AWD®

Assist Wheel Drive 150 & 160

Instruction Manual

Version 1-a - Original version

ez-Wheel®
A brand of the **IDEC Corporation Group**

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Please read this document carefully before using the product for the first time.

1. Introduction

1.1 Who is this manual intended for?

This manual is intended for industrial integrators.
Knowledge and understanding of electrical drive systems are necessary for implementing ***AWD®*** technology.

1.2 Terms of use

The terms used in this manual relate to the technical field of industrial machines.
For an accurate reading of the manual, a good knowledge of the following reference systems is recommended:

- Machinery Directive (2006/42/CE)
- Safety of machinery – Electrical equipment of machines (EN 60204-1)
- Ergonomics of manual handling (ISO 11228-2)

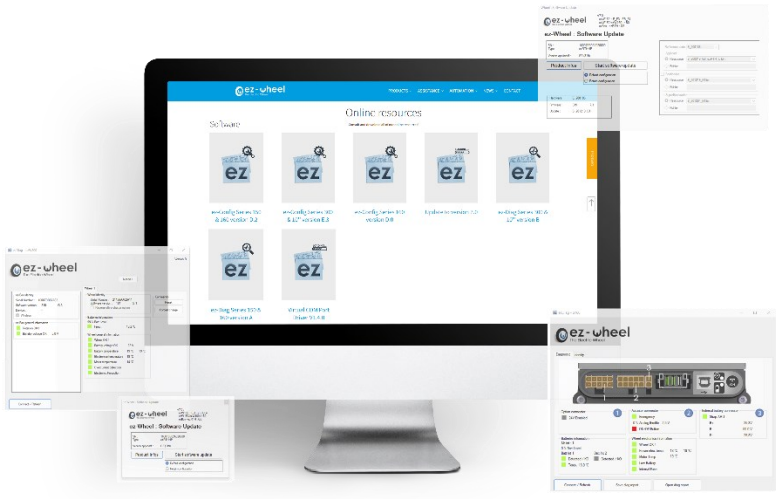
1.3 Additional resources

The following documents relating to the AWD® products are available from ez-wheel.com:

- Datasheets of AWD® products
- General AWD® range brochure and catalog
- 2D and 3D mechanical drawings for AWD® products

The following software related to the AWD® products are also available from ez-wheel.com in the Download section.

AWD® ez-Config	*ez-Config®* is the core of the *ez-Wheel®* solutions. Thanks to their open connectivity, wheels and hand controls are programmable and can be perfectly adapted to any situation.	
AWD® ez-Diag	*ez-Diag®* is your first device diagnostic assistant. This tool enables remote troubleshooting, making it quick and easy to get your equipment back into service.	
AWD® Update tool	This tool provides the latest release for all your *AWD®* devices.	



1.4 Declarations of conformity

AWD® products are developed in accordance with the regulatory requirements for commercialization. The declarations of conformity for AWD® products have been drawn up by IDEC Corporation.

1.5 Important information about the manual

⚠	Important information – Read carefully
ℹ	Additional information
🛠	Tools required
📖	Reference documents to consult

1.6 Disclaimer

IDEC and APEM SAS cannot be held responsible for any damage resulting from irrational or improper use of the product.
The technical information contained in this manual is subject to change without notice.
No responsibility is assumed for the completeness, accuracy, or currency of the data and illustrations provided.
Texts and visuals included in this manual are the property of APEM SAS, company of IDEC Corporation.
ez-Wheel® and *AWD®* Assist Wheel Drive are registered trademarks.
Other product names and designations may be trademarks and/or copyrights of their respective owners. Unauthorized use by third parties may infringe upon the rights of these owners.

"INSTRUCTION MANUAL"
English Version 2025, original version

APEM SAS - IDEC Mobility Solutions division
LE MOULIN DE L'ABBAYE - 135 ROUTE DE BORDEAUX
16400 LA COURONNE – France

2. Safety instructions

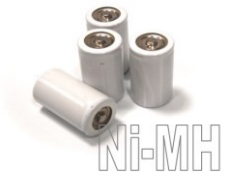
2.1 Precautions for using *ez-Wheel*® products

⚠	Do not use *ez-Wheel*® products for other purposes or in other conditions than those mentioned in the technical documentation. Read and make sure you have understood the manual before using *ez-Wheel*® products. Observe all the warnings and usage instructions in this manual. Keep this manual for reference throughout the life of the product. In the event of loss, you can obtain a copy of this manual from your reseller or from the IDEC/APEM Service Department. If the product is transferred to another owner, make sure that the manual is transferred as well. The characteristics, descriptions, and illustrations in this document are applicable at the date of publication. The manufacturer reserves the right to make any modifications and revisions to this document. Product users obtain their own information on these modifications.

2.2 Precautions for wheel use

⚠	Always use an appropriate charger. Do not immerse the wheel. Do not open the wheel. Do not expose to heat. Do not expose to fire. Do not insert metal parts into the connector. Do not modify the product in any way not authorized by the manufacturer. Do not attempt to modify the wheel's technical performance. The product must not be used for any purpose other than the technical performance specified in this manual. Inappropriate use will invalidate the warranty. Opening the wheel voids the warranty.

2.3 Precautions for battery use

	Under no circumstances should the user open the wheel or have access to the batteries. The wheel contains Ni-MH batteries which are subject to transport and user safety restrictions. All information and regulations concerning these batteries will be supplied on request.

3. Product description

The **AWD® 150** and **160** electric wheel range makes it quick and easy to implement high-performance electric drive systems.

AWD® 150 and **160** wheels are controlled by a wired interface connected directly to the rear of the wheel.
A wide range of accessories is available in the *ez-Wheel®* catalog to drive the wheels.

This manual contains instructions for installing, operating and maintaining the wheels.

3.1 Wheel presentation

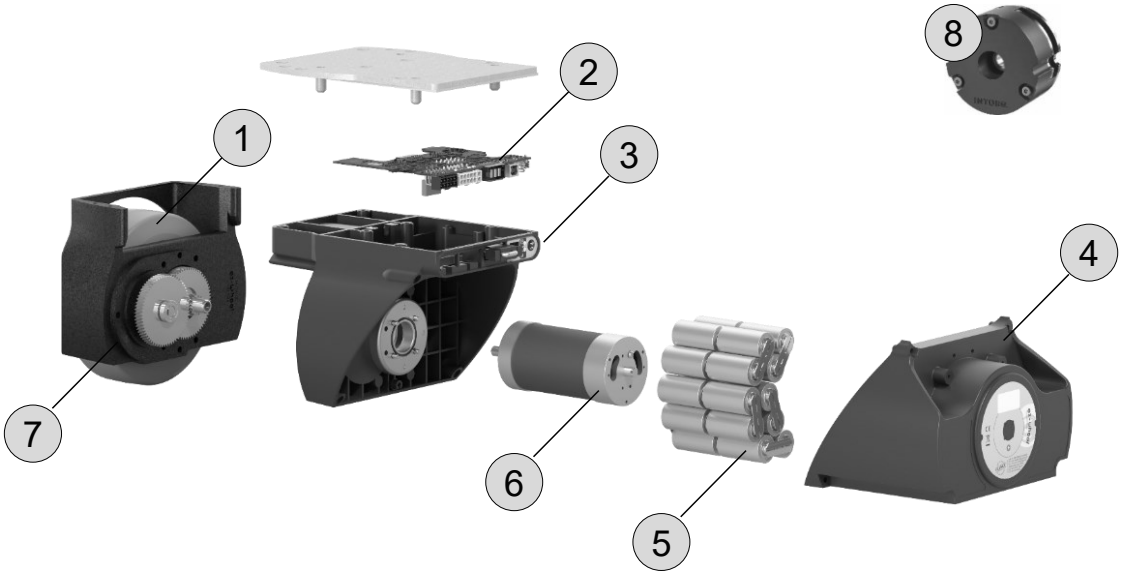


Figure 1 - Detailed view of the AWD® wheel components.

1	**Wheel** Polyurethane - Flat profile
2	**Electronics** Drive control Battery management
3	**Interface** Status and battery level USB for programming
4	**Cover** Robust
5	**Battery** Ni-MH battery 0-70-140 Wh – 24VDC
6	**Motor** High torque Ultra-compact BLDC PM
7	**Housing** Integrated gearbox
8	Brake (option)

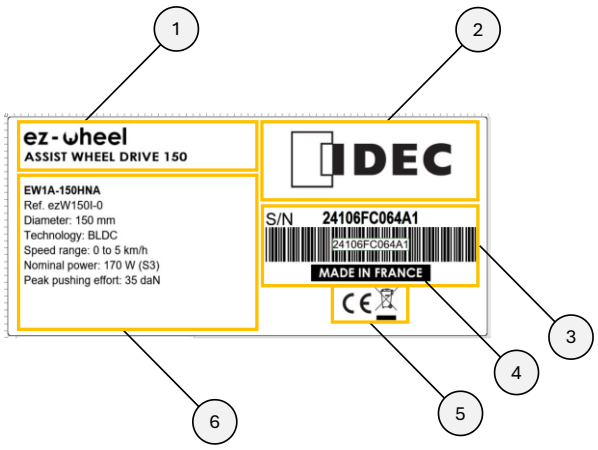
3.2 Wheel evolution environments and key features

	AWD® 150		AWD® 160
			
	Ref. EW1A-150HxA	**Ref. EW1A-150SxA**	**Ref. EW1A-160MxA**
Environment	**Industrial / logistics**	**Industrial / logistics**	**Medical/ logistics**
Index of protection (IP)	IP43	IP43	IP66
Inside	x	x	x
Humid environment	x	x	x
Slippery ground		x	x
Water spray			x
Washing with water			x
Antistatic wheel			x
Features			
Diameter	Ø 150 mm	Ø 150 mm	Ø 158 mm
Type of Tire	92 sh.A Blickle® Extrathane - Flat profile	PU 63 sh.A soft - Flat profile	PU 70 sh.A - Flat profile
Speed range (traction)	0 to 5 km/h	0 to 5 km/h	0 to 5 km/h
Peak pushing effort	35 daN Moves 1000 kg	35 daN Moves 1000 kg	27 daN Moves 750 kg
Nominal performance	15 daN at 4 km/h	15 daN at 4 km/h	9 daN at 5 km/h
Maximum rolling speed	8 km/h	8 km/h	8 km/h
Battery capacity	0/70/140 Wh	0/70/140 Wh	0/70/140 Wh
Option(s)	Parking brake Additional battery	Parking brake Additional battery	Additional battery

3.3 Terms of use

Temperatures	-10 to +40 °C
Maintenance period*	2-3 years[1]

3.4 Product label



[1] Reference value, based on standard test condition, may differ according to specific use.

1	Product Family and Range Identification
2	Manufacturer and trademark identification
3	Item code
4	Geographical origin of the product
5	Regulatory pictogram
6	Commercial reference, Motor performance

3.5 Application

- Industrial trolleys
- Rolling equipment for factories
- Mobile workstations and tools
- Catering trolleys
- Transfer chairs and beds
- Rolling equipment for hospitals

4. Synoptic

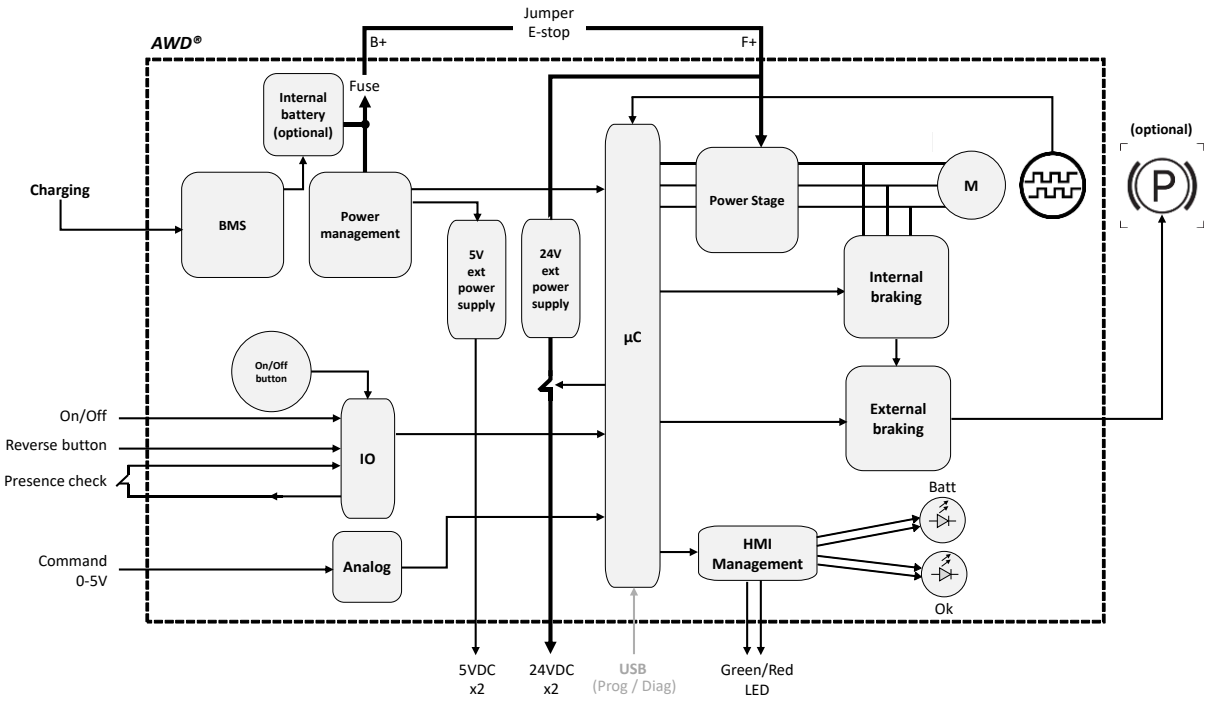


Figure 2 - AWD® 150 et 160 synoptic

The system described above is based on a modular architecture that enables autonomous operation via battery or external power supply. It is based on a microcontroller (µC) responsible for coordinating all the functions.

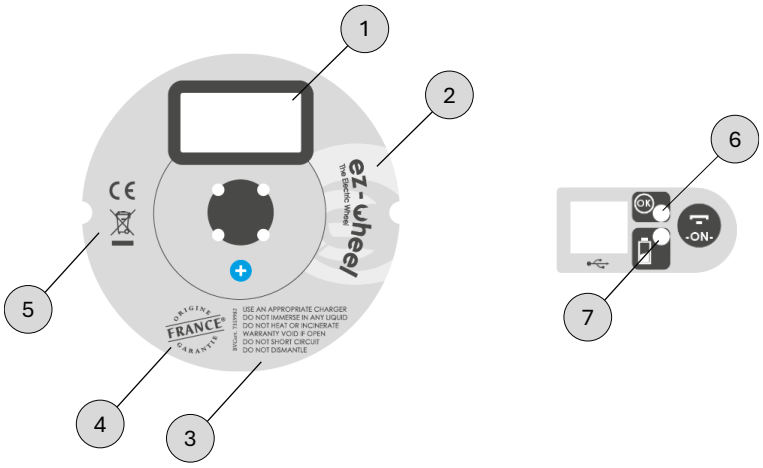
List of main functions:

Main functions	Description
Centralized control	- Microcontroller (µC) for overall coordination - Signal processing, control, safety check - Speed control via encoder
Power management	- Internal battery with BMS supervision - External power supply 5VDC / 24VDC - Fuse protection
Interfaces	- Charging - On/Off button - Status LEDs - I/O Reverse button Presence check Jumper - Analogue inputs Command
Motor control	- Motor control via Power Stage with speed feedback
Brake management	- Internal braking (electronic) - External braking (electromechanical) - Parking brake (‘P’ symbol)
Configuration and debugging	- USB port for system configuration, updates and diagnostics

5. Interfaces

5.1 HMI interfaces

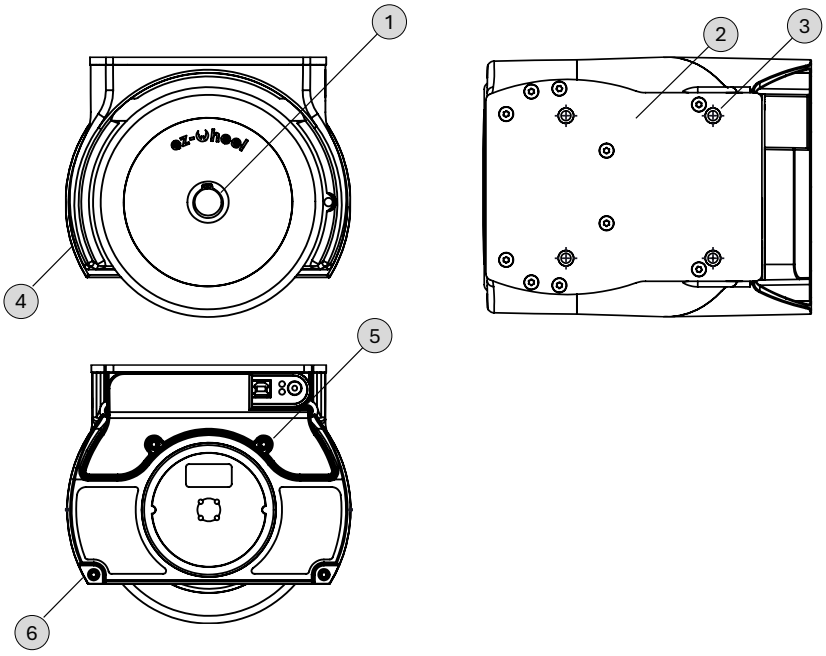
5.1.1 Label specification



1	Serial number
2	Product family identification
3	Disclaimer
4	Product origin
5	Legal markings
6	Status LED
7	Battery level LED

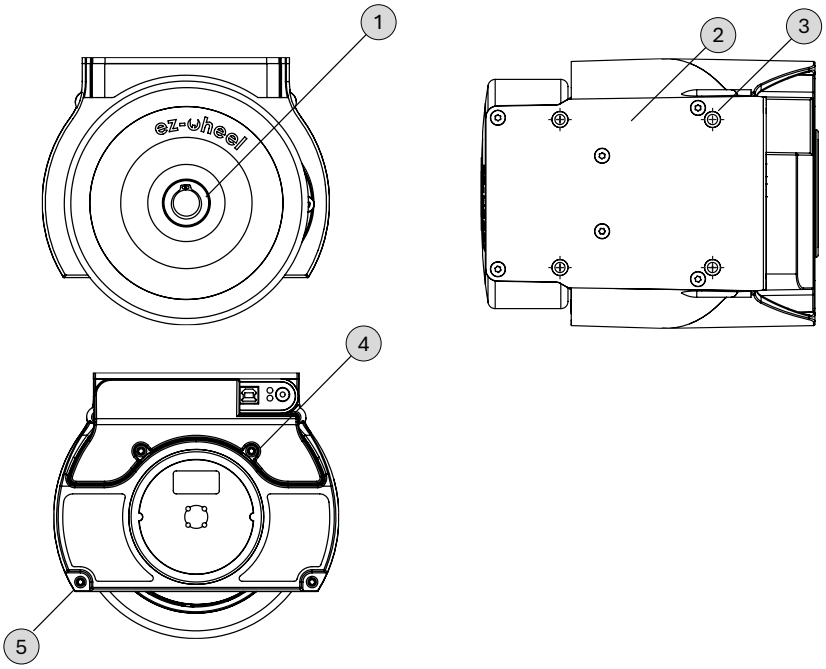
5.2 Mechanical interface

5.2.1 AWD® 150



1	Shaft with key
2	Mounting plate
3	4 fixing points M6 depth 16mm Max torque 7Nm
4	Cast iron reinforced housing
5	x2 M4 screws for connector cover
6	x4 M4 screws for battery cover Torque 1Nm

5.2.2 AWD® 160



1	Shaft with key
2	Mounting plate
3	4 fixing points M6 depth 16mm Max torque 7Nm
4	x2 M4 screws for connector cover
5	x4 M4 screws for battery cover Torque 1Nm

5.3 Electrical interface

1	Option connector
2	Command connector
3	Charging connector
4	External battery connector / Jumper
5	USB connector

The following paragraphs details each connector's specification and related functions.

5.3.1 Option connector ①

This connector is normally reserved for internal manufacturer use.

Connector type	SAMTEC Ref: IPBT-105-H1-T-D-RA-K		
Mate with	Connector: IPBD-05-D-K Contacts: AWG 16 to 20: CC69L-1620-01-T-SP AWG 20 to 24: CC69L-2024-01-T-SP		

PIN	Signal Type	Input / Output	Function	Range min	Range Max
1	Power	Output	5VDC	5V	5V@0,6A
2	-	-	*Internal use*	-	-
3	-	-	*Internal use*	-	-
4	Power	Input/Output	GND	0	0
5	Power	Output	24VDC	0	24V@15A*
6	Signal	Input	Reverse button	0	3V3
7	-	-	*Internal use*	-	-
8	-	-	*Internal use*	-	-
9	Power	Input/Output	GND	0	0
10	Power	Output	24VDC	0	24V@15A*

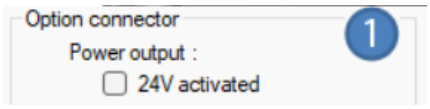
*Maximum total current on all outputs. The maximum current for a single PIN is 9A.

PIN 1: Power Output
PIN 1 provides 5V power output for any external devices.
The power is activated when the wheel is ON, when the wheel is OFF the power is deactivated.
Typical use is the power supply of a command as a joystick for instance.

PIN 6: Reverse button
PIN 6 controls a function called emergency reverse. When activated, the wheel is forced to move forward (whatever the command setpoint), until the reverse function is deactivated.
The function is activated when the PIN is connected to GND.
For example, a NO push button can be wired between PIN 4 and 6.
Typical use is to prevent an operator from being trapped between the trolley and an obstacle.

PIN 5 & 10: Power connector
PIN 5 and PIN 10 are dedicated to supplying external devices with 24V.
Each PIN can provide 24V and 9A maximum.
One PIN must be wired to a single ground; each ground can support a maximum of 9A.
The total current (PIN 5 and PIN 10) must not exceed 15A.

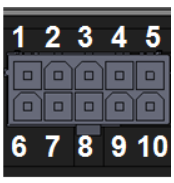
ez-Config® has to be configured to enable this function, tick the case:



ⓘ These power supplies are cut off when “External battery connector / Jumper” ④ is disconnected.
ⓘ It also includes the case when an emergency stop is activated.

5.3.2 Command connector ②

This connector is dedicated to connecting the different hand controls from the IDEC *ez-Wheel®* catalog.
This connector can also be used to connect a command developed by a third party, or to connect a PLC controlling the wheel directly through an analog output. Hereafter the specification allows developing external control devices.

Connector type	Molex MINIFIT Ref: 39-30-1100	
Mate with	Connector: 39-01-2100 Contact: AWG 16: 39-00-0078 AWG 18 to 24: 39-00-0039 AWG 22 to 28: 39-00-0047	

PIN	Signal Type	Input / Output	Function	Range min	Range Max
1	Power	Input / Output	GND	0V	0V
2	Power	Output	5VDC	5V	5V@0,6A
3	Signal	Input	On/Off	0	3V3
4	Analog	Input	Command 0-5V	0	5V
5	Signal	Output	Presence check +	3V3	3V3
6	Power	Input / Output	GND	0V	0V
7	-	-	*Internal use*	-	-
8	Signal	Output	External Green led	0	3V3@20mA*,**
9	Signal	Input	Presence check -	0	3V3
10	Signal	Output	External Red Led	0	3V3@20mA*,**

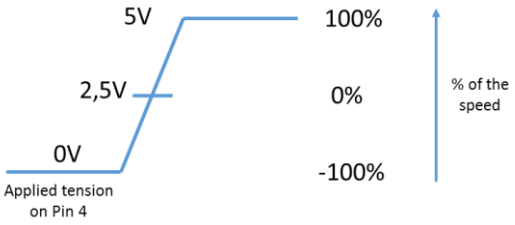
PIN 2: Power Output
PIN 2 provides 5V power output for any external devices.
The power is activated when the wheel is ON, when the wheel is OFF the power is deactivated.
Typical use is the power supply of a command as a joystick for instance.

PIN 3: On/Off Button
PIN 3 is used for remote On/Off function when pulled to GND (PIN 1).
This PIN can be configured in 2 modes through *ez-Config®*:

- Impulsion mode: the On/Off power of the wheel is managed with a pulse on PIN 3, typically with a push button
- Bi-stable mode: the On/Off power of the wheel is managed with maintained contact, typically with a 2 position-button or a rocker switch.

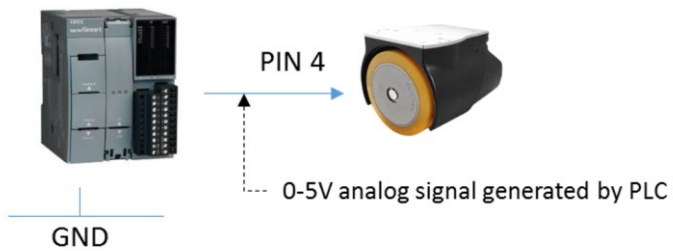
PIN 4: Command 0-5V - Wheel speed control
PIN 4 is dedicated to managing the throttle and the speed of the wheel, backward and forward.
The speed and the throttle are linearly controlled following the voltage applied to PIN 4 and the settings programmed through *ez-Config®*.

<u>The nominal settings are from 0V to 5V, as follows:</u>

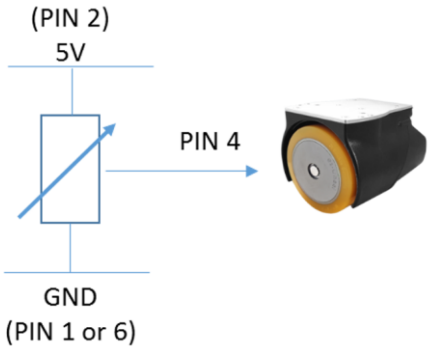


Refer to *ez-Config®* user manual to set up advanced parameters (Bi-directional, unidirectional, thresholds…).

<u>Example of cabling with PLC:</u>

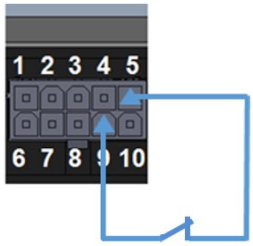


Example of cabling with command or potentiometer:



PIN 5 and 9: Presence check

The presence check function is dedicated to activating the default mode of the wheel when the hand control is not detected. A switch is to be wired between PIN 5 and 9, as follows:



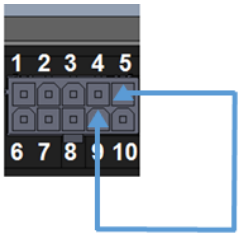
From software version C0 and later, when the presence check is in default, the wheel brakes (with motor brake and parking brake if available) even when the wheel is running; the rolling material can be stopped abruptly.

Before software version C0, the wheel behavior was as follows:

⚠ Wheel without parking brake: the wheel enters automatically in free wheel (default state).

⚠ Wheel with parking brake: the parking brake of the wheel is automatically activated, even when the wheel is running; the rolling material can be stopped abruptly.

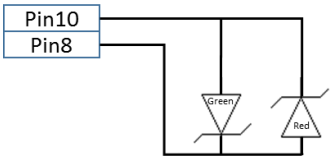
If the function is not used, PINs 5 and 9 must be strapped as follows:



PIN 8 and 10: Connecting LED to *AWD*® wheel

PIN 8 and 10 provide wheel information about the battery level or the status of the wheel by activating external LEDs. Bi-color LEDs have to be wired to get all information from the wheel and to manage green, red and orange colors.
Orange is made by quickly alternating green and red.

The wiring must be as follows:



By default, the LED information corresponds to the battery status; the wheel can be configured through *ez-Config®* to display the wheel status (OK button) instead of the battery status.

Refer to *ez-Config®* user manual.

5.3.3 Charging connector ③

The charging connector is dedicated to plugging the IDEC *ez-Wheel®* charger. An independent system of charge can be set up, hereafter the table of electrical interface:

Pin	Type	Function	Range min	Range Max
1	Power	GND	0	0
2	Power	supply	0	24V@4A

Connector type	Molex MINIFIT Ref: 39-30-1020	
Mate with	Connector: 39-01-2010 Contact: AWG 16: 39-00-0078 AWG 18 to 24: 39-00-0039 AWG 22 to 28: 39-00-0047	

Charging limits are:

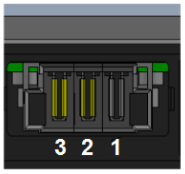
Battery temperature to start charging	**[-10°C ; 45°C]**
Battery temperature for charging	**[-15°C ; 50°C]**

5.3.4 External battery connector / Jumper ④

In normal use, with internal batteries, the jumper must be connected. The wheel can turn only if jumper ④ is connected, in the case of an internal battery power supply.

If external batteries are used, remove the jumper. Please refer to “5.4.3 Connector for external battery“ section and respect recommendations.

Pin	Type	Function	Range min	Range Max
1	Power	Motor power +	0	24@25A
2	Power	Battery -	0	0
3	Power	Battery +	0	24V@25A

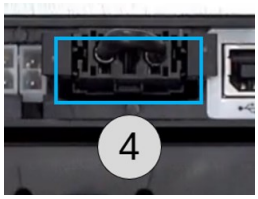
Connector type	SAMTEC Ref : MPT-03-01-01-T-RA-SD	
Mate with	Connector: IMS5-03-02 Contact: AWG 14 to 16: CC46L-1416-01-T	

⚠ With internal battery in the wheel:

- Check that the JUMPER is properly connected to the wheel before using.
- The JUMPER can be replaced by wiring up a remote emergency stop switch (or any other normally closed switch).

⚠ **Battery power is accessible on this connector. Take care not to short-circuit the metal contacts**.

In the absence of the JUMPER, or a switch wired to this connector, the wheel will not operate.

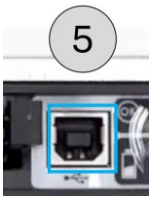


⚠ **The use of this connector as an external 24V power supply is totally forbidden; the wheel is not protected for this use.**

5.3.5 USB connector ⑤

The USB port is basically used to connect a USB cable to a computer, to program the wheel through *ez-Config®* programming tool.
The USB port can also be used when the wheel is running to monitor status information, for instance using the ez-Diag utility software.

The communication is made via the USB Port ⑤.
To dialogue with the wheel, refer to "9.6 Other connectors connection" section



⚠ For USB communication, it's necessary that a charged battery is connected, refer to "7.2.1 Connecting battery packs" section.

5.4 Battery & Power supply interface

<u>The wheel can be powered through two modes of battery supply:</u>

- First possibility is to use internal battery (provided by IDEC). See "10.3 Cable connection: recharging" chapter.
- Second possibility is to connect an external battery to connector ④ of the wheel. If the battery is not provided by IDEC, refer to this chapter and "9.4 External battery connection" section.

It is possible to connect a DC/DC or AC/DC power supply instead of an external battery.

Please respect the same specification given for the external battery instruction in this chapter and "9.4 External battery connection" section.

5.4.1 Configuration conditions

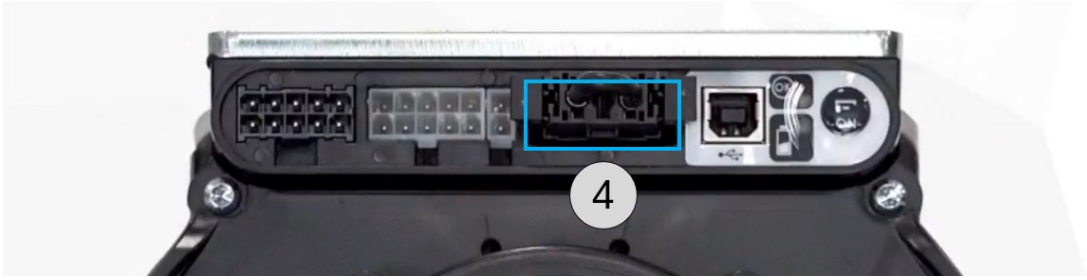
In external battery configuration, it is necessary, in *ez-Config®,* to set the "Sleep Timer" field to "0" to avoid standby.
The sleep timer should be managed by the external battery system.
Refer to *ez-Config®* user guide to configure the sleep timer to 0.
To avoid sleep mode in this configuration, the OFF function of the On/Off button of the wheel is automatically disabled with external battery. This is to avoid possible standby of the wheel.

5.4.2 External Battery specifications

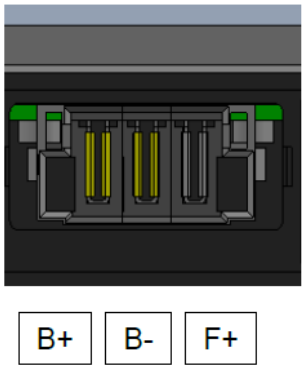
<u>The battery connected to the wheel has to respect:</u>

- Absolute maximum rating: 33V (damage beyond this value)
- Functional Range: 18V - 28V
- Maximum current: 25 A

5.4.3 Wiring for external battery



In the case of using an external battery, disconnect the jumper.
Connector type and pinout:



PIN	Description
B+	+ Internal battery
B-	- Internal battery
F+	+ towards motor

Connector type	SAMTEC MPT-03-01-01-T-RA-SD Cable connector Casing ref: SAMTEC IMS5-03-02 Contacts ref: SAMTEC CC46L-1416 Cable type: AWG14

Recommended wiring:

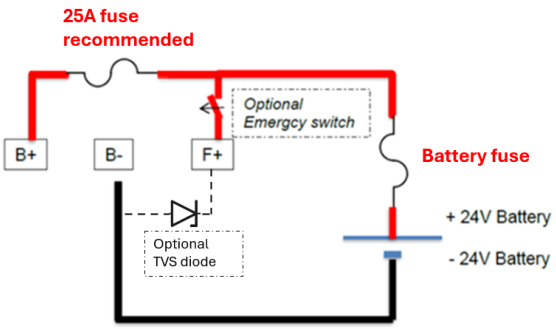
Wiring a 25A fuse to the B+ connector is recommended, which provides power to the electronics of the wheel.

⚠ **The battery must be absolutely protected by a fuse on the F+ connector, which provides power to the motor.**

Wiring a fuse in accordance with the supplier's recommendations is recommended (IDEC *ez-Wheel*'s batteries are already internally protected).

If the battery can refuse the power coming from the wheel (for example if the battery's internal electronics manage this aspect), then it is necessary to protect the wheel's electronics with a TVS diode.

In the case of towing or motor braking, this device will absorb the power generated by the wheel until the wheel's internal electronics react, redirecting this power to the motor winding.
Recommended part number: LittleFuse 20KPA32A



Wiring instructions:
Connect the cables imperatively in this way:

- Connect the B-
- Connect the B+
- Connect the F+

The electronics input (B+) should be powered first. Respect a delay of a minimum of 100 ms between the power supply of the electronics (B+) and the motor engine (F+). Once the electronics input is powered, it can be powered continuously; disconnect only the motor engine input (F+).

Advice for wires:

- Equip the wires with ferrite
- Use shielded cables
- Minimize the length of the cable and the cable path

⚠	Do not connect a charger to the wheel if an external battery is connected: the wheel will not manage a correct recharge of the battery. This could result in an uncontrolled charge of the external battery. Do not connect an external battery and an internal battery (or a voltage converter) at the same time.

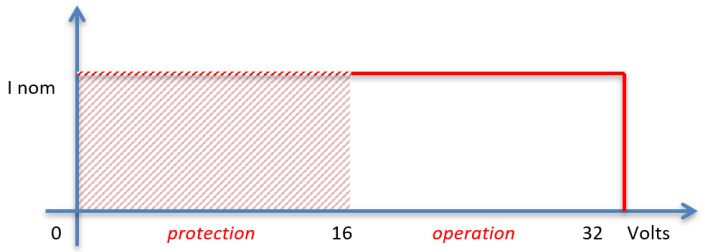
5.4.4 Wiring for external power supply

Constant Current Power Supply (CCPS)

Power connector for wiring for external power supply:

The power supply should deliver a stable and constant current, over a voltage range from 16 to 32 volts.
The open circuit voltage (no current) should be 32 volts.
The power supply should support a short circuit on the output.
When operating below 16V, the power supply should not deliver a current above the nominal. In this area, the power supply can switch to a protection mode but should restart automatically.
The power supply should also be protected against a voltage from 32 to 60 volts on its output.

Current / voltage characteristics:



Tolerances:

Current in operation zone	I_{nom}+/-10%
Current in protection zone	0 to I_{nom}+10%
Open circuit voltage	32 +/-0,5 V

For example, for a **3A nominal CCPS**:

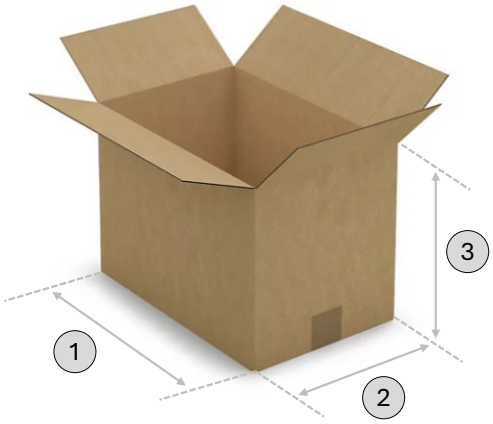
Current in operation zone	2,7 to 3,3 A
Current in protection zone	0 to 3,3 A
Open circuit voltage	32 +/-0,5 V

6. Mechanical data

6.1 Dimensions, packaging, and pack content

Information valid for *AWD*® 150 and *AWD*® 160 products.

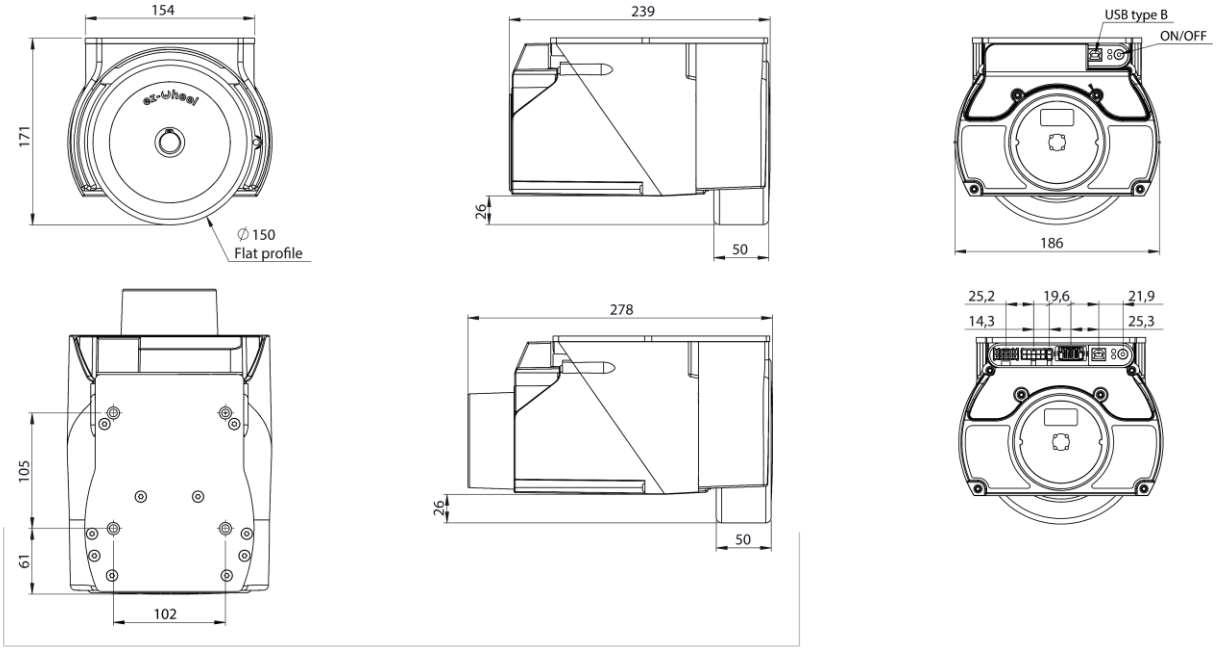
1	Depth: 320 mm
2	Width: 270 mm
3	Height: 230 mm



6.2 Overall dimensions and weight

6.2.1 Overall dimensions

AWD® 150



AWD® with brake option

Figure 3 - AWD® 150 Overall dimensions

AWD® 160

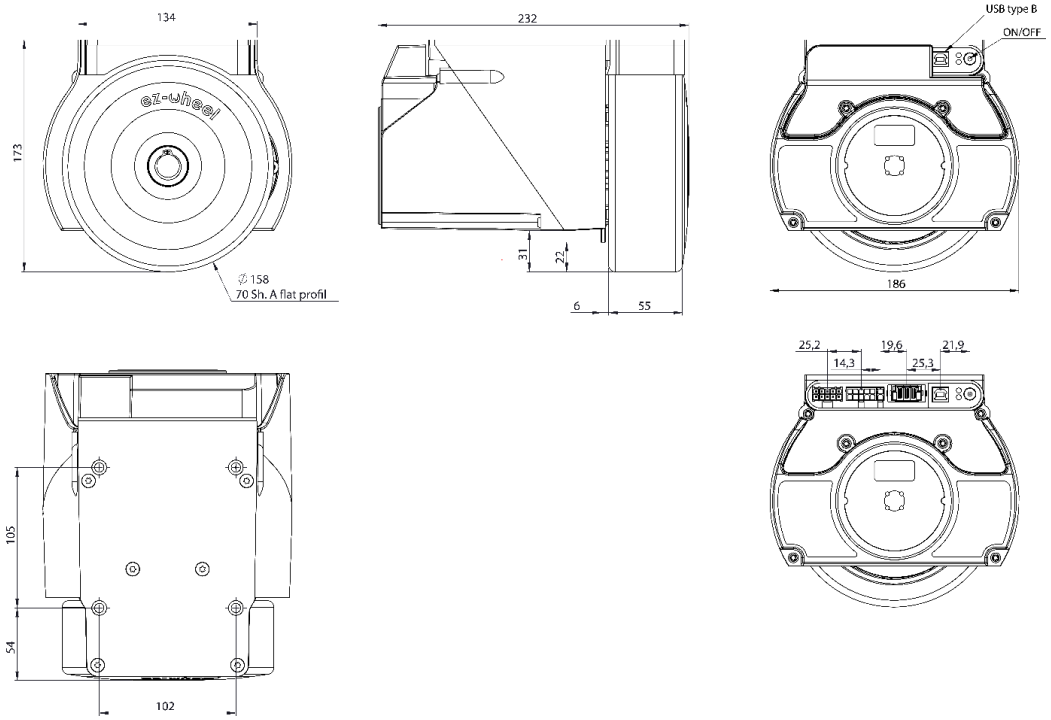


Figure 4 - AWD® 160 Overall dimensions

6.2.2 Product weight

AWD® 150

Part Number	Type de tyre	Number of batteries	Brake option	Weight ± 10% (kg)
EW1A-150HNA	92 sh.A	0	No	10
EW1A-150H1A	92 sh.A	1	No	11,3
EW1A-150H2A	92 sh.A	2	No	12,6
EW1A-150HNB	92 sh.A	0	Yes	11
EW1A-150H1B	92 sh.A	1	Yes	12,3
EW1A-150H2B	92 sh.A	2	Yes	13,6
EW1A-150SNA	63 sh.A	0	No	10
EW1A-150S1A	63 sh.A	1	No	11,3
EW1A-150S2A	63 sh.A	2	No	12,6
EW1A-150SNB	63 sh.A	0	Yes	11
EW1A-150S1B	63 sh.A	1	Yes	12,3
EW1A-150S2B	63 sh.A	2	Yes	13,6

AWD® 160

Part Number	Number of batteries	Weight ± 10% (kg)
EW1A-160MNA	0	5,5
EW1A-160M1A	1	6,8
EW1A-160M2A	2	8,1

6.3 Mechanical assembly drawing

AWD® 150

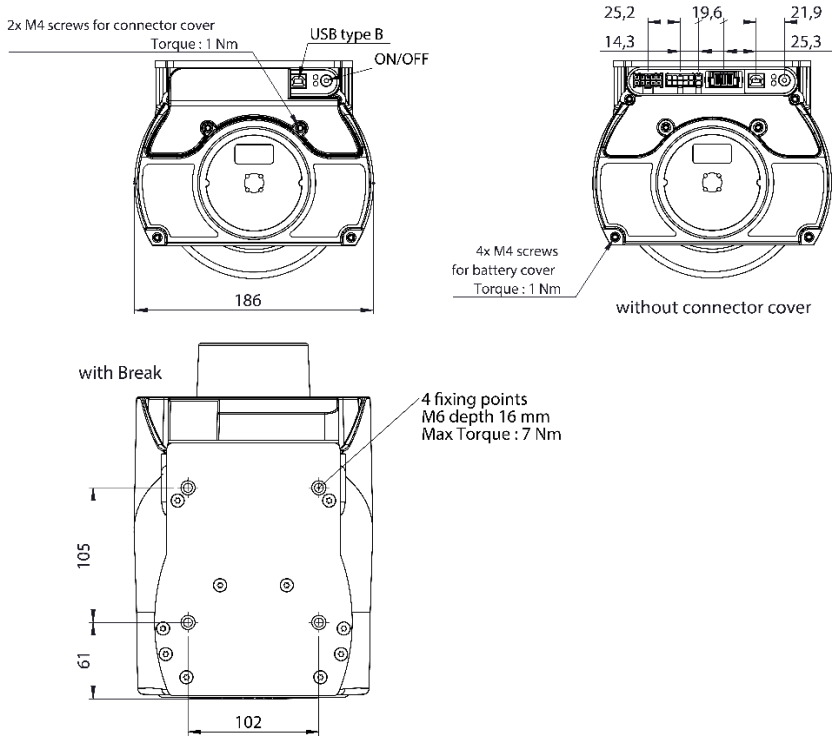


Figure 5 - AWD® 150 mechanical assembly drawing

AWD® 160

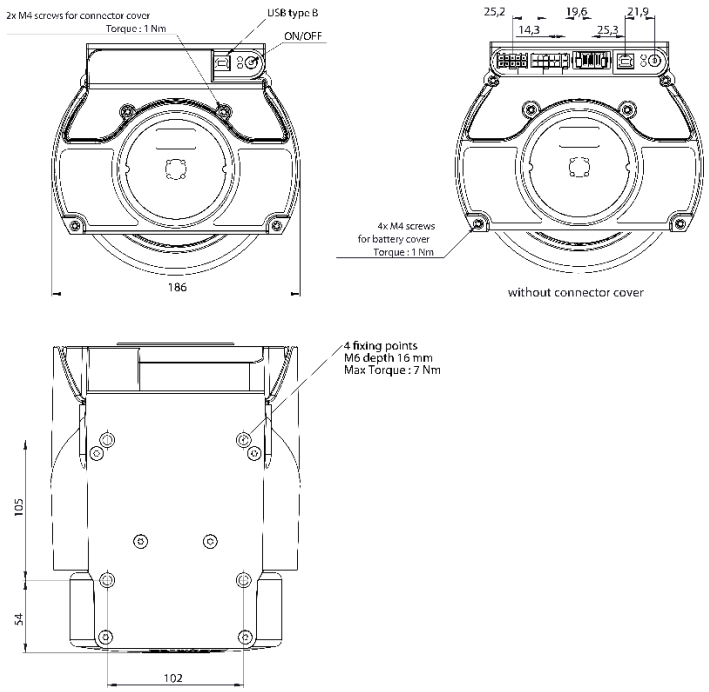


Figure 6 - AWD® 160 mechanical assembly drawing

7. Initial product preparation and verification

7.1 Open/close cable housing and cover

7.1.1 Removing the cable housing

- Unscrew the 2 screws.
- Remove the cable housing

- Torx screw M4x12
- Torx screwdriver and extension

7.1.2 Removing the cover

- Unscrew the 4 Torx M4x30 screws holding the cover to the chassis.

- 4 Torrx M4x30 screws
- Screwdriver with extension

A Torx extension screwdriver is recommended.

- Remove the cover.

This final step gives access to the various connectors, batteries and their connections.

7.1.3 Refitting the cover

- Position the two screws in the appropriate slots for the spacers - close to the connector interface.
- Align the housing with the chassis using the centering spacers.

- Torx screw M4x30
- Torx screwdriver and extension

- Tighten the 2 Torx screws until they touch.
- Do not tighten screws at this stage!
- Screw in the remaining 2 screws until fully tightened.

- Torx screw M4x30
- Torx screwdriver and extension

Tighten the first two screws until snug.

⚠ **The tightening torque of the screws is 2 Nm. Do not exceed this torque!**

- Be careful not to pinch any wires when fitting the cover back onto the chassis. This operation is necessary to make it easier to close the cover. The use of a Torx screwdriver extension is recommended.

7.1.4 Refitting the cable housing

- Return the cable housing to its original position.
- Screw in the 2 screws until fully tightened.

- Torx screw M4x12
- Torx screwdriver and extension

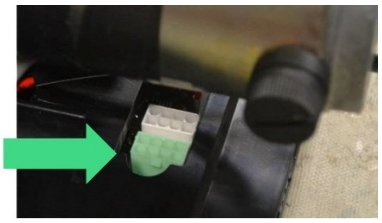
⚠ **Tightening torque for screws is 2 Nm. Do not exceed this torque!**

7.1.5 Cable routing

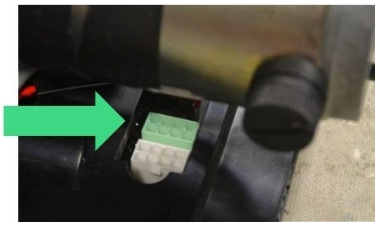
- When installing or handling connected cables, ensure that the cables are positioned in the passages provided in the housing before repositioning it.
- Once the housing has been positioned on the wheel, ensure that all cables pass through the cable duct between the cover and the cable housing.

7.2 Fitting or replacing battery packs

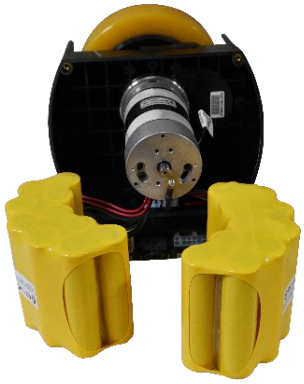
7.2.1 Connecting battery packs



- Connect the first battery pack to the 8-pin female Molex® on the left.



- Repeat the operation on the right-hand side for the second battery pack.



- Once the battery cables have been connected, reposition the blocks in their original positions.

Refer to “7.1 Open/Close cable housing” section for instructions on reassembling the cover.

7.2.2 Removing battery packs

- Remove the battery pack(s) from the battery compartment.

8. Product integration

⚠	**The integration of a drive wheel on a rolling machine must comply with the applicable Machine Directive.** **Refer to the Declaration of Incorporation available on the ez-wheel.com website section Download, to ensure that your machine complies with the relevant directives and standards.**

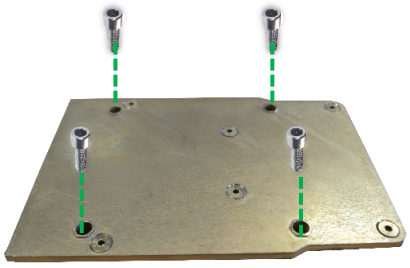
- Although *ez-Wheel*® wheels can be integrated directly into a machine, the use of suspended bracket integration accessories is recommended. These accessories optimize ground/track contact and guarantee the safety and comfort of use.
- Contact your reseller for more information on mounting the *ez-Wheel AWD*® and to find out which mounting accessories are available.

8.1 Fixing the wheel directly to the application

The wheel can be fixed to the chassis.
In this case, check the maximum vertical load the wheel can support.

- Fit the wheel mounting plate to the underside of the application using 4 M6 screws.

- Distance between axes: 102 x 105 mm
- Mounting drawings available on request
- The tightening torque of the screws is 7 Nm, do not exceed this torque.
- Maximum screw length in the plate is 16 mm.



8.2 Fixing the wheel to the application using a suspension bracket

Suspended brackets allow *AWD*® 150 & 160 wheels to be mounted on applications requiring an optimized wheel/ground connection. The following information sets out instructions for the installation, use and maintenance of the accessories.
The integration of a wheel drive on a rolling application must comply with the applicable machine directive.

Two product references are available in the IDEC *ez-Wheel*® catalog:

Part Number	Visual	Wheel compatibility
EW9Z-1MCS2		✓ *AWD*® 150 & 160
EW9Z-1MCS3	 	

The use of a suspension is ideal for applications involving the addition of a drive wheel as 5th wheel to an existing machine.

- All mechanical drawings useful for the integration of *ez-Wheel*® products are available on request.
- All the accessories listed are available in the *ez-Wheel*® catalog.

8.2.1 Wheel mounting on suspension bracket EW9Z-1MCSx

The only difference between EW9Z-1MCS2 and EW9Z-1MCS3 is the number of springs they incorporate (2 and 3 units respectively). This paragraph therefore deals with both products without distinction.

EW9Z-1MCSx suspended bracket technical specifications:

Weight	2,8 Kg
Material type	S235 steel
Water resistance	Anti-corrosion treatment

Suspension bracket position:

3 operating levels applied to the screed are available on this product:

Position 1	Extended position (deployed), passing a trough
Position 2	Nominal position, operating on levelled ground
Position 3	Compressed position, passing an obstacle

⚠ Follow the installation instructions to ensure optimum performance of the suspension.

Mounting the suspension on the wheel:

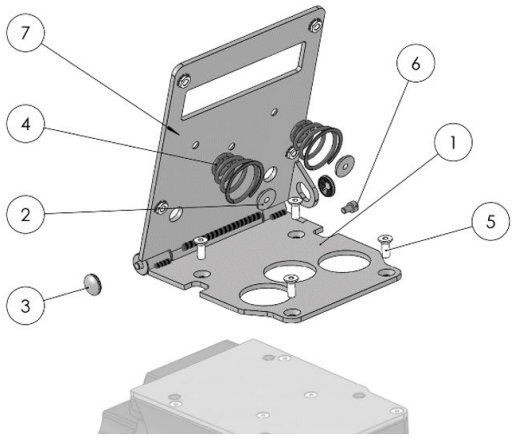
- Fix the suspension to the wheel mounting plate using the 4 FHC M6x16 screws. All 4 screws must be secured

Mounting drawings are available below
4 FHC M6x16 screws

Tightening torque is 3.9 Nm.

- Do not exceed this torque

The maximum length of the screws in the wheel plate is 16 mm, i.e. a maximum length of 20 mm (consider the thickness of the suspension plate).

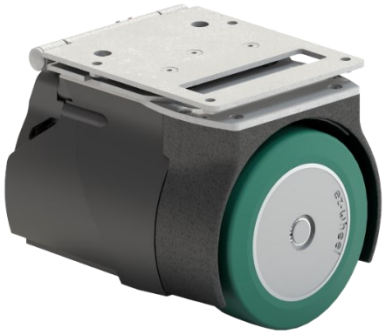


1	Welded hinge sub-assembly
2	Spring pin
3	Lock washer Ø6 with dome cap type (A)
4	Conical compression spring Ø wire 3 - Ø40 - Ø20
5	SCREW FHC M6x16 STEEL cl.10.9 ISO 10642
6	M5x8 CHC screw ZINCED STEEL CL.8.8 ISO 4762
7	FHC screw M6x8 ZINC PLATED STEEL CLASS 8.8 ISO 10642

Mounting the suspension/wheel assembly on the application:

- Fix the pre-assembled assembly to the machine using 4 M6 screws.
- It is imperative to fasten all 4 screws for a better hold of the system.

- Centre distance: 125 x 142 mm
- Mounting drawings are available below
- 4 M6 screws



Choose screws with a length between Lmin and Lmax so as not to interfere with the screed's total compression:

- Lmin = application plate thickness + 9 mm
- Lmax = application plate thickness + 13 mm

Suspension bracket drawings:

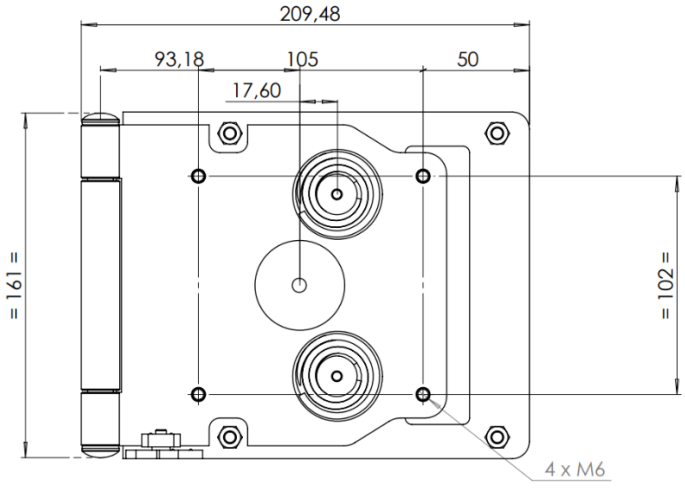


Figure 7 - Folded suspension drawing

- The lower plate attaches to *AWD*® 150 and 160 wheel.
- The upper plate has 3 slots to facilitate screw attachment of the lower plate to the wheel.

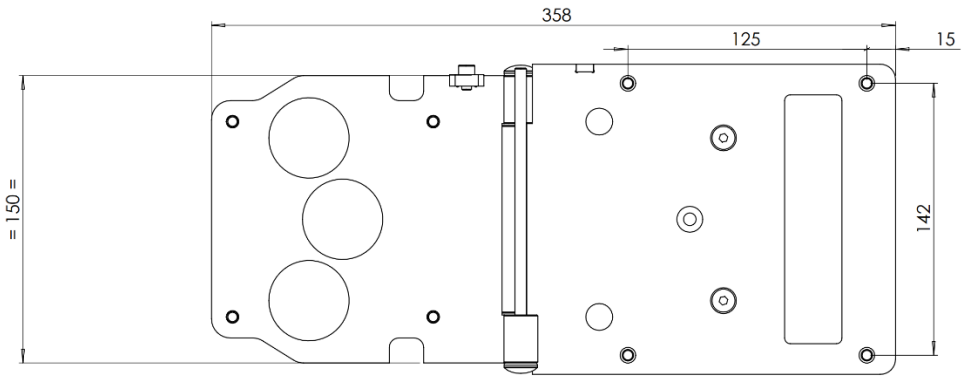
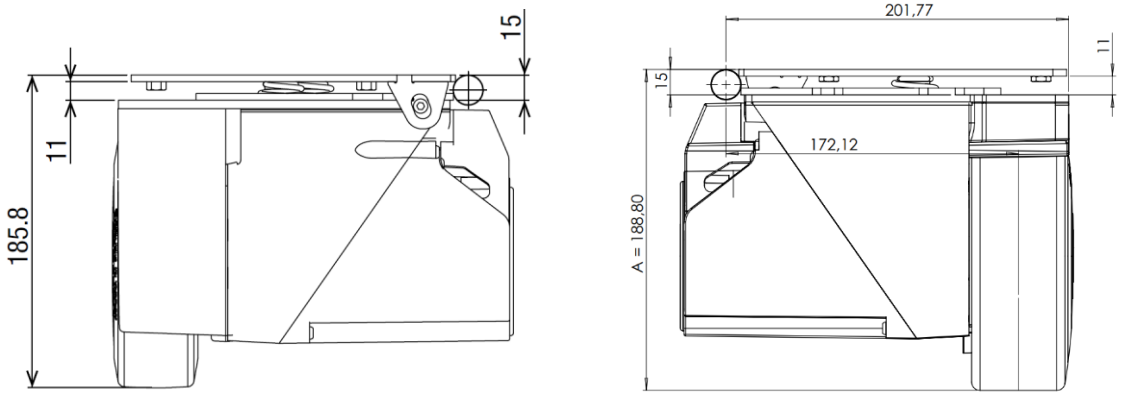
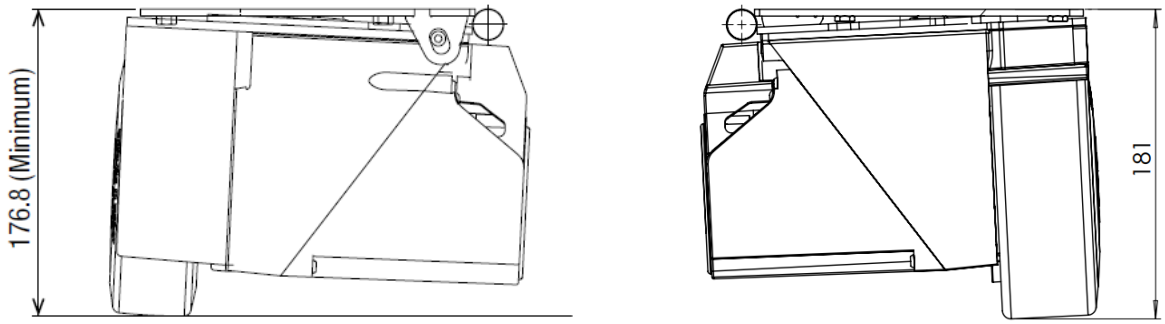


Figure 8 - Deployed suspension drawing



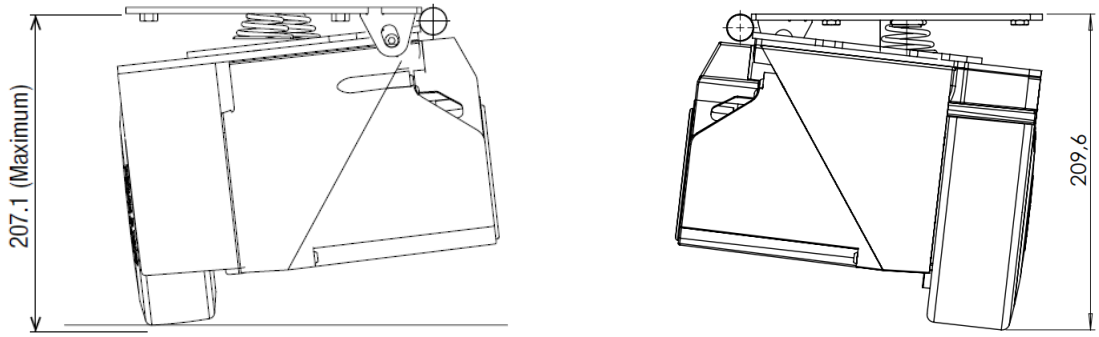
AWD® 150 *AWD®* 160

Figure 9 - Drawing of mounting height under application chassis in nominal position for AWD® wheels



AWD® 150 *AWD®* 160

Figure 10 - Compressed state drawing



AWD® 150 *AWD®* 160

Figure 11 - Extended state drawing

- Test the complete system and check that the electric wheel drive operates correctly and without slipping on the ground, over the entire load range permissible for the application.
- The maximum horizontal traction force given by the wheel for propulsion is 35 daN for *AWD*® 150 and 27 daN for *AWD*® 160.

If, despite the force applied by the suspension, slippage is observed:

- Check that the suspension position at rest is in the nominal position: the upper and lower plates of the suspension must be parallel.

8.2.2 Height tolerance and pressure level

	***AWD*® 150**	***AWD*® 160**
Total height with wheel[2]	186 mm	189 mm
Maximum height before loss of ground contact	207 mm	210 mm
Minimum height before hitting the chassis	177 mm	181 mm

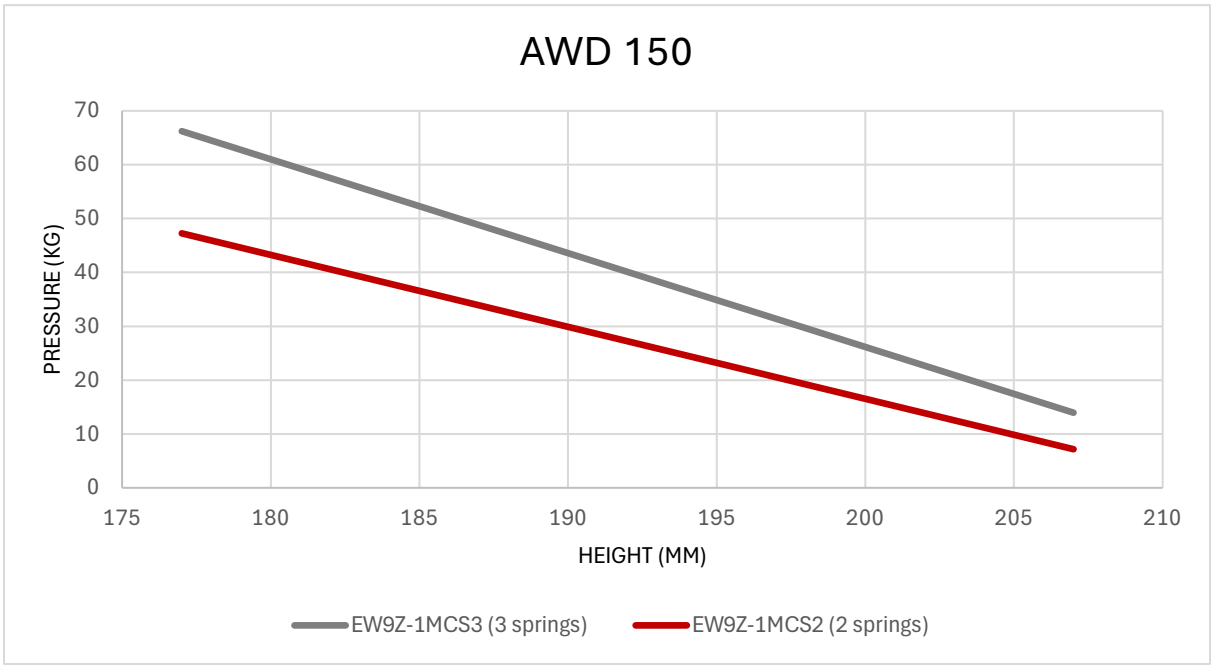


Figure 12 - Height tolerance and pressure level for AWD® 150

[2] Nominal, horizontal position

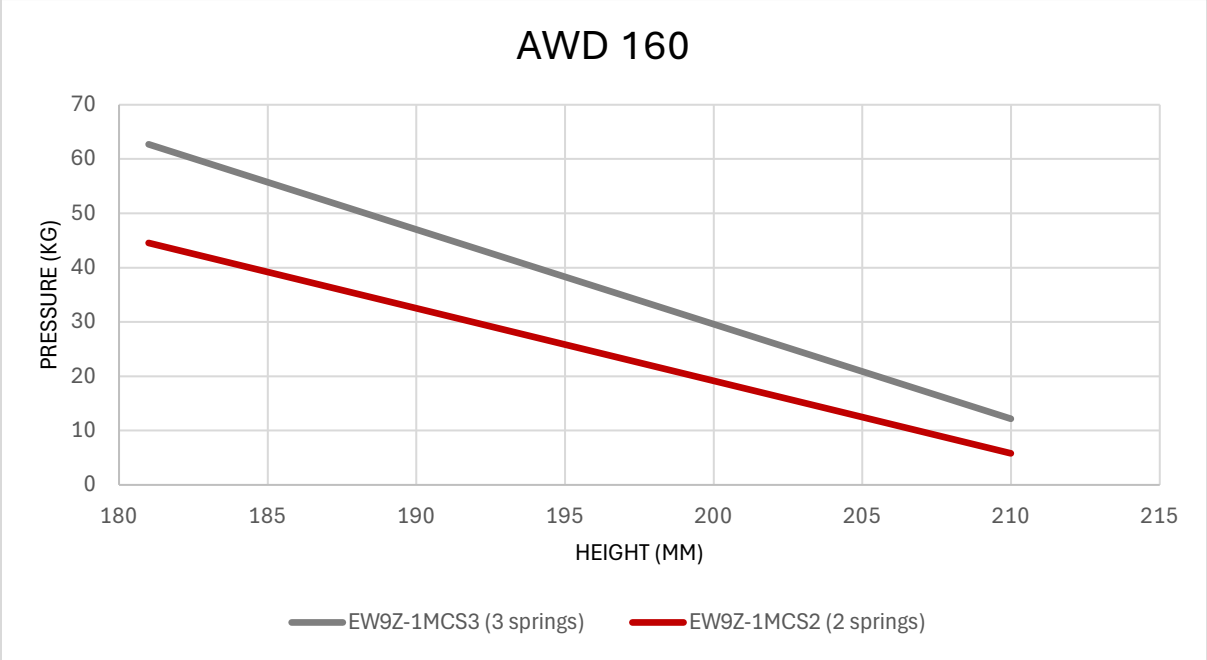


Figure 13 - Height tolerance and pressure level for AWD® 160

Empirical recommendation:
To avoid slippage, the vertical pressure applied to the wheel should be at least twice the wheel pushing effort.

8.3 Incorrect use

APEM SAS cannot be held responsible for any damage caused to the user by irrational or inappropriate use of the product.
Under no circumstances may the product be modified in any way not authorized by the manufacturer.
The product must not be used for any purpose beyond the technical performance specified by the manufacturer.

⚠ Do not attempt to disassemble the suspension, as disassembling the parts could be hazardous.

8.4 Fixing the directional controls

- Fit the command to the application so that it is intuitive and ergonomic to use.

Two approaches can be used to accomplish this:
- On a panel for rotary handle, joystick and tiller head commands
- On a tube for trigger-type command

- Contact your reseller for installation drawings of the various commands.

8.4.1 Positioning and operating direction

- Refer to the *ez-Config® AWD®* 150 & 160 manual, available on the ez-wheel.com website under Download section, for all compatibility, pairing and set up information about *ez-Wheel®* products.

9. Initial start-up of equipment

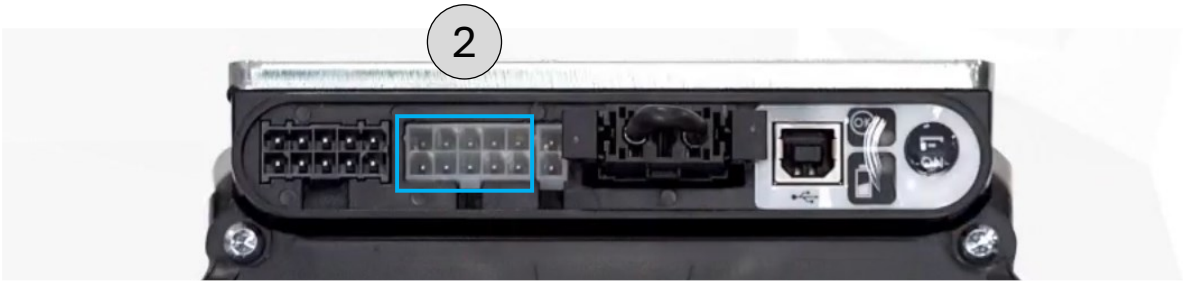
9.1 Cable/connection affiliations

- Please consult the following table to know the compatibility connectors/cables:

Connector ID	Connector specification	Cable compatibility	Description
1	Molex® Mini-Fit Jr female 10-pin	EW9Z-1BC24V	Option connector
2	Molex® Mini-Fit Jr female 10-pin	EW9Z-1ACxM	Command connector
3	Molex® Mini-Fit Jr 2-point female	EW9Z-1CCxMW	Charging connector
4	SAMTEC MPT-03-01-01-T-RA-SD	EW9Z-1BCEXT2MF EW9Z-1BCEXT2M	External battery connector
5	USB Type-A	Not provided	USB connector

9.2 Command connection

To connect the controller to the *AWD*® wheel, an EW9Z-1ACxM cable is required.
This cable should be plugged into the wheel's connector ②.

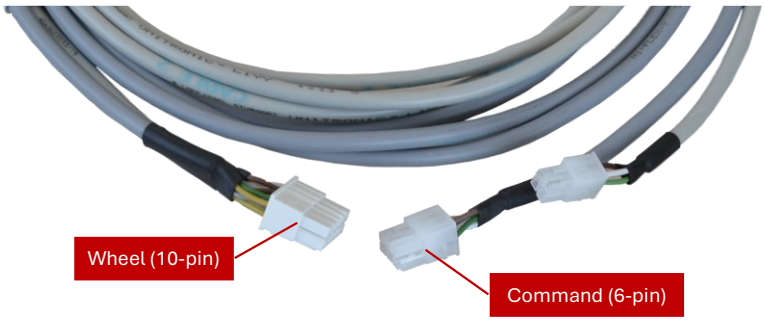


ℹ A suitable EW9Z-1ACxM connection cable length is required for integration into the application.
Please consult your reseller.

9.2.1 System without start button

- Connect the command to the wheel using the EW9Z-1ACxM adapter cable as follows:

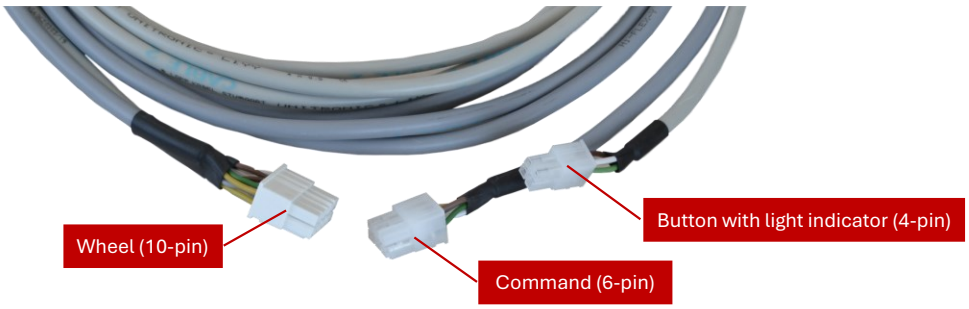
- Molex® Mini-Fit Jr 6-pin connector on command
- Molex® Mini-Fit Jr 10-pin connector on wheel



- Check that the locking pin retains the connector.
- Connect the command and knob to the wheel using the EW9Z-1ACxM adapter cable as follows:
  - Molex® Mini-Fit Jr 6-pin connector on the command
  - Faston lugs on knob
  - Molex® Mini-Fit Jr 10-pin connector on the wheel
- Check that the locking pin retains the connector.

9.2.2 System with a start button (indicator light)

- Connect the command and button to the wheel via the EW9Z-1ACxM cable, as follows:
  - Molex® Mini-Fit Jr 6-pin connector on the command
  - Molex® Mini-Fit Jr 4-pin connector on the button
  - Molex® Mini-Fit Jr 10 points connector on the wheel



- Check that the locking pin retains the connector.

All mechanical drawings that may be useful for integrating commands are available on request.

9.3 Charge cable connection

9.3.1 Charging system equipped with an XLR remote charging socket

- Secure the XLR panel connector to the application chassis using 2 screws.

M3 FHC screw
Torx screwdriver

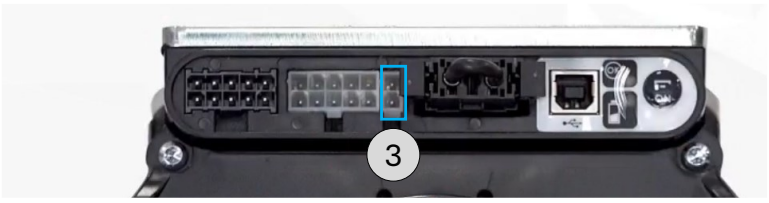
- Attach the EW9Z-1CCxMX charging cable to the application.

The panel-mounted XLR connector must be positioned for easy access and use.

- Connect the 2-pin Molex® connector of the EW9Z-1CCxMX charging cable to the 2-pin female connector on the wheel ③.
- Check that the locking pin retains the connector.

9.3.2 Charging system with an on-board charger MASCOT1A8Wx

- Attach the charger to the application chassis, ensuring access to the power cord for recharging.
- Connect the charger's 2-pin Molex® connector to the wheel's 2-pin female connector ③.



9.4 External battery connection

⚠ If an external battery is present, it is recommended to contact the reseller to verify the compatibility of the batteries used and the connection of external batteries.

⚠ **Never connect an external battery if the wheel is fitted with an internal battery.**

For details on connecting external battery or power supply refer to “5.4 Battery & Power supply interface” section.

9.5 Jumper / Emergency stop connection

In the case of a wheel-internal battery:

- Check that the Jumper is properly connected to the wheel before use.

The Jumper can be replaced by wiring a remote emergency stop button (or other normally closed buttons).

Battery voltage is accessible on this connector, so take care not to short-circuit the metal contacts.

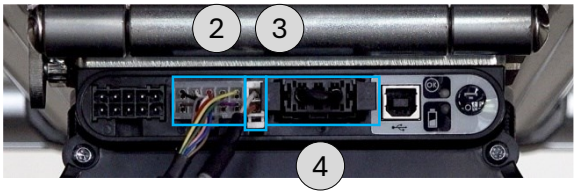
⚠ **If no jumper or button is connected to this connector, the wheel will not operate.**

9.6 Other connectors connection

⑤ USB socket:
The USB socket is reserved for system settings.
Contact your reseller for more information.

① Option connector:
This connector is dedicated to other purposes.
Refer to “5.3.1 Option connector” section.

⚠ **Before first use, ensure that the three main connectors are properly connected: command, charging cable, and jumper.**



10. First use

10.1 Preliminary check

- Check all connections.
- Fully charge the wheels before using them for the first time.

Refer to "10.3. Charge the *AWD®* wheel" section.

10.2 Light up the wheel

- Press the On/Off remote button to light up the wheel.
- The motorization is activated by the command.

10.3 Charge the *AWD®* wheel

Wheels can be recharged as soon as a mains connection is available (possibly several times a day).
There is no need to wait until the battery is fully discharged before recharging.

Charging system is equipped with an XLR remote charging socket Part Number EW9Z-1CC3MW:

- Connect the XLR connector on the charger to the 5-pin connector on the application chassis.
- When the wheel is fully charged, disconnect the charger by pressing the pin on the XLR connector.

Charging system includes an on-board charger

- Connect the charger plug directly to the mains.
- To disconnect the connector from the charger, press the locking lug and pull the connector.

⚠ Use an appropriate charger.
ⓘ Contact your reseller for more information on chargers.

10.4 Standby Mode

ⓘ The wheel goes into standby mode after a few minutes of inactivity on the control to preserve battery life.

To reactivate the system:

- Press the On/Off remote button; wake-up is instantaneous.

11. Troubleshooting

⚠ **Only APEM SAS service personnel are authorized to access wheel compartments not described in this manual.**
⚠ **Removal of the safety labels on the wheel's top plate will void the warranty.**
⚠ **If a malfunction occurs with your product, please contact your reseller.**

11.1 Wheel malfunctions

The appearance of the wheel seems to have deteriorated:

- Check the wheel for any missing parts.
- Inspect the cover for damage.

If the product is damaged, return it to your reseller including the wheel, command and accessories.

The wheel's recharge connector does not allow it to be used:

- Check that nothing has obstructed the charging connector. If necessary, carefully clean the connector.

The battery indicator light on the wheel does not flash when the charger is connected:

- Check all connections.
- Inspect the connector and main plug for damage or wear.
- Check the charger fuse, if fitted.

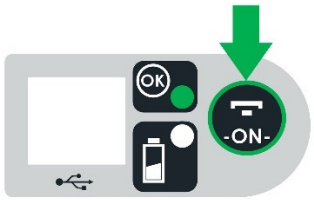
After prolonged storage, if the system does not start:

- Allow the battery to charge for several hours before attempting to restart the system.

11.2 Self-diagnostics and LEDs display

11.2.1 Preliminary steps

- Check that the wheel is securely in place before starting.
- Check the wheel status: press briefly the On/Off button on the wheel label and ensure the "OK" LED lights green.



If the application includes multiple wheels, repeat this procedure for each wheel.

- Press the remote button connected to the EW9Z-1AC3M wiring.
- Check the display on the wheel, or the remote display if available.
- Confirm that the command initiates both forward and reverse motion.

11.2.2 LEDs display and troubleshooting

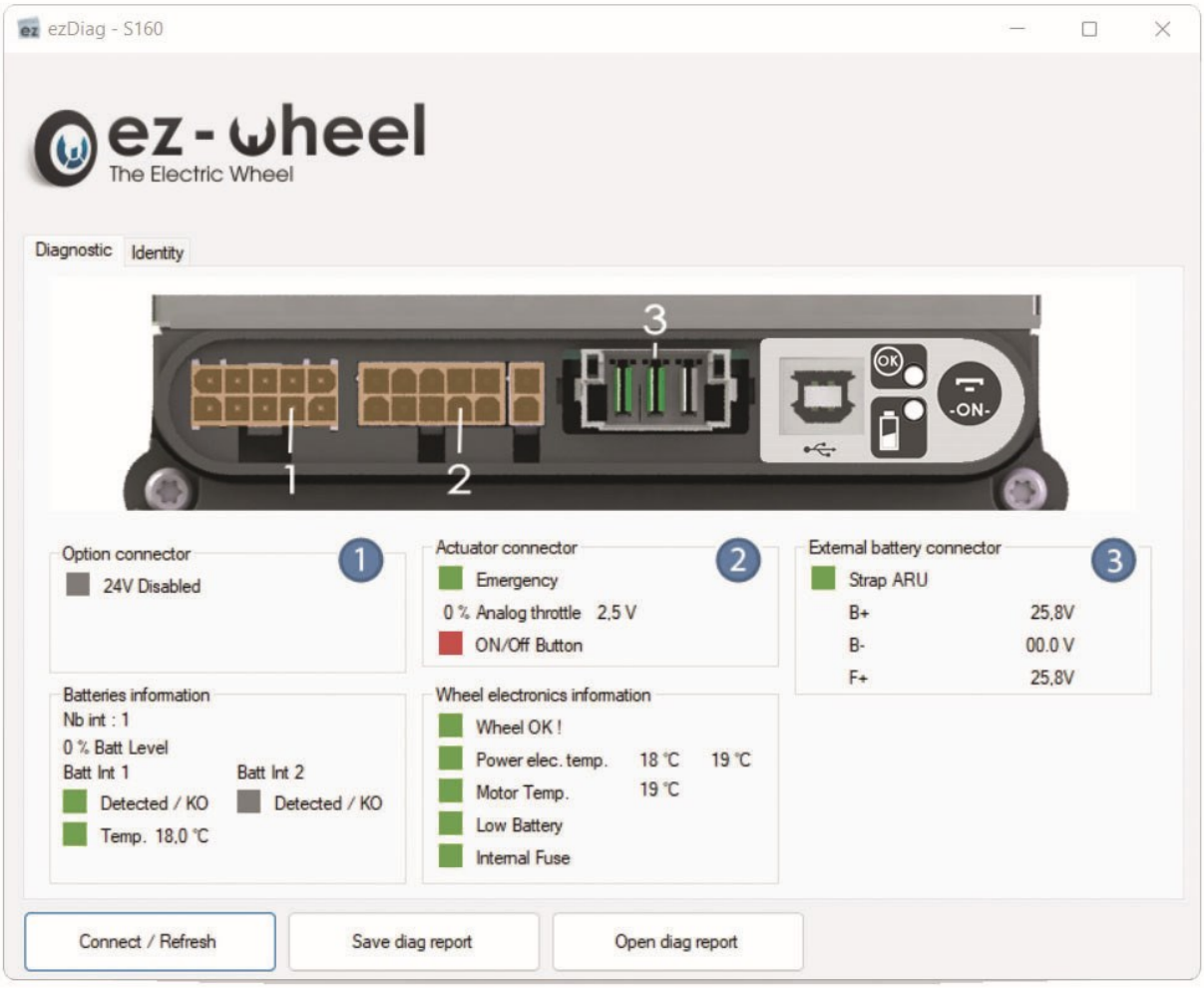
			Status	Troubleshooting
	Green		Wheel in operation	
	Red/Green		Fault preventing motorization or battery empty	General: ▪ Charge the wheel for several hours, then restart the system. ▪ Check that no safety device prevents motorization (anti-crush tiller button, dead man's switch, fuse blown, etc.). Connections: ▪ Check the presence of the Jumper or the status of the emergency stop button. ▪ Check connectors positioning and connection. Wheel temperature: The wheel temperature may be too high. ▪ Wait for a few tens of minutes, the system will operate normally when the wheel temperature has decreased.
	Green	**Green**	Wheel is charged	
	Flashing green	**Flashing green**	Wheel is charged, but connected to the charger	
	Orange	**Orange**	Wheel is half charged (50%)	
	Flashing orange	**Flashing orange**	Wheel is charging	
	Red	**Red**	Wheel has less than 1/3 of total charge	
	Flashing red	**Flashing red**	Wheel is completely discharged. Operation is impossible without recharging	▪ Charge the wheel for several hours.

11.3 *ez-Diag*® software

ez-Diag® is the first diagnostic assistant device for *AWD*® products. It enables remote troubleshooting, allowing equipment to be quickly and easily returned to service.

- Connect the wheel to the computer with the USB-A/USB-B cable.
- Download and launch the application.
- Press the Connect / Refresh button.

ⓘ The tool does not refresh continuously. It reads and displays information at the time of refresh.



11.3.1 Diagnostic window

Section	Description
Option Connector	- Availability of the 24VDC power supply and associated voltage
Actuator connector	- Emergency: Presence check status. Please refer to the relevant chapter - Analog throttle: Voltage and associated setpoint (%) for the Command 0-5V Please refer to the relevant chapter. - On/Off Button: status of the remote On/Off; opened or closed
External battery connector	⚠ Jumper or E-stop status ⚠ Voltage on internal batteries side (B+ / B-) and motor side (F+)
Batteries information	- Number of internal batteries installed - Internal batteries State of Charge (SoC) - Presence and status of installed internal batteries ℹ Discharge temperature limits are [-20°C ; 60°C] ℹ To reauthorize discharge, maximum temperature < 55°C
Wheel electronics information	- Wheel OK !: wheel status; ready-to-go or default. Similar to “OK” wheel indicator - Power elec. temp.: electronics’ power stage temperature limits are [-20°C ; 100°C] - Motor Temp.: motor temperature limits are [-20°C ; 80°C] - Low battery: empty batteries status. If empty, the operation is impossible without recharging - Internal fuse: wheel’s internal fuse status

11.3.2 Main buttons

Button	Description
Connect / Refresh	Read the wheel's information via USB to update data
Save diag report	Save the diagnosis displayed
Open diag report	Open a previously saved diagnosis

11.3.3 Identity Windows

It brings together the basic product identification.

12. Care and maintenance

12.1 Wheel maintenance

The wheel requires no maintenance other than recharging. Under no circumstances should it be opened.
IP54-rated *AWD*® 150 wheels are not washable with a simple water jet.
IP66-rated *AWD*® 160 wheels can be washed with a high-pressure jet.
Do not expose connectors, displays or labels to direct water jets. Use a damp sponge instead. Do not use solvents or corrosive products.

12.2 Long-term interruption of use

The wheel should be stored in a cool, dry place.
Recharge the wheel before any prolonged period of non-use.
Never leave an unused wheel completely discharged.
Do not store the wheel for more than 50 days without recharging it, even if it is not in use.
To restart the system after a prolonged interruption in operation. Refer to “9. Initial start-up of equipment” section.

13. After sales contact

If an *ez-Wheel®* product proves defective, please contact your reseller.
To enable the reseller to respond quickly, please have the serial numbers of the ez-Wheel® products and accessories ready.
The warranty conditions for *ez-Wheel®* products are available along with the general terms and conditions of sale from your reseller.

Before contacting your reseller, it is essential to carefully follow the various steps outlined in the "11. Troubleshooting" section.

14. End of product life

When the product reaches the end of its useful life, return it to your reseller.
Even though the product is no longer usable, it must be protected during transport.
Pack the equipment securely in its original packaging or equivalent.
If the original packaging is no longer available, place the product in a robust cardboard box, ensuring it is well secured, and close the package with adhesive tape.
If returning multiple pieces of equipment, combine them into a single package or securely attach the packages together.

15. Information & contact

For more information on *AWD®* technology:

	https://ez-wheel.com/en

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16. Modification history

Revision	Release date	Changes
v1-a	July 2025	First Release