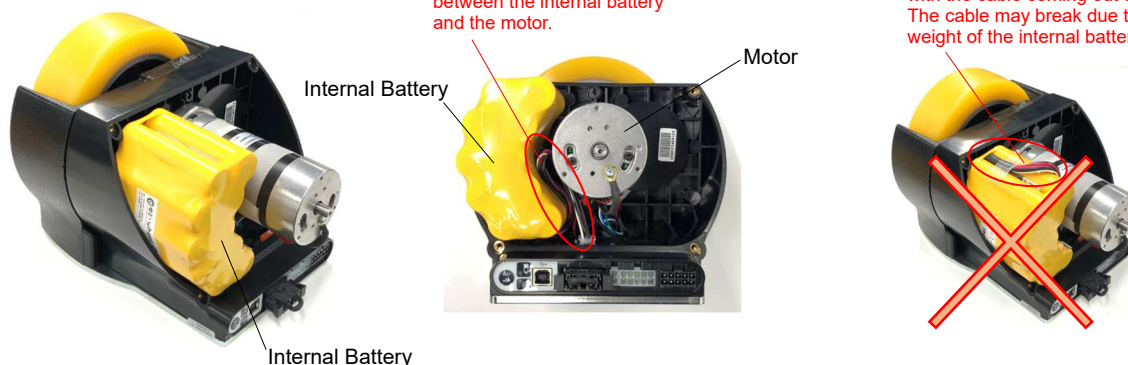
\* Make sure the connector is inserted all the way.



### 3. internal battery installation : To install only one internal battery

\* The cable should be placed between the internal battery and the motor.

\* Please do not place the side with the cable coming out on top. The cable may break due to the weight of the internal battery.

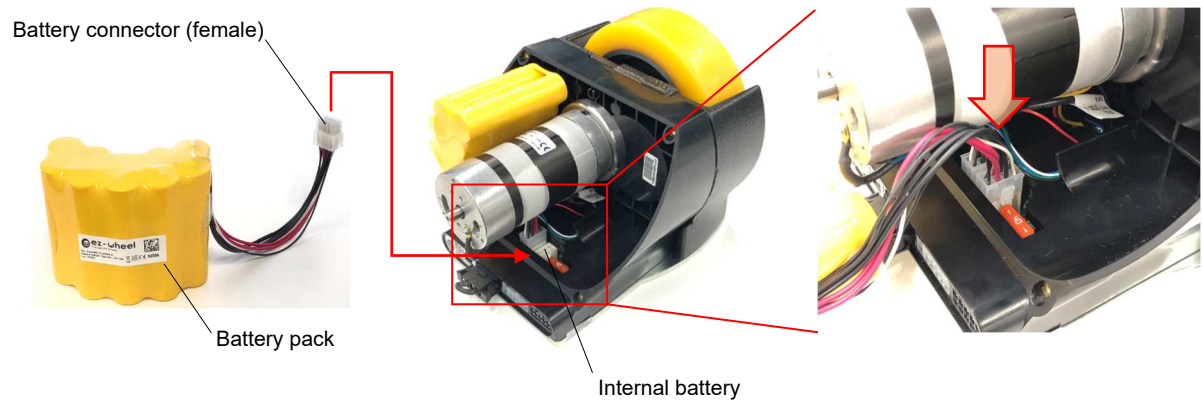




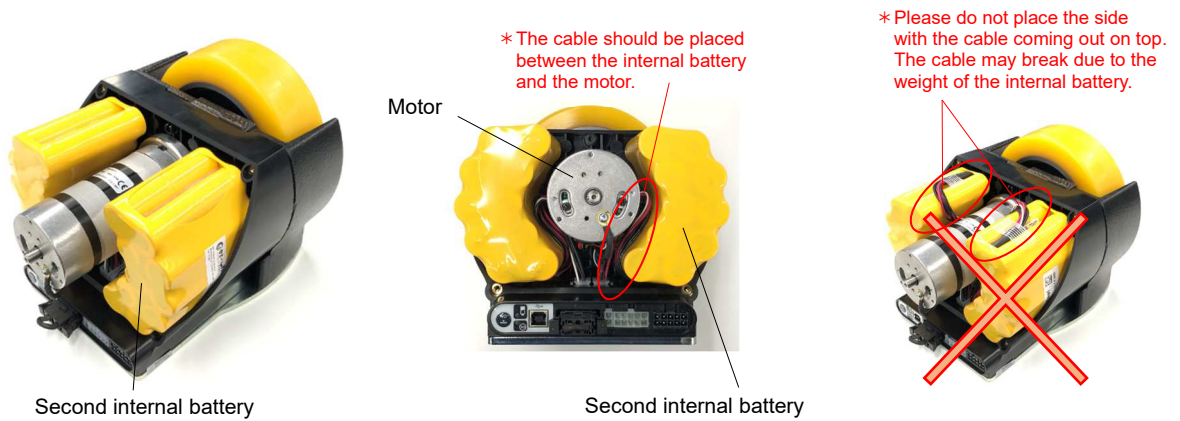
**4. internal battery installation : To install the second internal battery**

Connect the battery connector (female) of the second internal battery to the other end of the connector.

\* Make sure the connector is inserted all the way.



Install the second internal battery in the main body of the assist wheel drive.



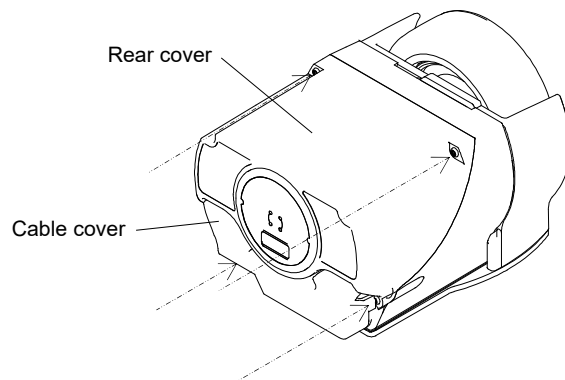
**5. Cable cover & rear cover installation**

Replace the cable cover and rear cover removed in the first step and fasten with the removed screws.

(two M4x12 torx screws for the cable cover, four M4x30 torx screws for the rear cover)

\* Please be careful not to get the cable caught between the rear cover and the main unit.

\* The tightening torque for the screws is 2 Nm; do not exceed this torque.

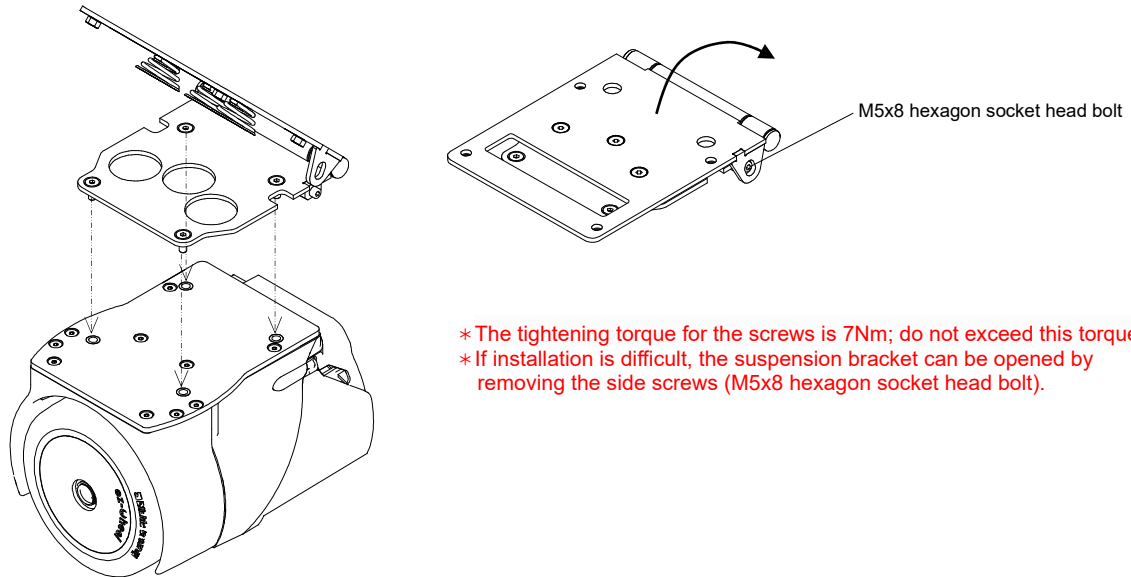


## Installation instructions of assist wheel drive main unit

This section describes how to install the assist wheel drive main unit.

### Suspension Bracket Installation

Attach the suspension bracket to the main unit using the supplied screws (four M6x16 hexagon socket countersunk screws). As shown in the figure below, the suspension bracket can be installed without opening it.



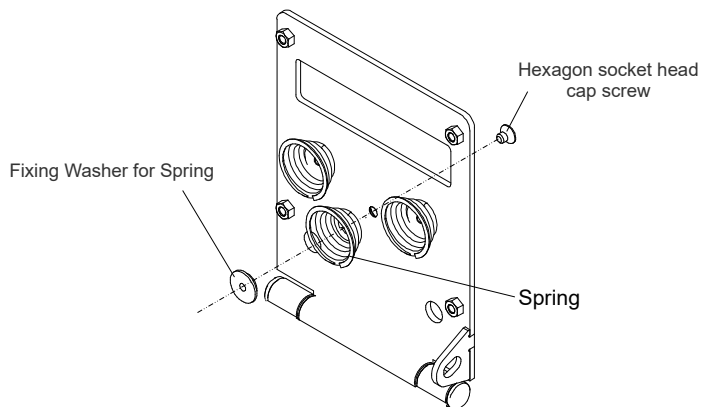
#### Adjustment of the number of springs in the suspension bracket

If the total weight of the load is less than 500 kg, remove the middle spring and use two springs.

If the total weight is between 500 and 1000 kg, it is not necessary to remove the springs.

#### How to remove the spring from the suspension bracket

By removing the hexagon socket countersunk screw, the spring and the fixing washer for the spring can be removed.

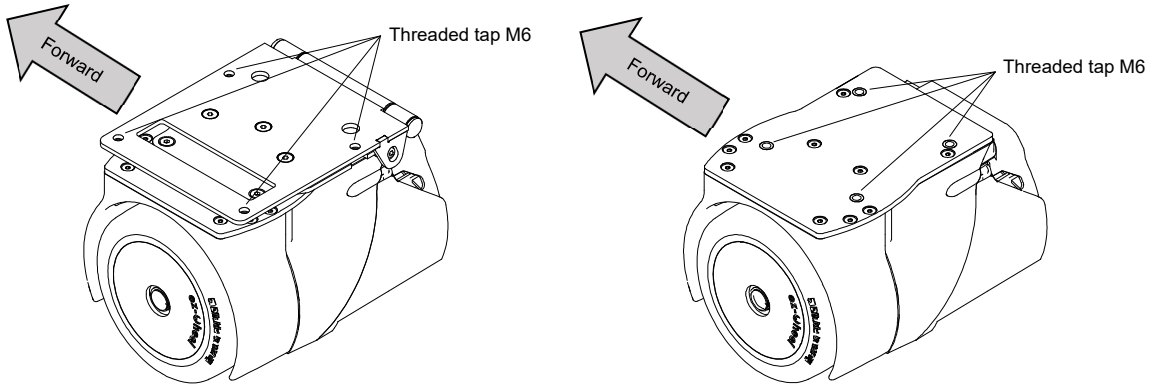


## How to install to trolleys, carts etc...

Install using the M6 taps (4 locations) on the suspension bracket.

For detail dimensions, please refer to Chapter 2 "Specifications: Dimensions".

\*When facing the direction of travel, the wheel should be installed with the wheel on the left side.



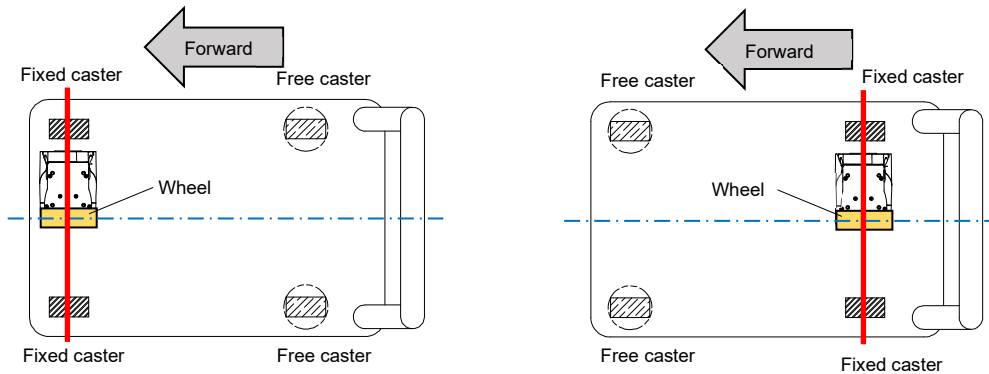
\*If the suspension bracket is not used, please install directly with the M6 threaded taps (4 locations) on the assist wheel drive.

## Installation examples of assist wheel drive

The following are installation examples of assist wheel drive main unit to a trolley.

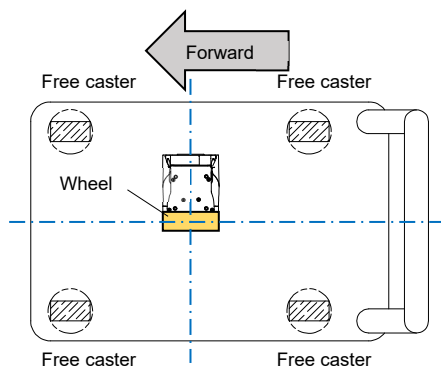
### In the case of the front or rear casters of the trolley are fixed casters

When installing on a trolley as shown in the figure below, the main unit of the assist wheel drive is installed so that the wheel is on the same axis as the fixed casters when viewed from above, and the wheel is centered on the width of the cart as much as possible.



### In the case of all casters of the trolley are flexible casters

When installing on a trolley as shown in the figure below, the main unit of the assist wheel drive is installed so that the wheel is at the center between the casters (as close to the center of gravity as possible) when viewed from above.



The actual structure of the trolley and the position of the center of gravity should be taken into consideration before determining the mounting position.

## How to connect the charging cable for the internal battery

This section describes how to connect the charging cable for the internal battery.

### 1. connect the charging cable for the internal battery

Connect the connector (female) of the charging cable for the internal battery to the charging connector on the interface of the main unit of the assist wheel drive.

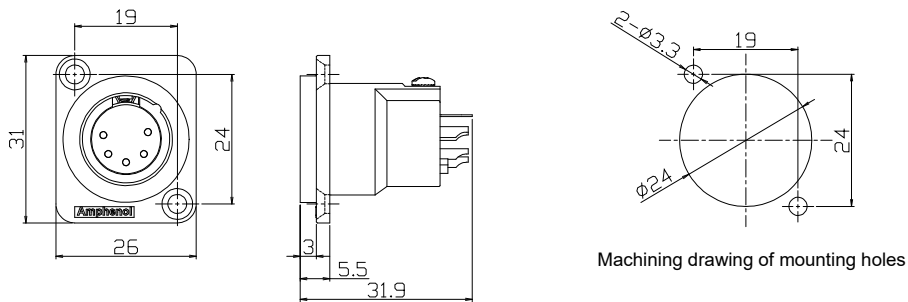
\* Make sure the connector is inserted all the way.



### 2. installation of the charging cable for the internal battery

Attach the flanged XLR connector (5-pin) to desired location.

The flanged XLR connector (5-pin) should be installed in a location where it is easy to insert the battery charger connector.



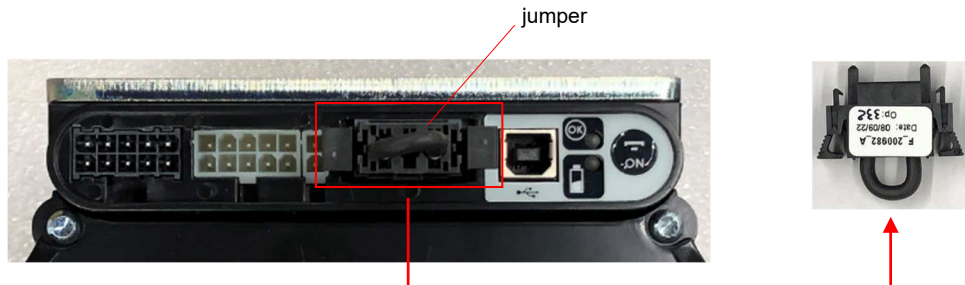
## How to connect an external battery

This section describes how to connect an external battery.

### 1. Remove jumper

Remove the jumper attached to the external battery connector of the assist wheel drive main unit.

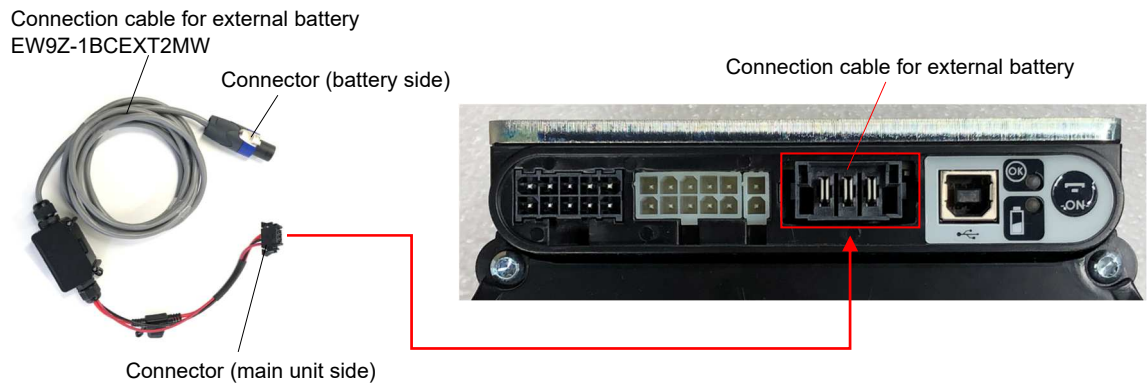
\* Jumper is not used when an external battery is used.



### 2. Connect the cable for external battery

Connect the connector of the external battery connector(main unit side) to the main unit of the assist wheel drive.

\* Make sure the connector is inserted all the way.

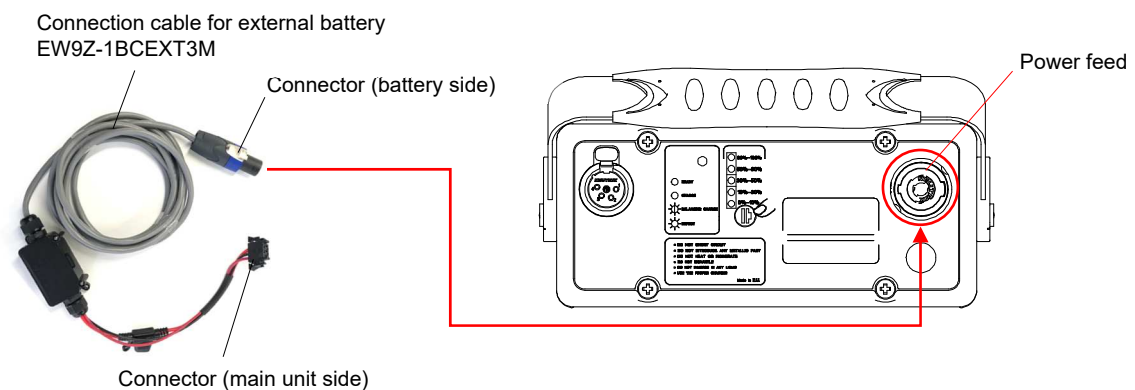


### 3. Connect external battery

Connect the connector (battery side) of the connection cable for the external battery to the power supply connector of the external battery. After insertion, turn the cable connector clockwise until it clicks into place.



Never connect an external battery if the wheel has an internal battery.

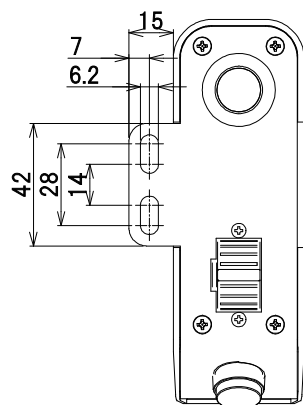


## Installation and connection instructions of assist wheel drive controller

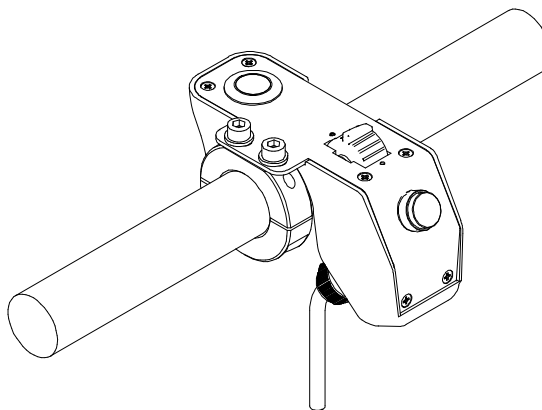
This section describes the installation and connection procedures of an assist wheel drive controller (EW9Z-1AC1R, EW9Z-1AC2R).

### Installation of assist wheel drive controller

D-cut split shaft collar is recommended for mounting on handles ( $\phi$  20-35 mm).



Mounting hole



Assist wheel drive controller cables and extension cables should be secured to the cart or other equipment to prevent slack. The wire may break if it gets caught in a wheel, caster, etc..

### How to connect an assist wheel drive controller

Connect the female connector on the assist wheel drive controller to the actuator connector on the main unit of the assist wheel drive.



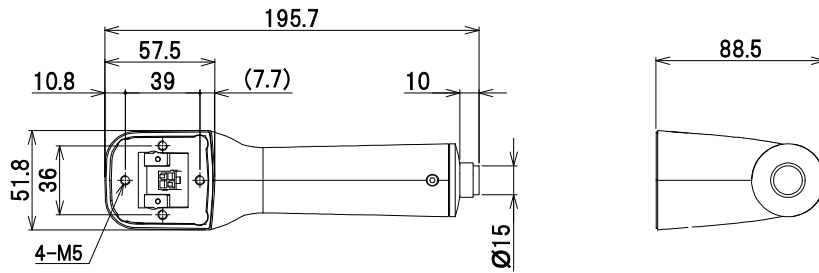
Connecting to the optional connector (black) may cause malfunction. Make sure the connector is inserted all the way.

## Installation and connection of handle-type controllers

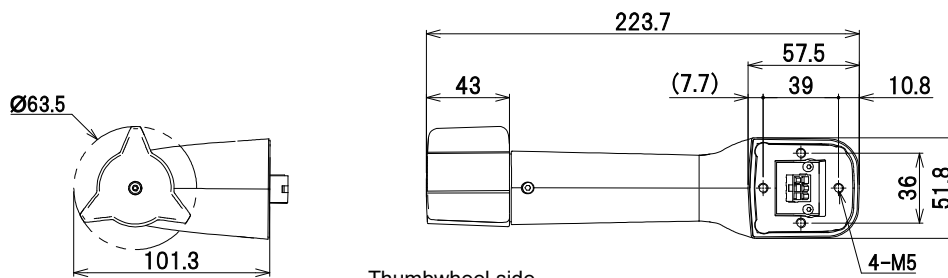
This section describes how to install and connect a handle-type controller (EW9Z-1ARH2, EW9Z-1ARH1).

### Installation of handle-type controllers

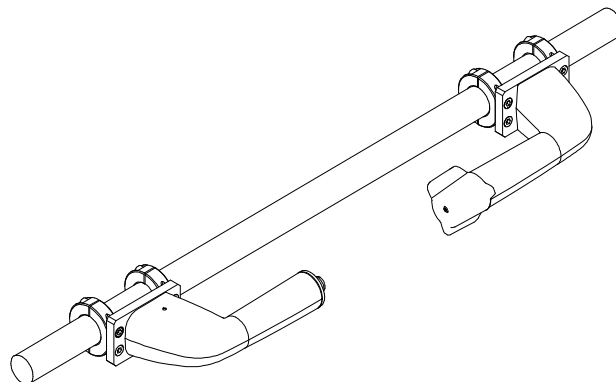
Refer to the illustration below and attach the product to a trolley, etc.



Power button side



Thumbwheel side



Installation example



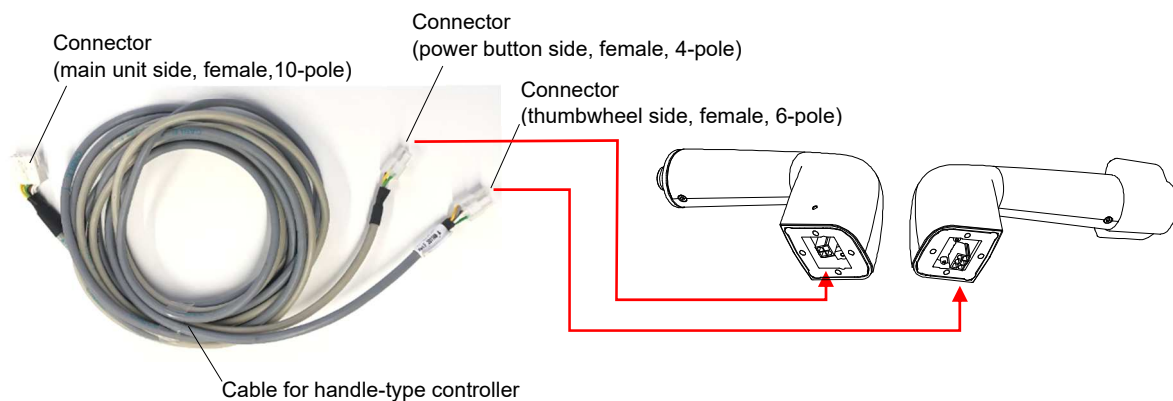
## How to connect a handle-type controller

### 1. connecting the cable for the handle-type controller to the handle

Connect the connector (power button side, female, 4-pole) of the cable for the handle-type controller to the power button side connector of the handle-type controller.

Connect the connector (thumbwheel side, female, 6-pole) of the cable for the handle-type controller to the connector on the thumbwheel side of the handle-type controller.

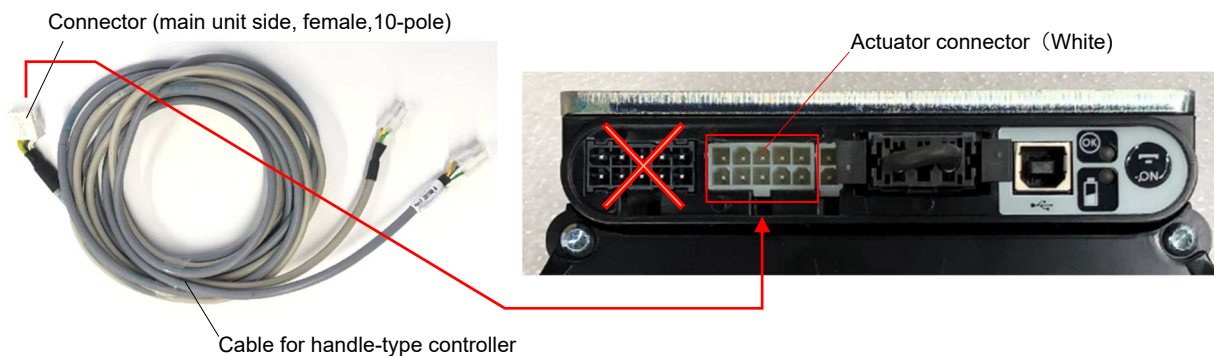
In a case of using a handle-type controller (without charge status indicator light) (EW9Z-1ARH1), connect the connector (power button side, female, 4-pole) of the cable for the handle-type controller to the connector of the illuminated pushbutton switch (EW9Z-1ARH2).



Make sure the connector is inserted all the way.

### 2. Connecting the cable for the handle-type controller to the main unit of the assist wheel drive

Connect the connector (main unit side, female, 10-pole) of the cable for the handle-type controller to the actuator connector on the main unit of the assist wheel drive.



Connecting to the optional connector (black) may cause malfunction.  
Make sure the connector is inserted all the way.

## Installation instructions of cable cover

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This section describes how to install the cable cover.

Attach the supplied cable cover to the main unit of the assist wheel drive with the supplied screws (two M4x12 torx screws).  
The cable should be aligned so that it exits out of the extraction hole.  
Please use a torx screwdriver of size T15.



Please be careful not to get the cable caught between the cable cover and the main unit.

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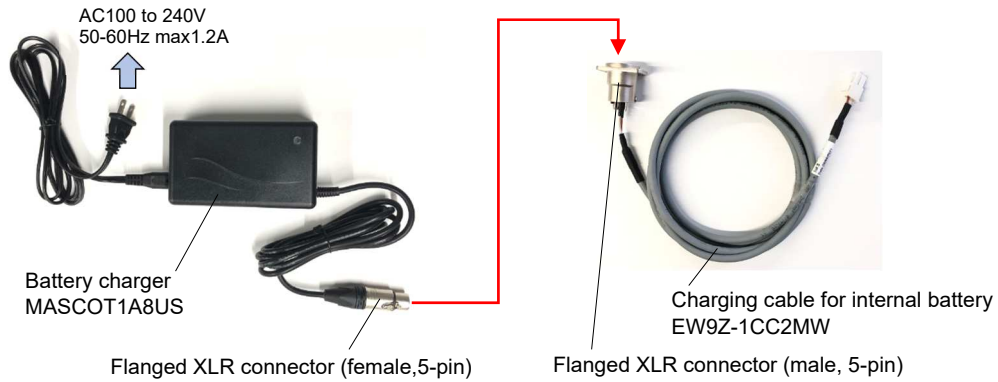
## How to charge a battery

The following is a description of how to charge a battery.

### For internal battery

Connect the XLR connector (female, 5-pin) of the battery charger to the flanged XLR connector (5-pin) of the internal battery charging cable.

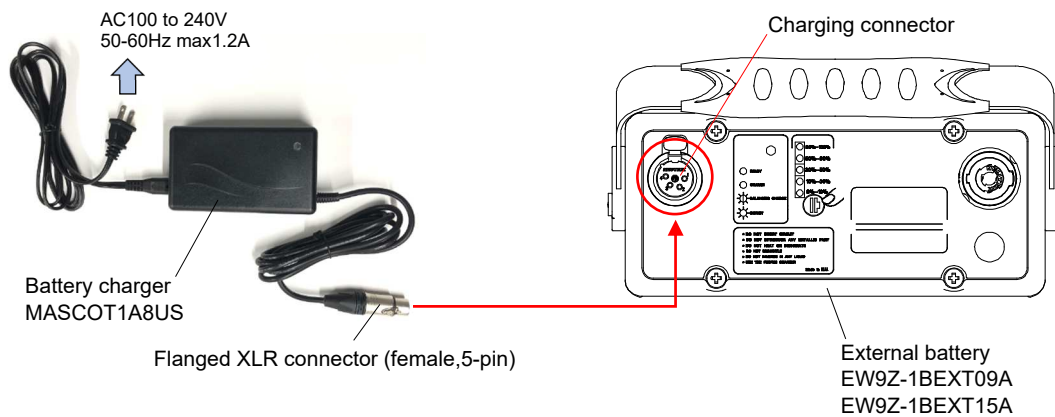
\* Make sure the connector is inserted all the way.



### For external batteries

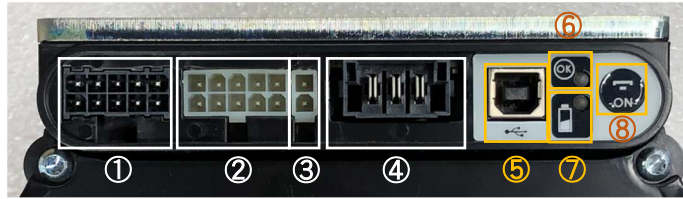
Connect the battery charger's XLR connector (female, 5-pin) to the external battery charging connector.

\* Make sure the connector is inserted all the way.



# Interfaces

Assist wheel drives are equipped with various interfaces.



## ① Optional Connectors

Outputs 5 VDC or 24 VDC. External devices can be connected.

Connector used on assist wheel drive: SAMTEC IPBT-105-H1-T-D-RA-K

Connector for connection: SAMTEC IPBD-05-D-K

Connecting terminals: SAMTEC CC69L-1620-01-T-SP (AWG16 to 20)

SAMTEC CC69L-2024-01-T-SP (AWG20 to 24)



PIN	Feature	Rated voltage	Rated current
1	output	DC5V	0.6A
2	reservation	-	-
3	reservation	-	-
4	COM	-	-
5	output	DC24V	1 point : 9A COM: 15A
6	reservation	-	-
7	reservation	-	-
8	reservation	-	-
9	COM	-	-
10	output	DC24V	1 point : 9A COM: 15A

### PIN1 (DC5V output)

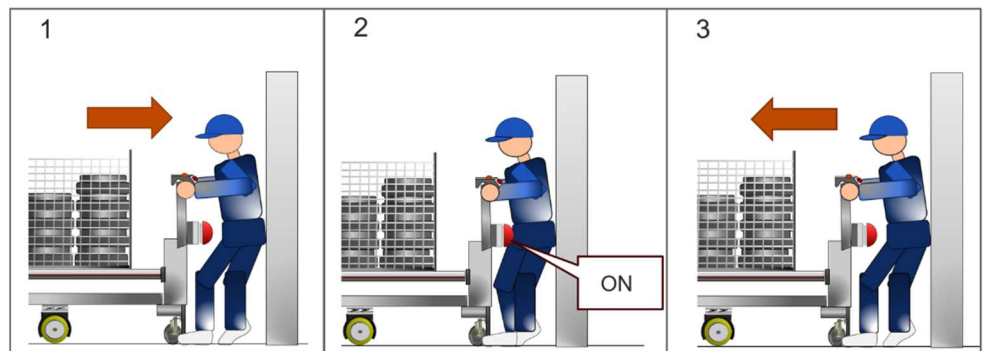
Outputs 5 VDC when the assist wheel drive is on. When off, the output is stopped.

### PIN 4, 6 Emergency reverse

Optional emergency reverse push button "EW9Z-1ERB2M" for preventing Caught-between can be connected to the optional connector. By closing a contact between pin 4 and pin 6, you can activate "emergency reverse". This function forces forward direction at a constant speed (regardless of the command set point) as long as the contact is kept closed.



EW9Z-1ERB2M

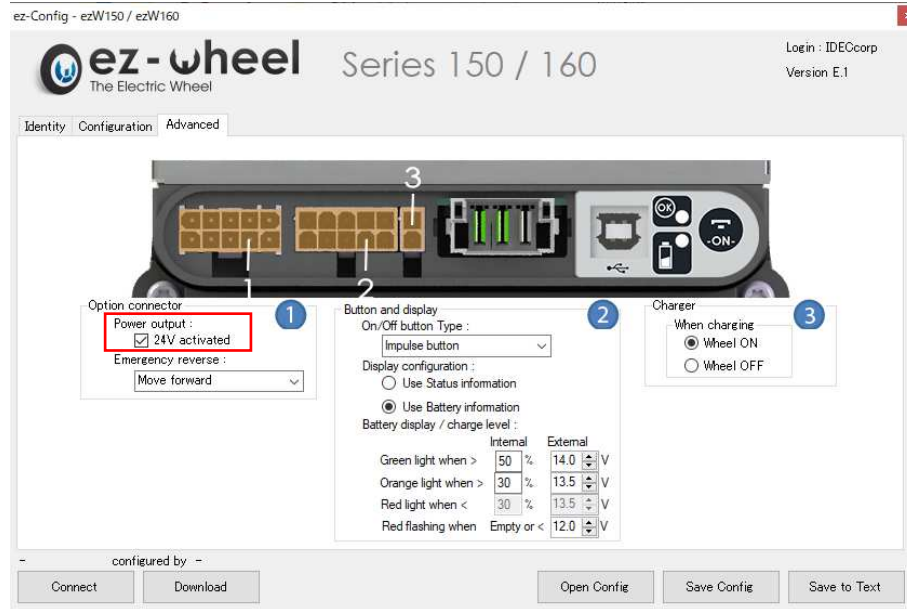


### PIN 5, 10 (24VDC output)

Outputs 24VDC when the assist wheel drive is on. When off, the output is stopped.

- The maximum current value that each PIN and COM can tolerate is 9A
- Adjust the total current value of PIN5 and PIN10 to within 15A
- Each PIN should be wired to ground

To use this function, "24V activated" must be enabled under "Option connector" - "Power output" in the "ez-Config" "Advanced" tab.



### ② Actuator Connector

Connect controllers, etc.

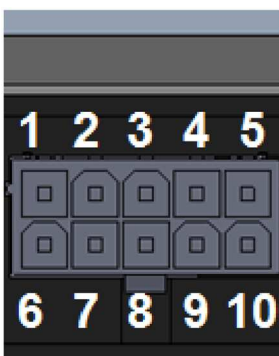
Connector used on assist wheel drive: Molex 390-30-1100

Connector for connection: Molex 39-01-2100

Connecting terminals: Molex 39-00-0078 (AWG16)

Molex 39-00-0039 (AWG18-24)

Molex 39-00-0047 (AWG22-28)



PIN	classification	Feature	Rated voltage	Rated current
1		COM	-	-
2	output	power	DC5V	0.6A
3	input	ON/OFF signal	DC 3.3V	-
4	analog input	Rotation direction and speed control	DC0V to 5V	-
5	output	stop signal	DC 3.3V	-
6		COM	-	-
7		reservation	-	-
8	output	LED (green)	DC3.3V-	20mA
9	input	stop signal	DC3.3V-	-
10		LED (red)	DC3.3V-	20mA

### PIN2 (DC5V output)

Outputs 5 VDC when the assist wheel drive is on. Used as a power supply for devices that control voltage, such as joysticks, and can be connected to "PIN4 Rotation direction and speed signal" to control assist wheel drives.

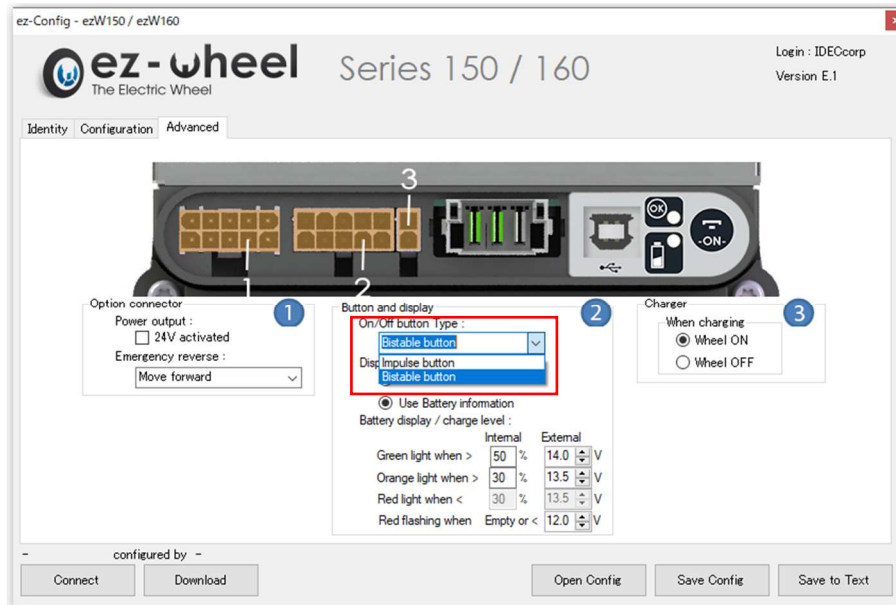
### PIN3 (ON/OFF signal)

Assist wheel drive can be turned on or off.

The switching method is set in ez-Config "Advanced" tab - "On/Off button Type".

Impulse button: Alternates between ON and OFF for the assist wheel drive each time the signal is turned ON (Alternate operation)

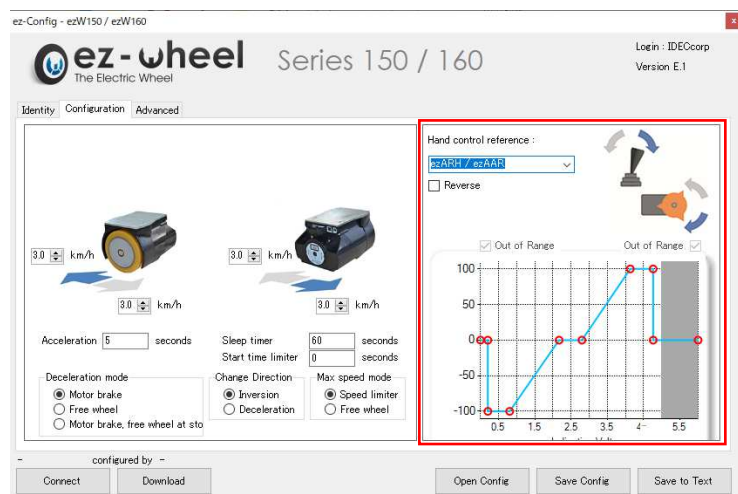
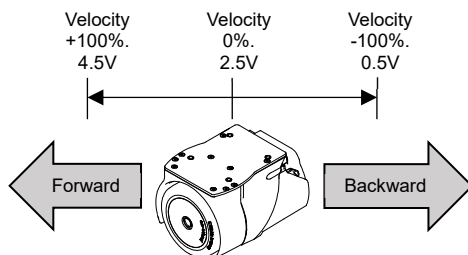
Bi-stable mode: The assist wheel is turned on while the signal is on, and the wheel is turned off while the signal is off. (Momentary operation = dead men switch when associated with a push button)



### PIN4 (Rotation direction and speed control)

The direction of rotation and speed of the assist wheel drive are controlled by the input voltage.

The relationship between the input voltage and the direction and speed of rotation can be set in ez-Config - "Hand control reference" in the "Configuration" tab.



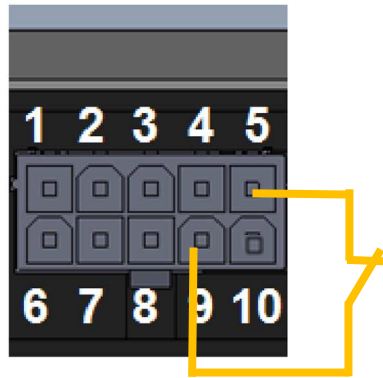
### PIN 5, 9 (stop signal)

While the signal is OFF, the brake is enabled and the assist wheel drive is stopped. Please see the ez-Config instruction manual for more information.

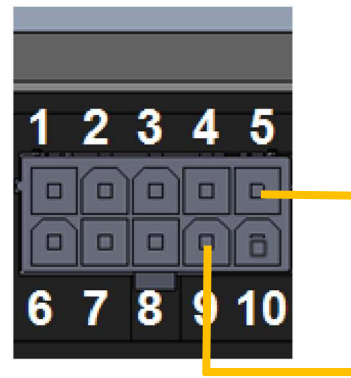
For models without an external brake: use the motor brake

For models with an external brake: use the external brake

Wiring examples for PIN5 and PIN9 are shown in the figure below.



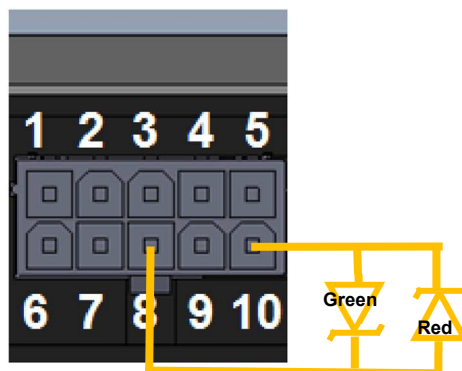
In a case of connecting a stop switch



In a case of not connecting a stop switch

### PIN 8, 10 (connection to external LED)

Connect to external LEDs to display battery level and assist wheel drive status. When bi-color LEDs (green and red) are used, the status can be expressed in tri-color (green, red, and orange).



### ③ Charging connector

Connect the charging cable for the internal battery to supply power to the internal battery of the assist wheel drive.

Connector used on assist wheel drive: Molex 390-30-1020

Connector for connection: Molex 39-01-2010

Connecting terminals: Molex 39-00-0078 (AWG16)

Molex 39-00-0039 (AWG18-24)

Molex 39-00-0047 (AWG22-28)



PIN	classification	Feature	Rated voltage	Rated current
1		COM	-	-
2	input	power	DC24V	4A

#### When connecting a non-optional charger

The charger to be connected must supply a stable constant current.

In addition, the following requirements must be met

- Open circuit voltage (without current) is 32 VDC
- Can protect against overcurrent due to short-circuit at output
- When operating at less than 16 VDC, the charger does not supply current in excess of its rating.
- The system is equipped with an automatic recovery function when it switches to the protection mode in such cases.
- Can also protect against voltages from 32VDC to 60VDC

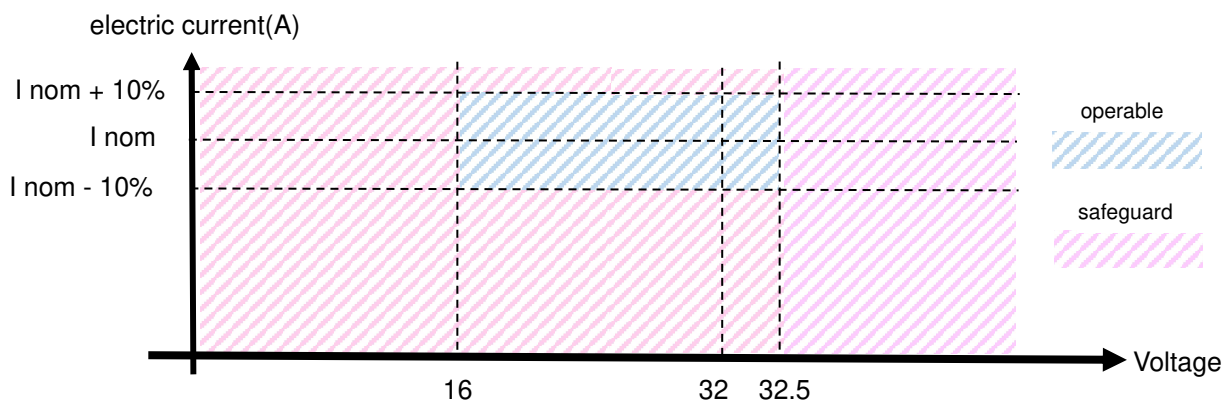
The voltage/current characteristics of the available chargers are as follows

【Tolerance】

Operable current value:  $I_{nom} \pm 10\%$ .

Current value to switch to protection mode: 0 to  $I_{nom} \pm 10\%$ .

Open circuit voltage: 32V DC  $\pm 0.5V\%$ .



【Example of a charger with a rated output of 3A】

Operable current value: 2.7A to 3.3A

Current values that switch to protection mode: 0 to 2.7 A and 3.3 A min.

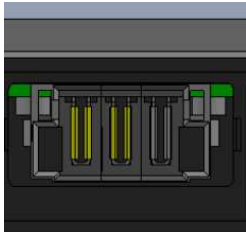
Open circuit voltage: 32V DC  $\pm 0.5V\%$ .



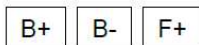
#### ④ external battery connector

If using an external battery, remove the jumper and connect the external battery cable.  
 If an internal battery is used, a jumper must be connected.

Connector used in assist wheel drive: SAMTEC MPT-03-01-01-T-RA-SD  
 Connector for connection: SAMTEC IMS5-03-02  
 Connecting terminals: SAMTEC CC46L-1416 (AWG14)



PIN	classification	Feature	Rated voltage	Rated current
B+	input	Driving circuits for control	DC24V	-
B-	input	0V	-	-
F+	input	Motor Drive	DC24V	-

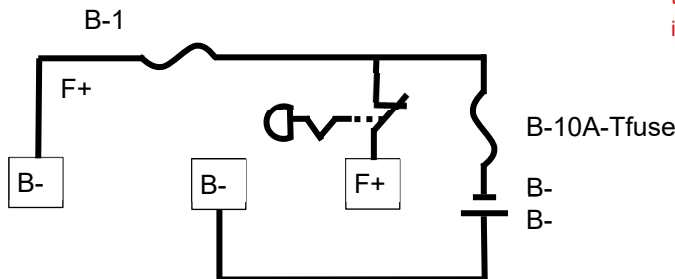


#### When connecting an external battery or switching power supply outside of options

Use an external battery that meets the following specifications

- Maximum output voltage: 33V DC (exceeding this value will cause the assist wheel drive to malfunction)
- Output voltage range: 18VDC to 28VDC
- Maximum output current: 15 A

Refer to the figure below for connection.



\* In case of integrating an external battery which is able to refuse current flowing back, a TVS diode should be integrated to protect the wheel's electronics.

- Protect the battery by wiring a 40A or 10A-T fuse to F+ PIN
- Wire a 10A-T fuse to B+ PIN to protect the circuit for control
- Power should be supplied in the order of PIN B+ => PIN F+ and adjusted so that an interval of at least 100 ms is opened.
- Do not connect the charger directly to the assist wheel drive if an external battery is connected. External batteries may fail.
- If the external battery is not automatically shut off in conjunction with the assist wheel drive being turned off, a separate circuit must be added to turn off the power supply in order to reduce the current consumption of the external battery.

#### ⑤ USB Boat

This port is used to connect to a PC when configuring the assist wheel drive in ez-Config.  
 Use a USB cable (USB 2.0 Type-A male - Type-B male) for connection.

#### ⑥ OK LED

LEDs indicate the status of the assist wheel drive and other information.

Status	LED indication	Description
Normal	● green	Assist wheel drive is working properly.
Error	● green/red blinking	Error or low battery.

## ⑦ Battery LED

LEDs indicate battery status and other information.

Status	LED indication	Description
Battery remaining at 100%.	● green	Battery level is 51-100%.
Battery level 50%.	● orange	Battery level is 31-50%.
Battery level below 30%.	● red	Battery level is below 30%.
Battery power remaining 0%.	●○ red blinking	Battery level is 0%.
Charging	●○ orange blinking	Charging the battery.
Charging complete	●○ green blinking	Charging is complete. (Charger is connected.)

## ⑧ Power button

Power button for assist wheel drive. When a controller is connected, power can also be turned ON/OFF from the controller (except EW9Z-1ARH1).

\* If you activate the assist wheel drive with the power button on the wheel, please press briefly to activate. If pressed too long, it will enter boot loader mode (OK LED: off, battery LED: red light on). In this case, you will need to wait about 30 seconds for it to start up. It is preferred to turn on/off the wheel with the controller button to avoid triggering boot loader mode.