

ENDO Users Manual

Magical Balancer

EDB-50/EDB-85/EDB-130



For safe and correct operation of the product, please be sure to read this manual and fully understand its content before use.

After reading, keep the manual safe so that you can find and use it readily.

In case of resale or transfer, make sure to transfer the manual to the new owner.

Introduction

Thank you very much for purchasing the Magical Balancer main equipment (also referred to as the product). To resolve any trouble and obtain the best performance from the product, please be sure to read this Instruction Manual (hereafter referred to as the manual) and fully understand its content.

Notation in this manual

Hazard levels

This product is designed with ultimate priority on the safety of operators. However, due to the nature of the system, there are risks that cannot be removed. In this manual, the level of significance and risk is defined and indicated in four stages, "DANGER", "WARNING", and "CAUTION". Thoroughly read and fully understand the indicated items before operating the product and performing maintenance procedures. The indications for "DANGER", "WARNING", and "CAUTION" are described below in order of risk significance (DANGER > WARNING > CAUTION).

 DANGER	Indicates a situation that, if mishandled, causes a danger of serious injury or death.
 WARNING	Indicates a situation that, if mishandled, may cause serious injury or death.
 CAUTION	Indicates a situation that, if mishandled, may cause injury or property damage.
NOTICE	Indicates a situation that, if mishandled, may cause property damage.

The extent of the problem described above (disability, injury, and property damage) is defined as follows.

Serious disability: Loss of eyesight, wound, burn (high-temperature or low-temperature), electric shock, bone fracture, poisoning, and other injuries that leave aftereffects and that require hospitalization or long-term outpatient treatment.

Moderate injury: Burn, electric shock, bone fracture, and other injuries that do not require hospitalization or long-term outpatient treatment.

Minor injury: Scratch, bruise, laceration, and other injuries that have a minor impact on health.

Property damage: Extended damage to buildings, household articles, and injury to domestic animals or pets.

Symbols

This Instruction Manual uses the following symbols that simply describe warning information in addition to the indications above, "WARNING" and "CAUTION".

	Indicates a PROHIBITED action that must not be performed.
	Indicates potential property damage or a danger that may inflict bodily injury.
	Indicates a REQUIRED action that must be performed.
	Indicates a NOTES when operating and maintaining the equipment.
	Indicates that it is necessary to thoroughly read this manual and the relevant documents.

Scope of warranty and liabilities for the equipment

Warranty and liabilities for the equipment

1. We will repair or replace the product free of charge if a failure due to manufacturing defects occurs under proper usage during the warranty period. In this case, present your warranty and request repair from your dealer.
2. The warranty will be void in the following cases:
 - 1) Change in ownership.
 - 2) Repair adjustment, or modification performed by a party other than the manufacturer, agents, or dealers.
3. The warranty period is one (1) year from the date of purchase.
4. Repairs applicable to any of the following shall be charged even during the warranty period:
 - 1) Failure/damage caused by incorrect use.
 - 2) Failure/damage caused by use of non-genuine parts.
 - 3) Failure/damage caused by fire, earthquake, natural disaster, or other unexpected incident.
 - 4) Incident caused by fall, shock, negligence, or by inadequate storage.
 - 5) Failure/damage caused by use of parts or other equipment that are not included in this product.
 - 6) Replacement of consumables.
 - 7) Usage in violation of dangers or cautions stipulated in this manual.
 - 8) Failure/damage caused by any reason that is not attributable to the manufacturer.
5. Warranty exclusions such as opportunity loss.

Excluded from the warranty period are opportunity loss, damage to anything other than our product(s), or other duties placed on you/your customers as a result of the failure of our product(s).

Copyright and liabilities

The copyright for this Instruction Manual (included with the product) belongs to Endo Kogyo Co., Ltd.

The Instruction Manual is provided for the limited purpose of supporting the safe and proper use of the product. It cannot be used for other purposes.

The customer may not use or make copies of this manual, in whole or in part, outside of this purpose without receiving prior consent from Endo Kogyo Co., Ltd.

The customer is also prohibited from translating or modifying the content of the manual, in whole or in part.

The content described in the manual is subject to change without advance notice.

Definition of intended users for this manual

This manual has been prepared to help all intended users involved with this product. From the point of view of safety, we have defined intended users according to their ability and experience and provided detailed descriptions for each group.

This manual defines four user levels.

Operator

The operator is a user who engages in general operations. Maintenance and other operations that require special skills are excluded from the general operations.

The operator is therefore not permitted to disassemble, install, or assemble the product.

The operator should read the manual thoroughly and carry out their work with complete understanding of the operating procedures.

Maintenance operator

In addition to the work of the operator described above, the maintenance operator is permitted to perform installation, simple troubleshooting, and periodic inspections.

The maintenance operator is required to have develop sufficient knowledge and operating skill for this product. The maintenance operator should read the manual thoroughly and carry out their work with a complete understanding of the equipment's characteristics and all required work.

Management supervisor

Duties of the management supervisor include turning ON/OFF the power when the work is completed and performing safety checks using an electroscope as necessary.

The management supervisor is required to have sufficient knowledge of the product and advanced operating skill for this product.

The management supervisor should manage not only the product itself but on-site operations that handle the product, comprehensively.

Service engineer

A worker with special knowledge and skills for installing the product, investigating the causes of a failure or damage, and performing repairs and overhauls.

Service engineering is normally performed by our service technicians

Emergency contact in case of malfunctions

If any malfunction occurs with the product, refer to the contact information indicated on the back cover of this manual and contact Endo Kogyo or an authorized dealer.

Our service representative will assist you.

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1. Warning sign and Precautions for Handling

1-1 Labels and name plates

Warning labels are attached to the locations with potential dangers related to the operation and maintenance.

The warning labels are displayed in an appropriate size and color that can easily attract operators' attention and indicate warning information and symbols of hazard classification.

In addition to the warning labels, handling labels that provide the information necessary for handling and nameplates that provide the product information are attached to the product.


CAUTION

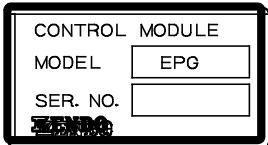
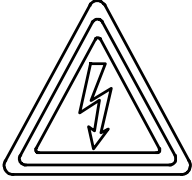
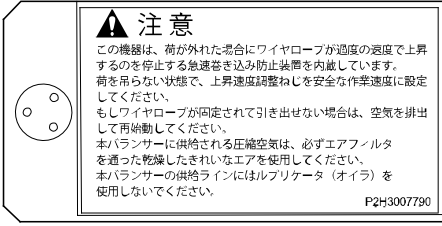


- The operators must check the positions of all danger warning labels attached to the product, and thoroughly read and fully understand the information on the labels before performing any procedure.
- If the warning labels or the nameplates are peeling off or deteriorated and become illegible, contact us to replace them.

1-1-1 Types of warning labels and nameplates

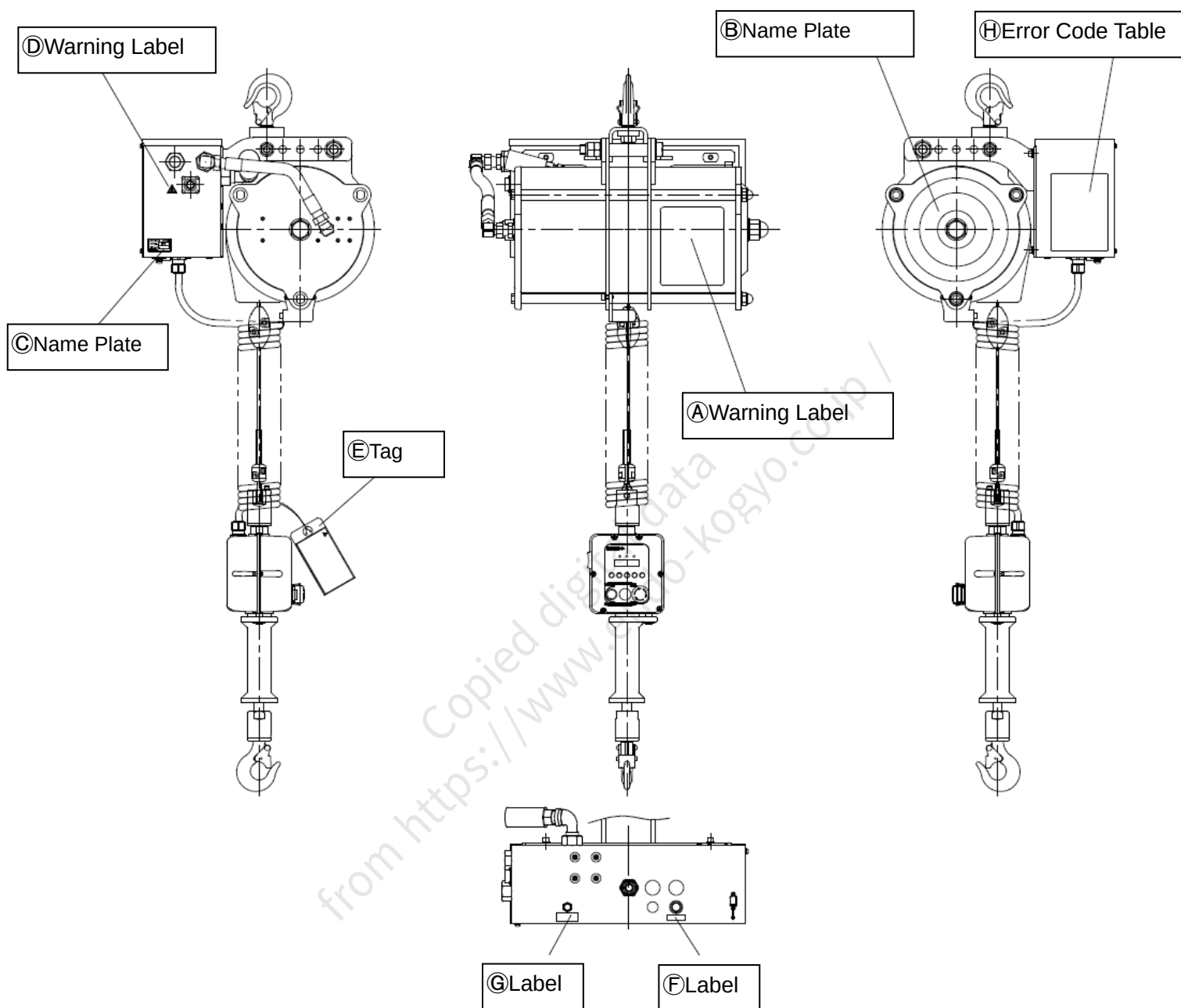
The following labels are attached to this product.

No.	Label appearance	Details
①		This label is a warning label attached to the main equipment of the Magical Balancer. Cautions for handling the product are indicated.
②		This is a nameplate attached to the main equipment of the Magical Balancer. The model name, serial number, year of manufacture, manufacturer's address and specifications of the product are indicated.

No.	Label appearance	Details
㉔		This is a nameplate attached to the control box of the main equipment of the Magical Balancer. The model name and serial number of the stand-alone control module are indicated.
㉕		This label is a warning label attached to the control box of the main equipment of the Magical Balancer. This is a warning label against electric shock.
㉖		This tag is attached to the curled cord. Cautions for handling the product are indicated.
㉗		This label is attached to the control box of the main equipment of the Magical Balancer. This label shows the operating conditions.
㉘		This label is attached to the control box of the main equipment of the Magical Balancer. This label shows the emergency release button.
㉙		This label is the error code table attached to the control box of the main equipment of the Magical Balancer. This label shows the error code numbers and the error names.

1-1-2 Locations of warning labels and nameplates

The labels and nameplates are attached to the following locations of the product as shown below.



1-2 Precautions for handling

Incorrect handling of this product may cause damage to the product or the suspended load as well as an injury.

Thoroughly read the following precautions and be sure to observe them when handling the product.

1-2-1 General handling

 DANGER	
	● Do not move directly under a lifted load. ● Do not transport a load overhead.

 WARNING	
	● Do not use the product for lifting or transporting a person. ● Do not lift or transport a load overhead or near a person. ● A person who has not received education (training) in the safety and the operation must never (and must never be permitted to) operate the Magical Balancer or perform slinging work. ● Do not operate the Magical Balancer when your health makes you unable to perform operation adequately. A person who operates the balancer should have no difficulties in hearing or vision, and needs to have deep expertise. ● When a sign such as “Inspection in progress” or “Do not operate” is attached to the grip controller of the Magical Balancer, do not operate the Magical Balancer until a designated person removes the sign.
	● Before the installation, operation, or maintenance and inspection of the product, carefully read and understand this Instruction Manual, and correctly use the product in order to avoid accidents from mishandling. ● Store this Instruction Manual so that anyone who performs the installation, operation, or management of the product can use it. ● For support members to attach (suspend) the Magical Balancer, use members that have a sufficient safety coefficient for supporting the mass (weight) and the maximum capacity of the Magical Balancer. ● Be sure to perform inspections before starting the operation as well as periodic inspections.

1-2-2 Installation

 DANGER	
	● Be sure to install the stoppers on the ends of the traverse and travel rails. ● Ensure that the location where the Magical Balancer is installed has sufficient strength.

 WARNING	
	● The installation must be performed by professionals or a person who has expertise. ● Do not install the Magical Balancer in a location outside the specified environment, such as a location where the balancer is exposed to rain or water. ● Do not connect the ground wire to the following. Gas and hydraulic piping: Danger of explosion or catching fire. Telephone line and lightning rod: Danger in case of lightning. Water pipe partially made of plastic in the middle: Does not serve as the ground.
	● Danger of electric shock. Implement a D class grounding construction. ● In addition to the grounding, install an earth leakage breaker on the electric circuit. ● Be sure to attach an auxiliary wire rope to the Magical Balancer.

 CAUTION	
	● Do not operate the product on the floor (placed horizontally). ● Do not operate the Magical Balancer with slack in its wire rope. Always suspend the balancer when operating it.

1-2-3 Air supply pressure and voltage

 WARNING	
	● Operate the Magical Balancer with an air supply pressure less than 0.7 MPa. ● Use the operating voltage and current within their ratings (AC100V/0.7A · AC115V/0.7A · AC240V/0.4A)

 CAUTION	
	● Do not use a lubricator (oiler) for the air supply line of the Magical Balancer. Do not use any type of lubricating oil, because it may cause a malfunction in the control module as well as damage to the internal parts.
	● Be sure to install a filter and a regulator.

1-2-4 Precautions for use

 DANGER	
	● Do not move directly under a lifted load. ● Do not transport a load overhead. Never operate the product if the following abnormalities exist in the wire rope. (1) Kink, deformation, or corrosion (2) Wire breakage, wear beyond the usage limit

 WARINNG	
	● Never suspend a load exceeding the maximum capacity. Note: The maximum capacity is indicated on the main equipment. ● Do not permit a person to climb on the suspended load. In addition, never use the product for carrying a person. ● Do not enter the traveling direction (path) of the suspended load. ● Do not move your face close to the suspended load. ● Do not operate the balancer while putting your hand or finger in the hook. ● Do not operate the balancer when there is a person within the range of movement of the suspended load. ● Do not leave the operating position while suspending a load. ● Do not operate the balancer in such a way that the suspended load or the bottom hook will swing. ● Do not use the stoppers to stop hoisting of a load. ● Do not pull a load in an oblique direction. When the bottom hook is not located directly under the Magical Balancer, do not operate the Magical Balancer. Move the Magical Balancer directly over the center of gravity of the load before suspending it. ● Prevent the wire rope from contacting with a sharp edge. ● Avoid lifting a load fixed to another structure. ● Do not perform reversing of the suspended load. ● Check the operation of the grip controller before use. Do not operate the balancer if the grip controller does not operate smoothly. ● Do not operate the Magical Balancer if it is damaged or it creates abnormal noise or vibration. ● Do not sever a load suspended in midair. ● Do not electrically weld a load suspended in midair. ● Do not connect the ground of a welder to the wire rope. Never allow the wire rope to contact with a welding electrode.



WARNING



- Use the operating voltage and current within their ratings.
- When moving the Magical Balancer, ensure that there is no obstacle within the range of movement of the suspended load and the hook.
- Always pay attention to the load while operating the balancer.
- If the balancer moves opposite to the slide direction of the grip controller, stop the operation immediately.
- To move a load with the plain trolley, do not push the wire rope of the Magical Balancer, but push the load.
Do not pull the load.



CAUTION



- Never use the product if the hook latch is damaged or not functioning normally.
- Do not operate the balancer rapidly, for example, by lifting a load up and down rapidly or stopping suddenly.
- Do not use the product while holding a stopper.
- Prevent the suspended load from contacting with the wiring and other structures.
- Do not hang the curled cord on other objects or pull the cord hard.
- Prevent the Magical Balancer or the trolley from colliding with the stopper of the I-shaped steel (rail) or other structures.
- Do not wind up the wire rope rapidly when slack remains in the rope.
- Ensure that the lifting height is sufficient for the work.
- Do not leave a load suspended.
The suspended load may slowly descend over time. After the work is completed, lift down the suspended load to the ground.
- Do not shut off the power supply or the air supply when the load is suspended.



- Smoothly perform the lifting up and down of the suspended load.
- Ensure that the bottom hook can rotate smoothly before use.
- Correctly place the sling on the hook.
- Stop winding up temporarily after the wire rope is tightened.
Note: Do not rapidly hoist the load from the ground.
- If the air supply pressure is shut off while the product is being used, the load is held temporarily and then slowly descends over time.
- If you cannot lift down the load due to the winding limit of the wire rope, manually pull out the wire rope to lift down the load.

1-2-5 Periodic inspections

 DANGER	
	● Periodically inspect the Magical Balancer, and replace worn or damaged parts. ● Discard the hook if it is stretched, worn or damaged. Do not try to repair it, but replace with a new hook.

 WARNING	
	● Never perform any modification of the product or its accessories. ● Never use parts other than our genuine parts. ● Before performing maintenance and inspection or repair, shut off supply of the air and electricity. ● The maintenance and inspection or repair must be performed by a person with expertise designated by the business operator. ● Always perform the maintenance and inspection or repair with an empty load (without a load). ● Be sure to lift down the Magical Balancer to the ground before disassembling it. ● If any abnormal part is found during the maintenance and inspection, do not use the product as is, but repair it immediately. ● When performing the maintenance and inspection or repair, be sure to post a sign indicating that the work is in progress (such as “Inspection in progress” and “Do not operate”). ● If there is anything unclear regarding the Magical Balancer, stop using it and contact us or the agent from which you purchased the product.

 CAUTION	
	● Follow the instructions (see “エラー! 参照元が見つかりません。 エラー! 参照元が見つかりません。”) to perform lubrication. ● When performing a test run after the maintenance and inspection or repair, be sure to perform it with the Magical Balancer suspended. Note: Do not operate the Magical Balancer with slack in its wire rope.

2. Unpacking and Installation

2-1 Packaging arrangement and transportation

This product is packaged for delivery in a cardboard box.

The total weight of the package is approximately 42 kg and 50 kg or more for the light and heavy models, respectively.

When transporting the package, use a dolly or lifter, and do not drop or apply excessive impact to the package.

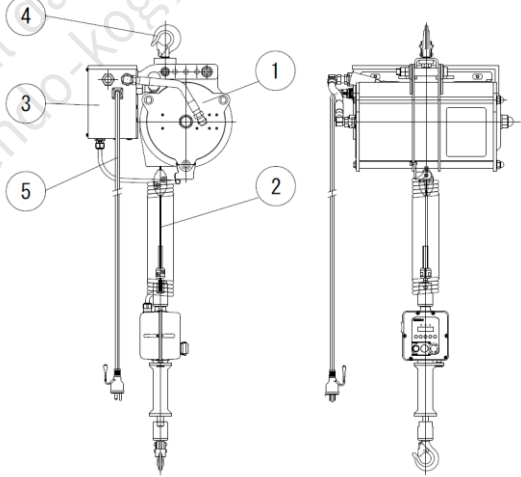
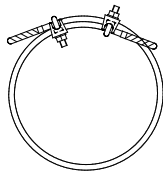
Prepare a box of a similar size for re-packaging.

2-2 Checks after unpacking

After opening the package, check that the ordered items are included.

Please contact us if by any chance you find anything missing or damaged.

2-2-1 Set of product

No.	Item name	Quantity	Appearance
①	Main equipment	1	
②	Set of wire rope		
③	Control module Model: EPG		
④	Upper hook		
⑤	Power cable		
⑥	Set of support wire rope	1	
⑦	Instruction Manual (this manual)	1	

Notes:

- The figure above is an image intended to help explain the names. The dimensions and shapes differ according to the specifications.
- Items (2) to (5) are delivered as the standard accessories and assembled in the main equipment before shipment.

2-2-2 Record of product

Record the model (MODEL) and the serial number indicated on the nameplate of the product as well as your dealer.

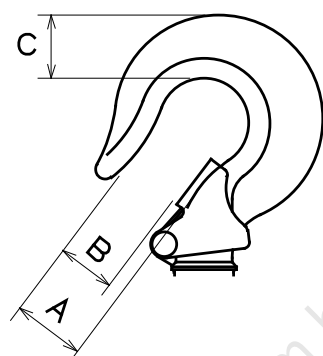
Note: When you request repair or need consumable parts, contact us after preparing this type of information in advance.

Item	Product information
Product model	
Serial number of main equipment	
Serial number of control module	
Date of purchase	
Dealer	

2-2-3 Prerecording for inspection

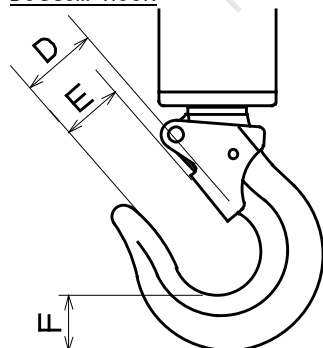
After purchasing the product, measure and record the actual dimensions of the hooks in advance, and use the measured values as the references for inspection.

Upper hook



Measurement A	mm
Measurement B	mm
Measurement C	mm

Bottom hook



Measurement D	mm
Measurement E	mm
Measurement F	mm

2-3 Disposal of packing materials

After opening the package, dispose of any packing and cushioning materials in accordance with the municipal regulations in the area where the product is used.

3. Product Description

3-1 Summary of Magical Balancer

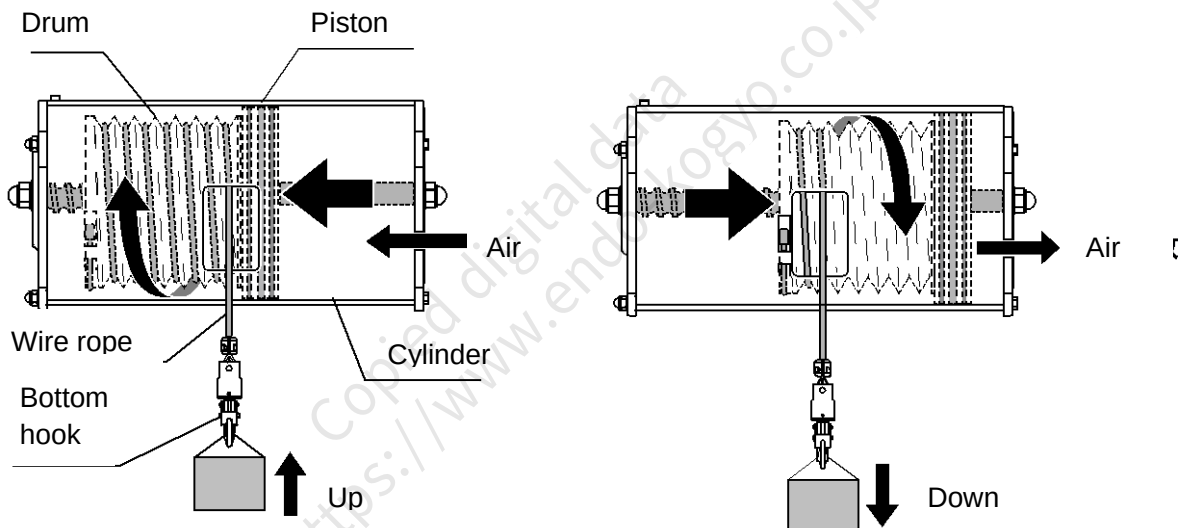
3-1-1 Functions of Magical Balancer

The Magical Balancer EDB series models are hoisting machines operated with compressed air and air cylinders. The balancers can be used for cargo handling and transportation.

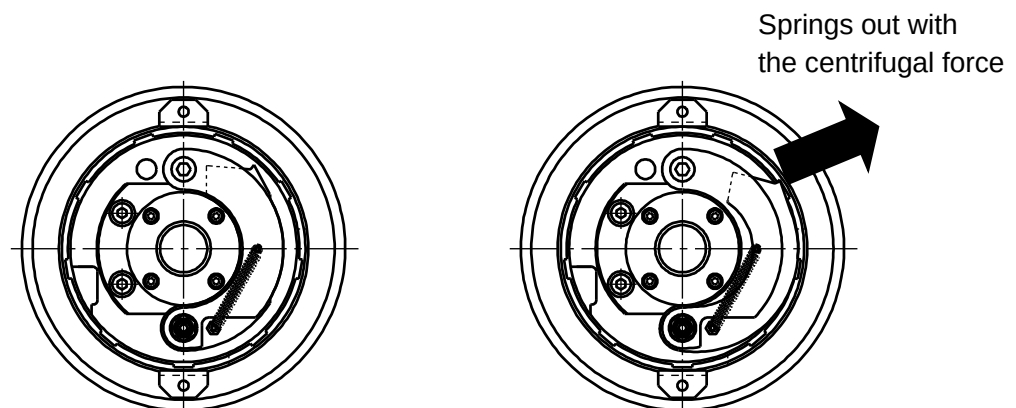
The piston is pushed out by the air supply and rotates the drum, thereby winding up the wire rope around the drum.

When the air is released, the wire rope is reeled out by the self weight of the bottom hook and the load.

The supply and release of the air are controlled with electrical signals.



In addition, the product is equipped with a “anti-jump device”, which uses a ratchet mechanism to prevent the suspended load from rebounding due to rapid winding after the load is dropped.

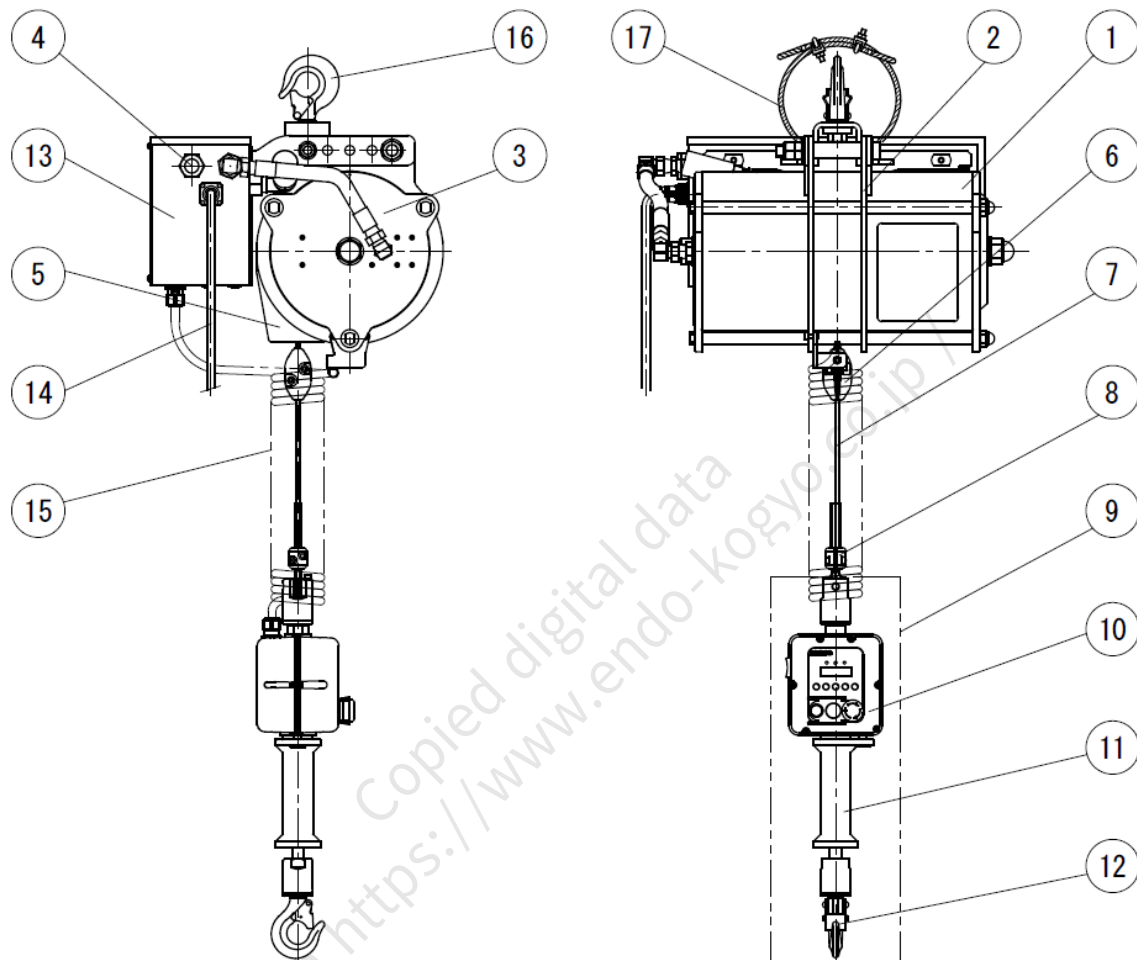


3-2 Components

3-2-1 Appearance of the main equipment of the Magical Balancer

The names of main components of magical balancers are provided below.

(The numbers in the figure below are intended to help explain the names. Please note that they are different from the numbers in the Parts List.)



Notes: • The figure above is an image intended to help explain the names. Since the dimensions and shapes differ according to the specifications, refer to the attached Exploded View and Parts List for the details.

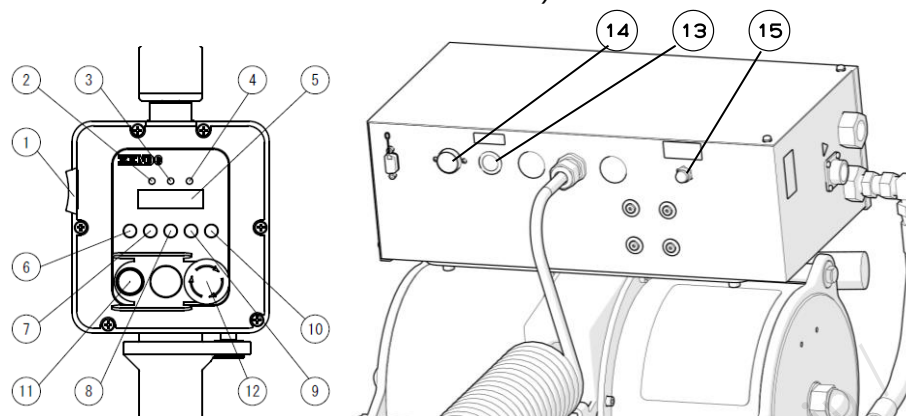
- The set of the control section including the control box of the main equipment, curled cord, and grip controller are together referred to as the control module.

Code	Name	Code	Name	Code	Name
1	Casing	7	Wire rope	13	Control box of main equipment
2	Hanger	8	Wire clip	14	Power cable
3	End cap	9	Grip controller	15	Curled cord
4	Air supply port	10	Grip box	16	Upper hook
5	Wire guide	11	Grip	17	Auxiliary wire rope
6	Stopper	12	Bottom hook		

3-2-2 Names and functions of the control panel section of the grip box and the bottom of the control box of the main equipment

The following are the names and functions of the control panel section of the grip box and the bottom of the control box of the main equipment.

(The numbers in the figure below are intended to help explain the names. Please note that they are different from the numbers in the Parts List.)



No.	Name	Function
1	Power switch	Used to start up and shut down the Magical Balancer.
2	Grip lamp	Turns ON in green during the grip control.
3	Work lamp	Turns ON in blue during the workpiece control.
4	Alarm lamp	Turns ON in red when an abnormality has occurred.
5	LCD display	The statuses of the equipment, any errors that are occurring, etc. are displayed.
6	[Mode] key	Used to select the display mode shown on the LCD indicator.
7	[Set] key	Used to confirm the displayed content or configure the settings.
8	[Shift] key	Used in combination with the [Set], [Δ], and [▼] keys.
9	[Δ] key	Used to increase the displayed numerical value (+1) or shift the displayed content upward.
10	[▼] key	Used to decrease the displayed numerical value (-1) or shift the displayed content downward.
11	Function button	Pressing down this button during the workpiece control disables the balancing mode and maintains the position of the suspended load even when the load fluctuates. However, this function cannot be used when the load fluctuation occurs instantaneously. The functions of this buttons can be changed by parameter settings.
12	Emergency stop button	Pressing down this button stops the Magical Balancer by shutting off the air inside. In addition, the grip control mode as well as the balancing mode are disabled.
13	Status lamp	Turns ON while the equipment is operable, and blinks when an abnormality has occurred.
14	Control box buzzer	Sounds when the mode is switched to the balancing mode.
15	Emergency release button	If the balancer become inoperable, for example, when a power failure has occurred, pressing this button evacuates the air inside the cylinder, allowing the suspended workpiece to slowly descend and be released.

3-3 Product specifications

Table-1 Product standard specifications of Magical Balancer

Model	Air supply pressure (MPa)	Suspension capacity (kg)	Main equipment mass (kg)*	Lifting height (m)	Wire rope diameter (mm)	Connecting port diameter	Operating voltage	Rated current
EDB-50	0.4	20	42	1.9	ϕ 4.76	Rc 1/2	single phase AC100V-240V	AC 0.7A (AC100V) AC 0.7A (AC115V) AC 0.4A (AC240V)
	0.5	30						
	0.6	40						
	0.7	50						
EDB-85	0.4	40	43					
	0.5	55						
	0.6	70						
	0.7	85						
EDB-130	0.4	61	50					
	0.5	84						
	0.6	107						
	0.7	130						

Note: Approximately 6 kg are added when the optional trolley is installed.

3-4 Operating environment

Installation location: General indoor
 Ambient temperature: 0°C to +40°C (no condensation and no freezing)
 Atmosphere: Non-explosive, free of flammable or corrosive gas, or dust, water/oil should not splash directly and no flammables nearby.

3-5 Disposal of the product

When disposing of the product, follow the local regulations of the area where the product is used, and properly treat it as industrial waste.

4. Installation of Magical Balancer



WARNING



- The installation of the Magical Balancer should be performed by a maintenance operator who has developed sufficient knowledge and operating skill for the Magical Balancer.

4-1 Preparation and required checks before installation

4-1-1 Tools for installation

- Wrenches (Spanner) : Used for installing the auxiliary wire rope.



CAUTION



- If the accessories are provided separately from the Magical Balancer, be sure to install them on the main equipment before installing the Magical Balancer according to the procedure.

4-1-2 Check of installation location

Before installing the Magical Balancer, check the following.

- 1 Ensure that the pressure of the air supply conforms to the operating pressure range of the Magical Balancer (0.4 to 0.7 MPa).
- 2 Ensure that the voltage of the power supply conforms to the operating voltage of the Magical Balancer (100 to 240 V AC).
- 3 Ensure that the installation location is in the environment described in “エラー! 参照元が見つかりません。エラー! 参照元が見つかりません。”.



CAUTION



- Do not install the product outdoors.
- Do not install the product in potentially harmful indoor environments. This includes locations with low or high temperatures, high humidity, large amounts of dust, or corrosive atmosphere containing a large amount of acid or salt.

4-2 Installation procedures



DANGER

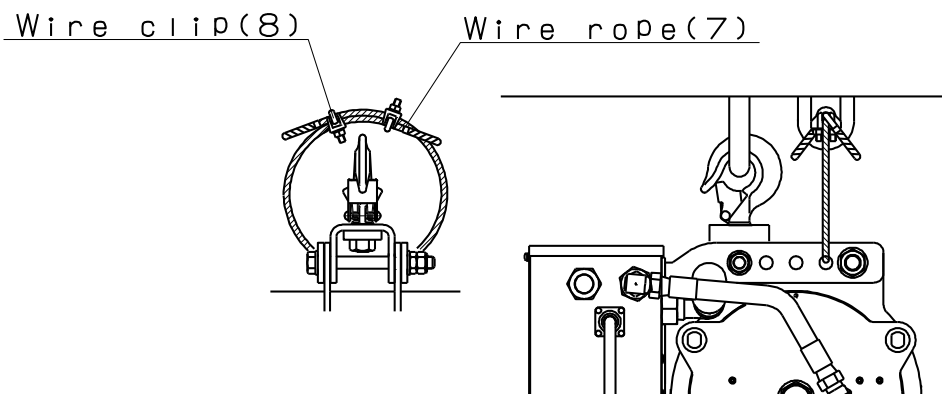


- A wire rope is packed together with the Magical Balancer. Be sure to attach the wire rope to the hanger of the balancer. This is necessary to protect workers if the top hook or support members (metal hangers) of the Magical Balancer are damaged.
- For support members to attach (suspend) the Magical Balancer, use members that have a sufficient safety coefficient for supporting the mass (weight) and the maximum capacity of the Magical Balancer.
- Do not use support members that cause the Magical Balancer to tilt toward one direction.
- Adjust the length of the auxiliary wire rope so that the dropping distance of the main equipment can be limited to 100 mm.

4-2-1 Installation

Note: The numbers in brackets in the procedures are the reference numbers of the Parts List.

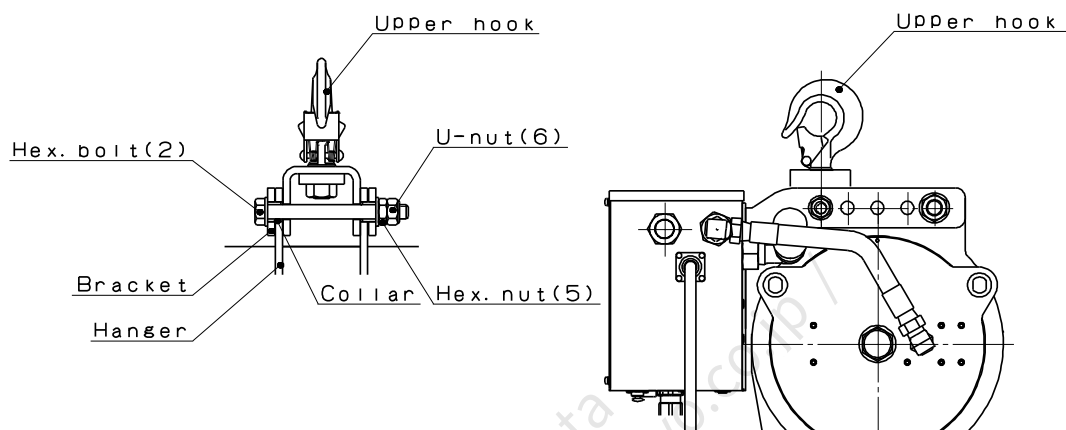
- 1 Use the top hook (accessories) or the trolley (options) to attach the Magical Balancer to the support members.
 - For the method of attaching the top hook, refer to “4-3 Attachment of the upper hook”.
 - For the method of attaching the trolley, refer to “4-4 Attachment of trolley”.
- 2 If the upper hook is attached, ensure that the top hook is correctly attached to the support members and the hook latch is correctly closed.
- 3 Attach the auxiliary wire rope as shown in the following outline.
 - 1) Pass wire rope (7) through the hole of the hanger, and wind the wire rope around the head supporting section.
 - 2) Adjust the length of the end of wire rope (7).
 - 3) Use wire clip (8) to securely clamp the wire rope.
 - 4) Tighten the nut of wire clip (8) with a torque of 10 N·m.



4-3 Attachment of the upper hook(standard accessories)

Note: The numbers in brackets in the procedures are the reference numbers of the Parts List.

- 1 Attach the top hook to the position shown in the figure below.
Pass hexagon head bolt (2) through the bracket, collar, hanger, and top hook.
- 2 Secure hexagon head bolt (2) with hexagon head nut (5) and U-nut (6).



4-4 Attachment of trolley (special accessories)



WARNING



- The attachment of the trolley should be performed by a maintenance operator who has developed sufficient knowledge and operating skill for the Magical Balancer.

Since the positions to install the collars and plain washers vary with the beam width, refer to the figures for their installation.

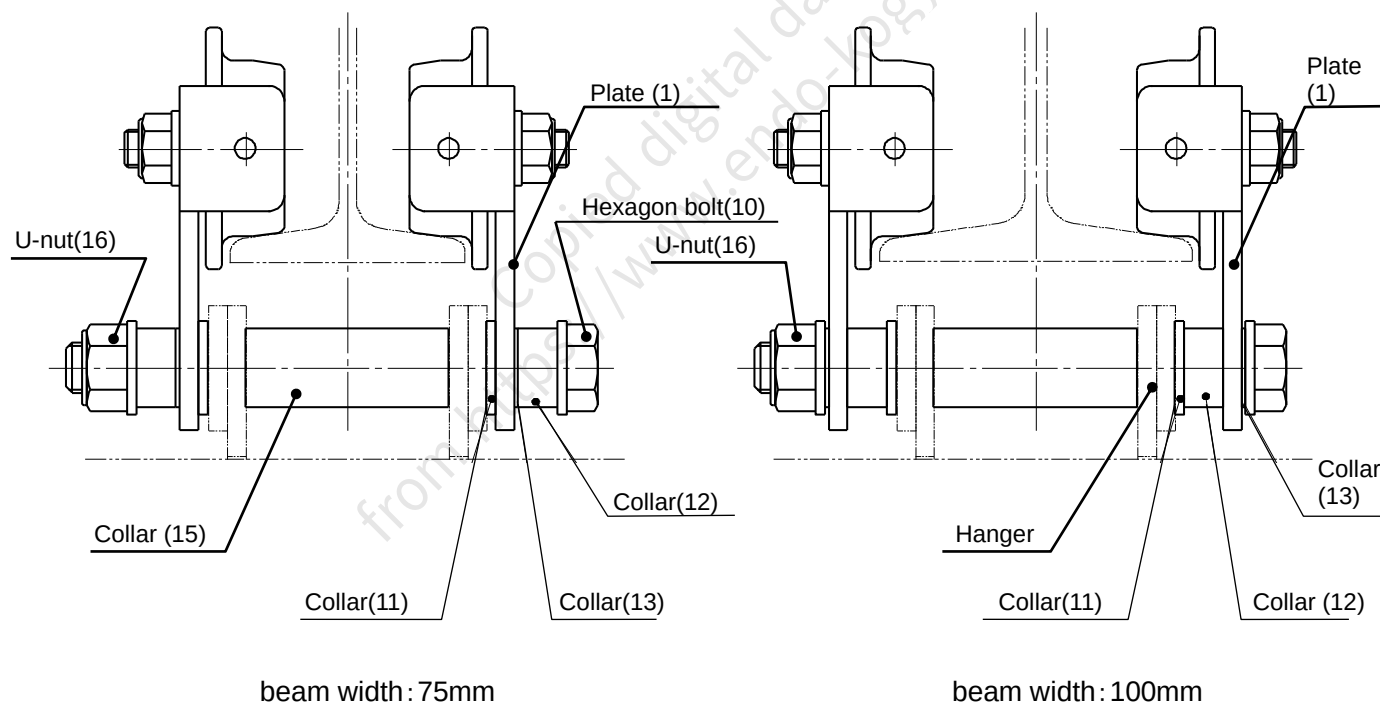
Attach the trolley as shown below.

Pass hexagon head bolt (10) through the collars, plate, and hanger.

Secure hexagon head bolt (10) with U-nut (16).

If the beam width is 75 mm, install collar (12) on the outer side of plate (1).

If the beam width is 100 mm, install collar (12) on the inner side of plate (1).



4-5 Piping of the air hose



WARNING



- Maintain the air supply pressure below 0.7 MPa.
The Magical Balancer is designed to be operated within the air supply pressure range below 0.7 MPa. If the air supply pressure exceeds 0.7 MPa, use a regulator to reduce the pressure to the required air supply pressure.



CAUTION



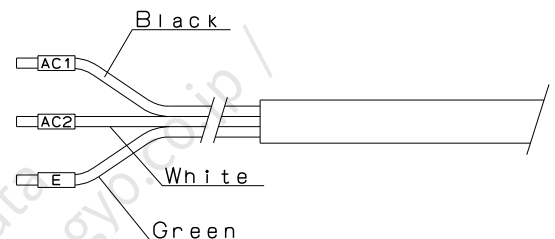
- Do not use a lubricator (oiler) for the air supply line of the Magical Balancer. Do not use any type of lubricating oil, because it may cause a malfunction in the control module as well as damage to the internal parts.
- Be sure to install a filter and a regulator.

- 1 Check whether a sufficient amount of air can be supplied to the operating position of the Magical Balancer.
If the pipe diameter is too small or the piping distance is too long, the pressure drop may be so significant that the product cannot exhibit its intended performance.
- 2 Use an air hose with an inner diameter of 9.5 mm (3/8 in.) or greater.
- 3 Air-blow the air hose and the pipes before connecting them to the Magical Balancer. This prevents foreign objects from entering the control module or the cylinder.
- 4 The compressed air supplied to the Magical Balancer must not contain moisture or foreign objects (dust particles). Install an air filter to separate them.
- 5 Provide a drain circuit at the lowest point of the piping.

4-6 Connection of the power cable

 WARNING	
	● To prevent electric shocks caused by earth leakage, a qualified technician should perform grounding work according to the standards of the area where the system is installed. ● In addition to the grounding, install an earth leakage breaker on the electric circuit.
	● Do not connect the ground wire to the following. ● Gas and hydraulic piping: Danger of explosion or catching fire. ● Telephone line and lightning rod: Danger in case of lightning. Water pipe partially made of plastic in the middle: Does not serve as the ground.

- 1 Check the supply voltage and connect the "AC1" and "AC2" cable to the power supply. The "E" cable is for grounding.
- 2 Be sure to install a grounding and ground-short circuit breaker.



4-7 Post-installation checks

4-7-1 Checking the winding up operation

- 1 Confirm that the air supply pressure is within the range of 0.4MPa to 0.7MPa .
- 2 Turn on the power supply and confirm that the operation of the grip controller and its operation are correct. See "5.Usage".

4-7-2 Checking the working range

 WARNING	
	● Never use the magical balancer at maximum length.

- 1 Check that the anti-bounce device does not work and the stopper does not hit the body in normal operation.
- 2 Confirm that the operation range does not reach the upper and lower limits.
- 3 Confirm that the stopper stops after the "up" and "down" operation.

4-7-3 Other checks

- 1 Perform "up" and "down" motions by lifting the slinging load. When trolleys are used, the trolley also traverses the tracks.
- 2 When traversing, operate the trolley for the entire length. Also check the condition of the rails and the length of the air hoses. Usage

5. Usage of Magical Balancer

5-1 Inspections before starting the operation



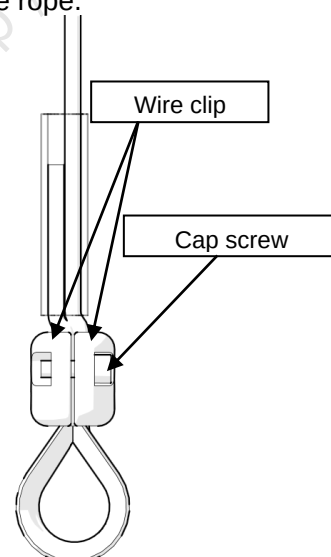
WARNING



- Be sure to perform the inspections before starting the operation.
- If any abnormality is found, immediately stop using the product. Take appropriate measures before using it.
Using the product without addressing an abnormality is very dangerous, possibly causing an injury. Never use the product with an abnormality.

5-1-1 Checking before starting up

- 1 Ensure that there is no kink, deformation, damage, or wear in the wire rope.
- 2 Ensure that the hook is not stretched or damaged. In addition, ensure that the hook latch works normally.
- 3 Ensure that the hexagon socket head cap screw of the wire clip is not loose. If the screw is loose, tighten it with the following tightening torque according to the model of the main equipment.
Tightening torque: 5.9 N·m
- 4 Ensure that there is no crack or wear in the hose.
- 5 Ensure that there is no crack or wear in the power cable and the curled cord.
- 6 Ensure that there is no air leakage from the main equipment and its control box.
- 7 When using the trolley, ensure that there is no abnormality in the rails for the trolley.
- 8 Ensure that there is no wear or damage in the sling (suspension fitting).



5-1-2 Checking the operation with an empty load

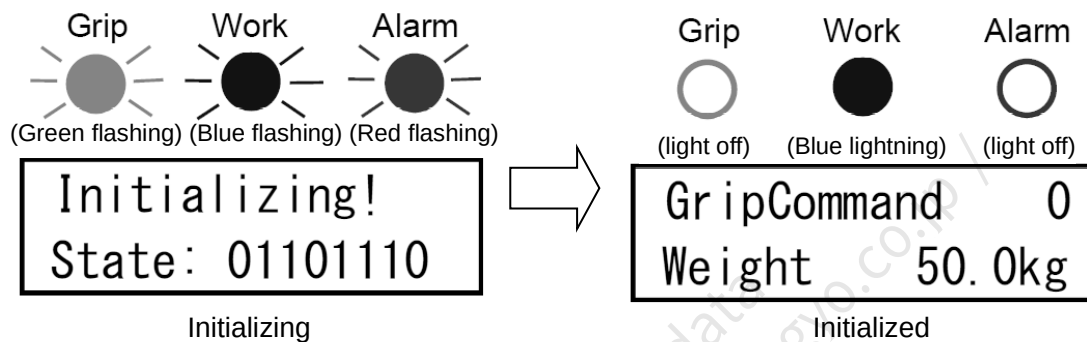
- 1 Ensure that the grip controller can be controlled smoothly, and it correctly operates as indicated.
- 2 Ensure that the anti-jump device will not be activated.

5-1-3 Checking the operation with a load

- 1 Suspend a load equal or close to the maximum capacity and lift up the load by a short distance from the ground. Then, ensure that the balancer stops after the “Up” and “Down” operations.
- 2 Ensure that there is no unusual noise (abnormal noise) or vibration.

5-2 Starting up the Magical Balancer

- 1 Ensure that no load is hung on the bottom hook of the Magical Balancer.
- 2 When the power switch of the Magical Balancer is turned ON, the grip controller automatically stands up and the initialization setting process is started. Until the initialization setting process is completed, do not touch the grip.
Note: In rare instances, the standing-up of the grip controller may stop in the middle.
In such cases, slide the grip upward until the grip controller is lifted away from the ground.
- 3 After the initialization setting is completed, the weight display screen is automatically displayed.
- 4 If the initialization is completed normally, a beep sounds and the Work lamp (blue) turns ON, completing the startup.



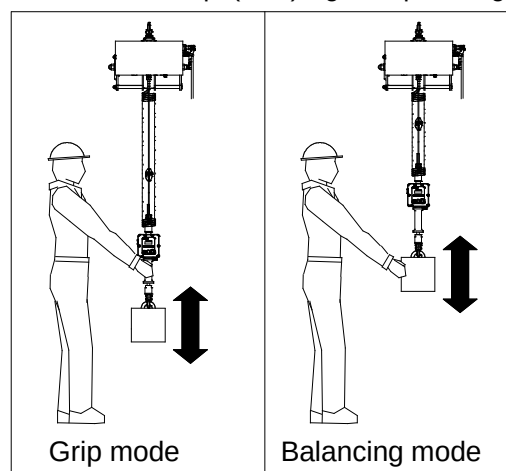
5-3 Controlling the Magical Balancer

5-3-1 Control mode

The Magical Balancer can be controlled by switching the following two control modes. With the factory default system settings, the control modes are switched automatically.

Grip mode: This is an operation mode in which the balancer raises or lowers a load by sliding a grip controller. In addition to lifting and lowering the load, this operation can also be used to load and unload the load. The Grip lamp (green) lights up during grip mode.

Balancing mode: The suspended load is raised or lowered by directly touching it. The load stays at the required position. The Work lamp (blue) lights up during the balancing mode.



5-3-2 How to suspend a load

 WARNING	
	Before lifting up a load, ensure that the bottom hook latch is set.

While the load is hung on the bottom hook, sliding the grip upward can lift up the workpiece.

- 1 Hang the load on the bottom hook.
- 2 Hold the grip and slide it upward.
During sliding of the grip, the Grip lamp (green) turns ON.
- 3 After the load is lifted up to a desired height, return the grip to the neutral position.
- 4 The weight of the load is detected and the control mode is switched to the balancing mode.
At this time, the Work lamp (blue) turns ON and a beep sounds.

5-3-3 Balancing mode

 CAUTION	
	When performing the balancing control, ensure that the Work lamp (blue) is turned ON.

You can directly lift up and down the load while the Work lamp (blue) is turned ON.

- 1 Ensure that the blue lamp is turned ON.
- 2 You can hold and lift the load up and down.

5-3-4 How to lift down the load

 WARNING	
	- Do not unhook the load from the bottom hook while the control mode is the balancing mode. - Do not unhook the load from the bottom hook before the bottom hook moves away from the load completely.

While the load is hung on the bottom hook, sliding the grip downward can lift down the workpiece to the ground.

- 1 Lift down the load to the installation point.
- 2 Slide the grip downward to evacuate air from the main equipment of the Magical Balancer.
- 3 After ensuring that the bottom hook has moved away from the load completely, unhook the load from the bottom hook.

5-3-5 Function button

Press the function button to temporarily disable the balancing mode.

The load will maintain its position even if the weight of the load increases or decreases.

However, if a load change occurs instantaneously, the position of the workpiece may shift.

This function can be deactivated by pressing the Function button again.

Note: The function of this button can be changed.

For details on how to change the settings and functions, refer to "5-7 Function button settings".

5-4 Operations after completing the work

 CAUTION	
	● Do not leave a load suspended. The suspended load may slowly descend over time. After the work is completed, lower the suspended load to the ground.
	● Do not shut off the power supply while the load is suspended.
	● Do not shut off the air supply while the load is suspended.

- 1 Lower the suspended load, and ensure that no object is placed under the grip controller.
- 2 Turn OFF the power switch on the side of the grip controller.
- 3 The Status lamp of the control box of the main equipment turns OFF.

5-5 Storing the magical balancer

To store the Magical Balancer for a long period, avoid a high or low temperature location and store it in a location with low humidity.

5-6 Mode menu

5-6-1 Switching the mode menu

The modes displayed on the LCD indicator include the following six modes.

The modes can be switched with the [Mode] key on the front panel.

1) Monitor Mode

In addition to the control information of the grip and the weight value of the workpiece, the internal status of the equipment is displayed, including the air supply pressure and the cylinder pressure.

In this mode, you can monitor the internal status of the equipment to check whether the equipment is operating normally.

2) Error Mode

An error that has occurred is displayed. When multiple errors have occurred, the error display is automatically switched to show the multiple errors. In addition to the current errors, the history of the previous errors can be displayed. If an error has occurred, the equipment cannot be used until the error is released. For the detailed usage of the Error Mode, refer to "7-2 Error Mode".

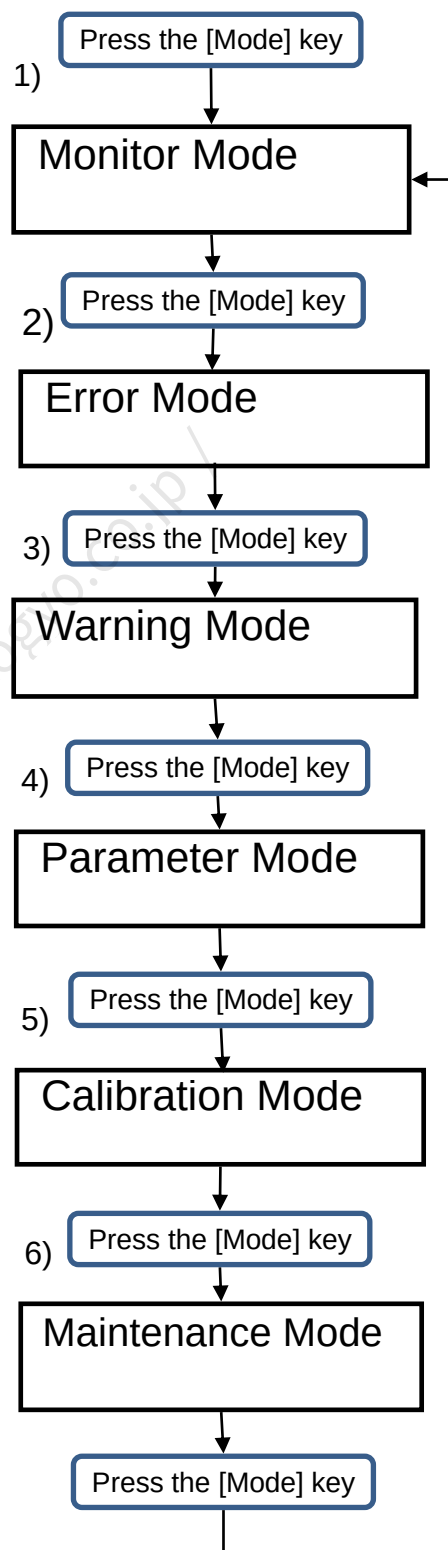
3) to 6) are for maintenance or adjustment purposes by us or our authorized dealers. Never control them without our instruction.

3) Warning Mode

4) Parameter Mode

5) Calibration Mode

6) Maintenance Mode



5-7 Function button settings

 WARNING	
	Do not perform any operations other than setting the function buttons in "Parameter Mode". This may change the control parameters of the magical balancer and cause operational errors.

The functions of the function buttons can be changed by changing the parameters as follows

• Load variation tracking function

When the function button is pressed, the position of the suspended load is maintained even when the load changes.

Press the button again to release the function. (Default setting)

• Balance inhibit function

When pressed, this function shuts off the main valve and prohibits the balance mode.

Press the button again or operate the grip to release it.

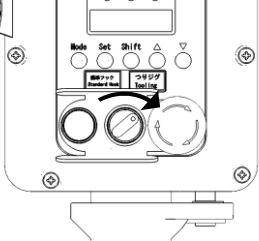
Operation Procedures		LCD display screen
1	Press the [Mode] key until "Parameter Mode" appears.	Parameter Mode
2	Hold down the [Shift] key and press the [Set] key to enter the edit screen.	Param-01 0x0001 1100000000000000
3	Hold down the [Shift] key and press the [Δ] key ([▼] key while holding down the [Shift] key) to move the cursor.	Param-01 0x0001 1100000000000000 cursor ↑
4	Press the [Δ] key ([▼] key) to change the parameter value. Load variation tracking function: 1100 0000 0000 0000 Balance inhibit function : 1101 0000 0000 0000	Param-01 0x0001 1101000000000000
5	Press the [Set] key to enter the confirmation screen for editing. Press the [Set] key again to confirm the edit.	Parameter Write? Param-01 0x0001
6	The Edit Complete screen will appear.	Parameter Write Completed !
7	Press the [Mode] key.	Param-01 0x0001 1101000000000000
8	Press the [Mode] key again to exit the edit screen.	Parameter Mode

5-8 Setting No-Load Weight using select switch (Option)

The magical balancer allows you to set the no-load weight for each attachment
It can be set as a no-load state.

 WARNING	
	Do not perform any operations other than setting the no-load weight in "Calibration Mode". This may change the control parameters of the magical balancer and cause operational errors.
NOTE	
Saving the current operating parameters will overwrite the shipping operating parameters and will not allow the user to return to the shipping operating parameters.	

To set the no-load weight for each attachment, hold the attachment or jig that you want to set to no-load weight.

Operation	Control panel LCD display screen
1. Operate the grip of the magical balancer to lift the jig and stop it in the middle.	
2. Switch the select switch to right side. The right side is for Tooling and the left side is for standard hooks.	
3. Press the [Mode] key until "Calibration Mode" is displayed.	Calibration Mode
1. After pressing the [Shift] key at least twice, press the [Set] key while holding down the [Shift] key. 2. Press the [Set] key again until the screen shown on the right appears.	Calibration Mode No Load MEASURE
3. Press the [Δ] key ([▼] key) to select the attachment whose parameters are to be changed. Attach1. Standard lower hook (when jig is not used) Attach2. Magical balancer-interlocked vacuum jig Attach3. Magical balancer interlocking clamp jig Attach4. Jig without interlocking control with magical balancer	No Load Wt. Set Attach1 Measure?
1. When the [Set] key is pressed, the screen shown on the right is displayed and the no-load weight is recalculated. (The figure on the right is when Attach1 is selected. Do not touch the grip controller during recalculation.	Attach1 Weight Measuring Wait!
2. After recalculating the no-load weight, the screen shown on the right will be displayed.	Attach1 Weight Completed !
3. Press the [Mode] key three times to exit the "Calibration Mode".	Calibration Mode

6. Periodic Inspections and Maintenance

Daily and periodic inspections are required for the product to be used safely and properly. If any failure is found in the inspections, the relevant parts must be replaced. Please contact us in such cases.



DANGER



- Periodically inspect the Magical Balancer, and replace worn or damaged parts.
- If any abnormal part is found during the periodic inspection, do not use the product as is, but repair it immediately.



WARNING



- Never perform any modification of the product or its accessories.
- Never use parts other than our genuine parts.



- If any abnormal part is found during the maintenance and inspection, do not use the product as is, but repair it immediately.
- Before performing the inspection, pull out the wire rope completely, evacuate the air inside the cylinder, and then shut off the air supply.
However, inspections that are performed while operating the Magical Balancer are excluded, such as inspection of the operation of the grip controller, balance, and anti-jump device.
- Before performing maintenance and inspection or repair, shut off the air supply.
- The maintenance and inspection or repair must be performed by a person with expertise designated by the business operator.
- Always perform the maintenance and inspection or repair with an empty load (without a load).
- Be sure to lift down the Magical Balancer to the ground before disassembling it.
- When performing the maintenance and inspection or repair, be sure to post a sign indicating that the work is in progress (such as "Inspection in progress" and "Do not operate").
- If there is anything unclear regarding the Magical Balancer, stop using it and contact us or the agent from which you purchased the product.



CAUTION



- Follow the instructions to perform lubrication.
- When performing a test run after the maintenance and inspection or repair, be sure to perform it with the Magical Balancer suspended.
Note: Do not operate the Magical Balancer with slack in its wire rope.

■ Monthly inspection

Perform an inspection at least once per month and take appropriate measures against abnormal parts.

- Since the number of inspections varies with the operating environment, the frequency of use, and the weight condition of the Magical Balancer, shorten the inspection intervals according to the operating conditions.
- For the inspection items and methods, refer to “6-2 Inspection”.

■ Operating limit of the parts

It is very dangerous to use the parts that are worn beyond the standard during the inspections and other checks.

Never use such parts.

6-1 Lubrication

6-1-1 Lubrication for the main equipment of the Magical Balancer

When disassembling the equipment, use the lubricating oils in the table or their equivalents recommended by the manufacturers for the following sections.

Manufacturer	Casing and piston section	Ball screw and thrust bearing
Exxon Mobil Corporation	Mobilux EP 1	Mobilux EP 2
Kyodo Yushi Co., Ltd.	One Luber MP 1	One Luber MP 2
Cosmo Oil Co., Ltd.	Cosmo Grease Dynamax No. 1	Cosmo Grease Dynamax No. 2
Showa Shell Sekiyu K.K.	Alvania EP Grease 1	Alvania EP Grease 2



CAUTION



- Do not use any type of lubricating oil for the control module.
- Sophisticated parts are used on the air pipeline of the control module. Therefore, do not install a lubricator (oiler) on the air supply line of the Magical Balancer because it may cause a malfunction of valves or damage to the internal parts.

6-2 Inspection methods

6-2-1 Inspection of the hooka and their operating limit

■ Inspection of the opening, inspection for cracking and wear, and the operation limit

If any of the following conditions is found during the inspection of the hooks, never use them as they are, but replace them.

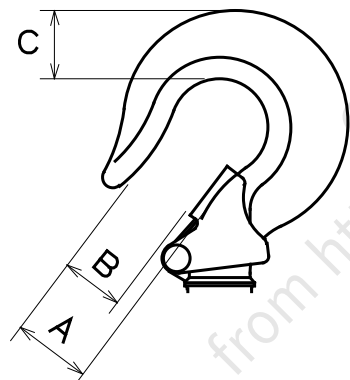
- The opening is extended to a degree that can be visually judged. The dimensions are different from the specified dimensions.
- Deformed or cracked.
- In particular, pay attention to any bends or cracks in the shank of the hooks.
- The wear amount in the section that contacts with the sling exceeds the operating limit.
- The latch is damaged and or not functioning properly.
- Check whether the bottom hook can rotate smoothly.

If it cannot rotate smoothly (rumbles when rotated by hand), the hook has reached the operation usage limit.

■ Dimensions of the opening and the limit on the wear amount

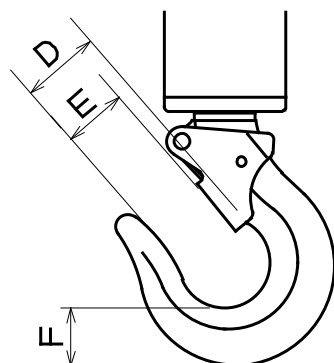
For dimensions A, B, D, and E of the opening of the hooks, to be accurate, measure the actual dimensions of the hooks of your product and record the values for later use as the references in the inspection.

Upper hook



EDB-50/EDB-85/EDB-130 (mm)		
	Reference dimension	Operation usage limit
A	25.5	No more than the reference dimension
B	23.0	No more than the reference dimension
C	22.0	20.7

Bottom hook



EDB-50/EDB-85/EDB-130 (mm)		
	Reference dimension	Operation usage limit
D	26.0	No more than the reference dimension
E	21.0	No more than the reference dimension
F	19.0	16.9

If a dimension has reached the operation usage limit, the hook must be replaced. Stop using the Magical Balancer, and contact us for the replacement.

6-2-2 Inspection of the wire rope and its operating limit

Inspect the wire rope after extending it for the full length.

If any of the following conditions is found during the inspection of the wire rope, never use it. It must be replaced.

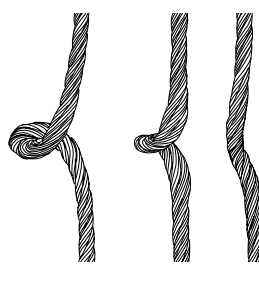
- Kink, deformation, or corrosion.
- The number of broken wires exceeds the operating limit.
- The reduction in the diameter exceeds the operating limit.



Wire breakage



Deformation



Kink

■ Limits on the wire breakage and the wear amount

The number of broken wires within one pitch of the wire rope must be less than 10% of the total number of wires.

However, the number of broken wires within a narrow range of the same strand is limited to 5%.

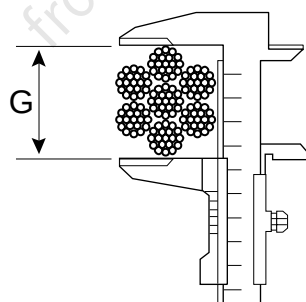


Model	Total number of wires	Limit on the number of broken wires 10%	Limit on the number of broken wires within a narrow range of the same strand 5%
EDB-50, EDB-85, EDB-130	133 pieces (7 × 19)	13 pieces	7 pieces

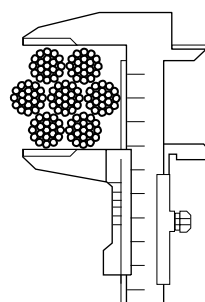
■ Inspection of the diameter of the wire rope

Check that the diameter of the wire rope has not been reduced to less than the limiting dimension below.

Correctly measure the diameter by referring to the figure below.



correct



not correct

	Reference dimension	Operating limit
G	4.76	4.3

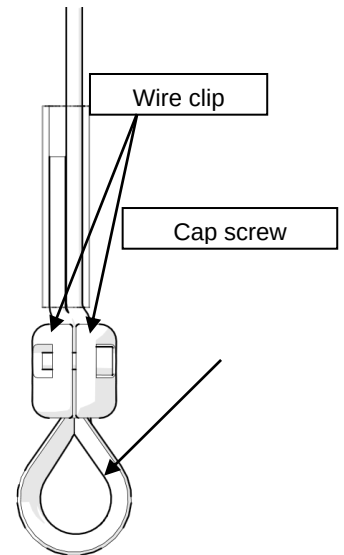
The wire rope must be replaced when the diameter has been reduced to less than the limiting dimension. Stop using the Magical Balancer, and contact us for the replacement.

■ Wire rope end

- Ensure that there is no deformation and or crack in the wire clip.
- Ensure that the hexagon socket head cap screw of the wire clip is not loose.

If the screw is loose, tighten it with the following tightening torque according to the model of the main equipment.

Tightening torque: 5.9 N·m



6-2-3 Inspection main equipment

- Check for cracks in the casing.
- Check for deformation and cracks in the hanger.
- Check for cracks in the bolt attachment section of the end cap.
- Check for deformation and cracks in the section to attach the hook.
- Check for air leakage.
- Check for loose bolts.

6-2-4 Inspection of the control module

- Check for deformation in the control box of the main equipment.
- Check for deformation, twisting, damage, and cracks in the curled cord.
- Check for breakage and chips in the casing, cover, and grip of the grip controller.
- Check the clarity and legibility of the LCD indicator.
- Check whether the various indicator lamps can turn ON.
- Check for air leakage.
- Check for loose bolts.
- Check for damage and looseness in the piping parts.

6-2-5 Other inspections

■ Labels and tags

Check whether the labels and tags are attached, and whether they are clear and legible. Replace them as necessary.

Note: For the attachment positions, refer to the figure in “1-1-2 Locations of warning labels and nameplates”.

■ Trolley

Check whether the wheels of the trolley are correctly running on the rails of the I-shaped steel, H-shaped steel, or other rails.

Check for extreme wear in the wheels and the rails. Replace them if there is an abnormality.

■ Support members

Check for abnormalities, including strain, wear, and cracks.

■ Power cable

Check for deformation, twisting, damage, and cracks in the power cable.

6-2-6 Comprehensive operation inspection

■ Operation with a load

- Check for abnormalities while lifting up and down a load. Repeat the operation more than once across the entire operating lifting height.
- Ensure that the balancer stops after the “Up” and “Down” operations.
- Check for any significant decline in the lifting-up performance.
- Check for unusual noise (abnormal noise) and vibration.

Copied digital data
from <https://www.endo-kogyo.co.jp/>

7. Troubleshooting



CAUTION



- If you notice anything unusual, stop the operation immediately. Take appropriate measures after checking the items listed in the table below.
- If the situation does not relate to any of the listed items in the table below, contact your dealer.

7-1 Main failures and countermeasures

Failure	Reason	Measure
Suspended load cannot be lifted up.	The air supply pressure is insufficient.	Set the air supply pressure to a value that can support the suspension capacity. Check for air leakage in the piping.
	Overloaded.	Check the weight of the suspended load.
	The anti-jump device is activated.	Keep lowering the grip controller to reduce the pressure inside the main equipment and release the prevention device.
	The anti-jump device is always activated.	Replace the spring that holds the ratchet.
	The ball screw and the thrust bearing will not move.	Clean the ball screw and the thrust bearing, and lubricate or replace them.
The suspended load descends.	There is an air leakage around the bolt in the center of the end cap.	Replace the O-ring between the ball screw cover and the end cap.
	There is an air leakage between the end cap and the casing.	Replace the O-ring of the end cap.
	There is an air leakage between the piston and the casing.	Replace the worn piston. Clean and apply lubricating oil to the inside of the casing.
	There is an air leakage inside the control box of the main equipment or in the piping section to the main equipment.	Replace the parts causing the air leakage. Retighten the parts causing the air leakage.
The grip will not move.	The inside of the grip is filled with debris.	Clean the inside of the grip.
An error code is displayed.	An abnormality has occurred with the control of the Magical Balancer.	Follow "7-2 Error Mode" to take measures.
The LCD board is not displayed.	The power is not turned ON.	Confirm that the power supply is connected. Confirm that the power switch is turned ON.
	The electric wiring including the curled cord or the LCD board is broken.	Parts replacement is required. Please contact us or an authorized dealer.

7-2 Error Mode

7-2-1 Operation method of the Error Mode

To check the error that has occurred, select the Error Mode by switching the mode menu as described above.

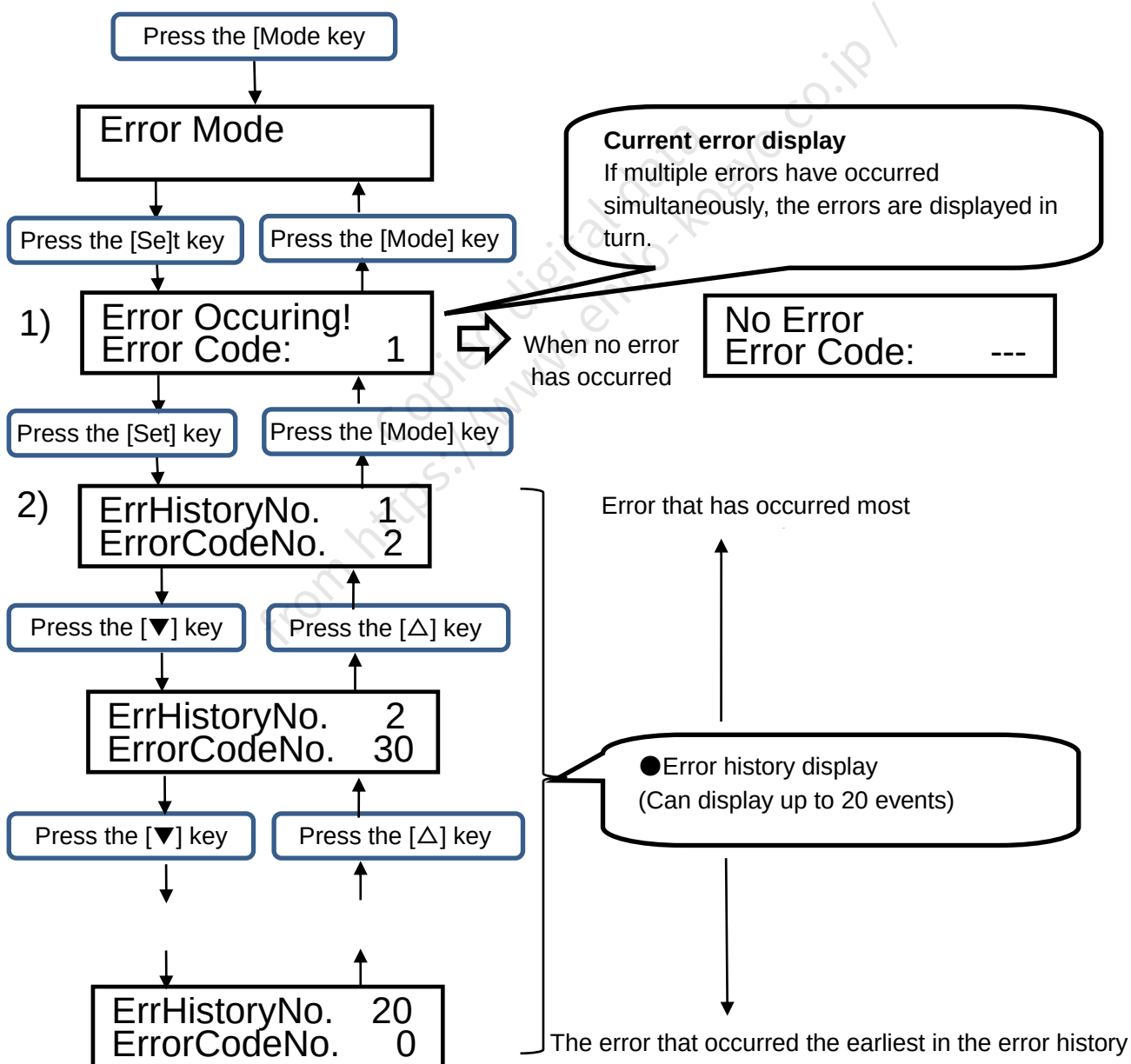
The following is the procedure to display the error number. Note that, immediately after an error has occurred, the following operations are unnecessary because the error screen is automatically displayed.

3 Press the [Mode] key several times until the “Error Mode” screen is displayed.

4 After the “Error Mode” screen is displayed, press the [Set] key.

5 When screen (1) is displayed as in the figure below, pressing the [Set] key again displays the error history screens ((2) and the following screens).

The error history screens allow you to view the recent error history up to 20 events. Pressing the [Δ] and [▼] keys displays the previous error history. The error histories are displayed in the order starting from the one that has occurred most recently (No. 1).



7-2-2 Error in the control box and the countermeasures

The table below summarizes the errors detected for the control box of the main equipment, the causes, and the details of countermeasures.

No.	Error Name	Main cause	Solution
1	Emergency stop error	The emergency stop button has been pushed.	Rotate the emergency stop button clockwise and return the button to its original position in order to release the emergency stop state.
2	Low pressure error	The air supply pressure to the balancer has dropped or no air is supplied.	Check the air supply pressure using the pressure gauge, and check whether the air pressure has dropped.
3	Pressure sensor 1 error	The output value of the pressure sensor for detecting the air supply pressure is out of the specified range. Therefore, a failure in this pressure sensor is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
4	Pressure sensor 2 error	The output value of the pressure sensor of the electropneumatic regulator is out of the specified range. Therefore, a failure in this pressure sensor is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
5	Pressure sensor 3 error	The output value of the pressure sensor for detecting the air pressure inside the cylinder is out of the specified range. Therefore, a failure in this pressure sensor is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
6	Config Error	The model setting value of the model setting rotary switch on the control board in the control box of the main equipment is out of the specified setting range.	It needs the condition check from us. Please contact with us or our authorized dealers.
7	Control box network error	Since an abnormality has occurred in the communication from the grip box to the control box of the main equipment, wire breakage in the curled cord is possible.	The curl cord needs to be replaced. Please contact with us or our authorized dealers.
8	EEPROM memory error	The EEPROM on the circuit board in the control box of the main equipment cannot be written or read correctly.	It needs the condition check from us. Please contact with us or our authorized dealers.
9	Regulator error 1	The output pressure of the precision regulator cannot be set to the specified pressure. Therefore, a failure in the precision regulator is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
10	Regulator error 2	The output pressure of the electropneumatic regulator cannot be set to the specified pressure. Therefore, a failure in the electropneumatic regulator is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
11	Control box PCB error	An abnormality was detected in the hardware of the circuit board in the control box of the main equipment.	It needs the condition check from us. Please contact with us or our authorized dealers.
12	Parameter error	An abnormality was detected in the numerical values of the operation parameters stored on the circuit board in the control box of the main equipment.	It needs the condition check from us. Please contact with us or our authorized dealers.
13	Atm pressure error	The atmospheric pressure measurement data is beyond the specified range.	It needs the condition check from us. Please contact with us or our authorized dealers.

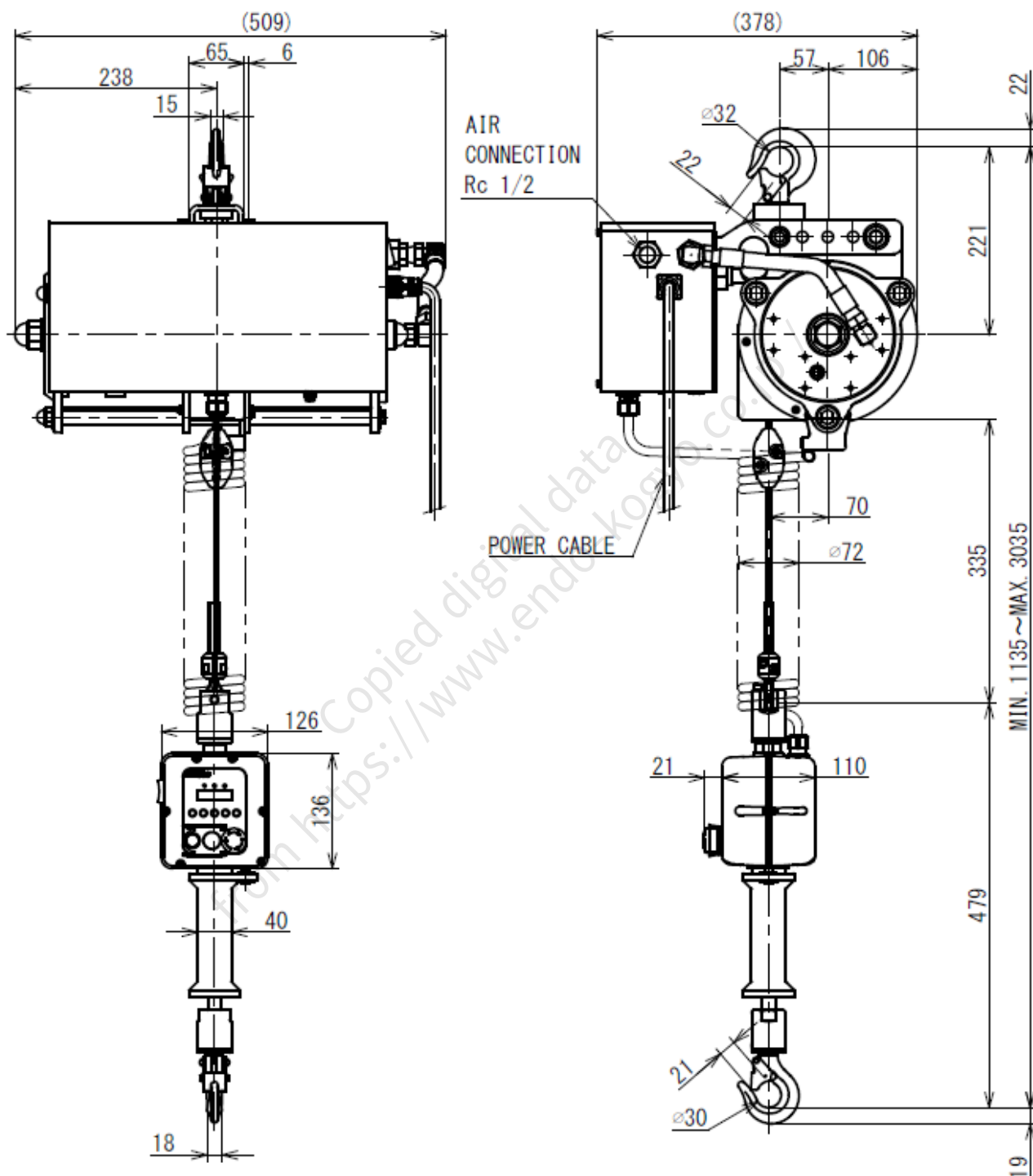
7-2-3 Error in the grip box and the countermeasures

The table below summarizes the errors detected for the grip box side, the causes, and the details of countermeasures.

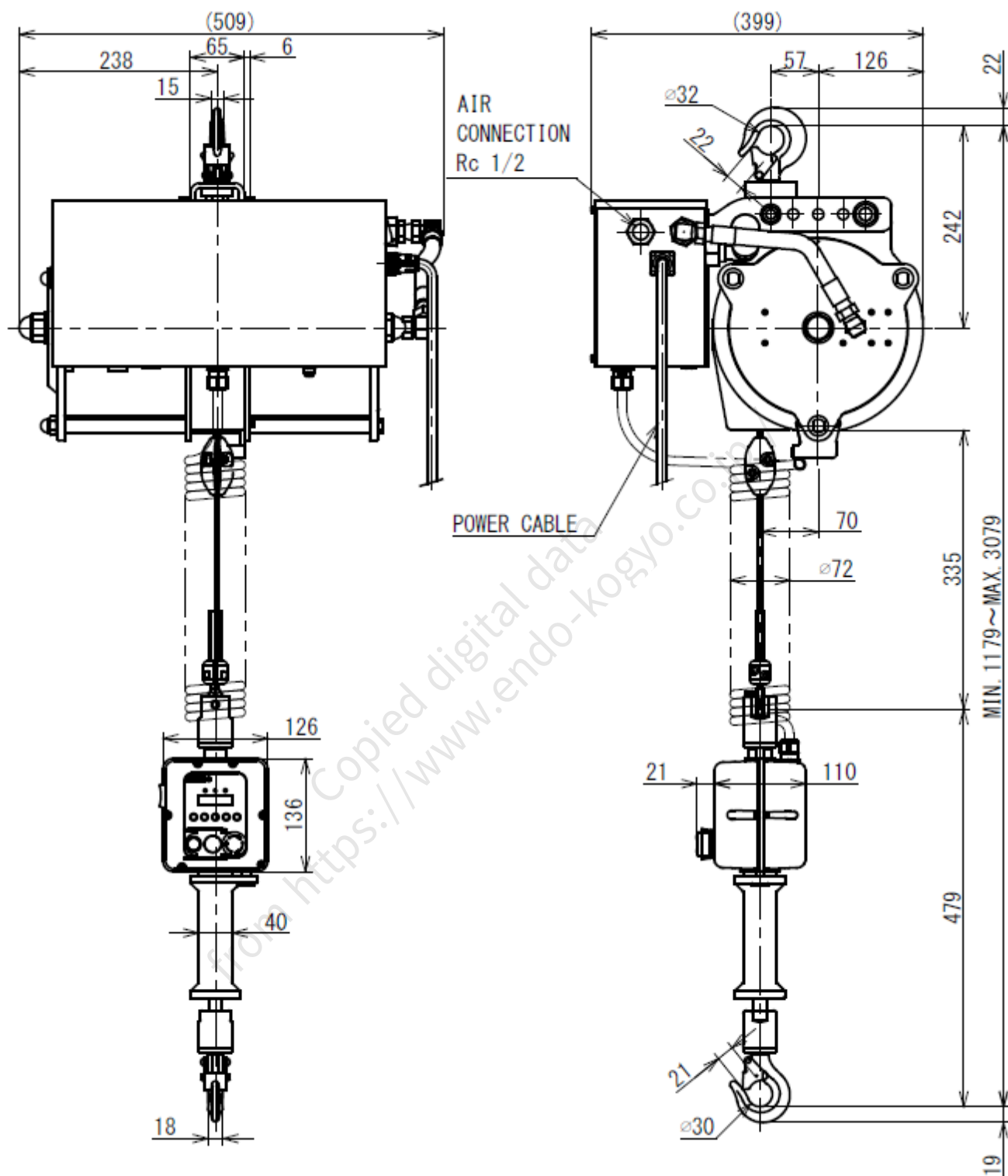
No.	Error Name	Main cause	Solution
31	Grip controller network error 1	Since a communication error has occurred in the signal line from the grip box to the control box of the main equipment, wire breakage in the curled cord is possible.	Check the state of the curled cord connecting the grip controller with the control box of the main equipment. If wire breakage has occurred, the parts must be replaced. Please contact us or an authorized dealer.
32	Grip controller network error 2	Since a communication error has occurred in the signal line from the control box of the main equipment to the grip box, wire breakage in the curled cord is possible.	Check the state of the curled cord connecting the grip controller with the control box of the main equipment. If wire breakage has occurred, the parts must be replaced. Please contact us or an authorized dealer.
33	Grip controller PCB error	Since the data cannot be read from the grip control board, a failure in the grip sensor board is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
34	LCD board error	Since the data cannot be written on the LCD indicator correctly, a failure in the LCD indicator or the FFC cable is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
35	Grip sensor 1 error	The output value of grip sensor 1 with no operation is beyond the specified range.	It needs the condition check from us. Please contact with us or our authorized dealers.
36	Grip sensor 2 error	The output value of grip sensor 2 with no operation is beyond the specified range.	
37	Amplifier error	Since the data cannot be read from the load cell amplifier correctly, a failure in the load cell amplifier is possible.	It needs the condition check from us. Please contact with us or our authorized dealers.
38	Load cell error	Since the output value of the load cell exceeds the specified value, the following are possible: (1) the connection cable of the load cell is broken, or (2) there is a failure in the load cell or the mounting parts of the load cell.	It needs the condition check from us. Please contact with us or our authorized dealers.
39	Flash memory error	A malfunction has occurred in the flash memory on the grip control board.	It needs the condition check from us. Please contact with us or our authorized dealers.
40	Vacuum sensor error	Since the output value from the negative pressure sensor is beyond the specified numerical range, the following are possible: (1) there is a connection failure in the negative pressure sensor cable, or (2) there is a failure in the negative pressure sensor.	It needs the condition check from us. Please contact with us or our authorized dealers.

8. Dimensional Drawing

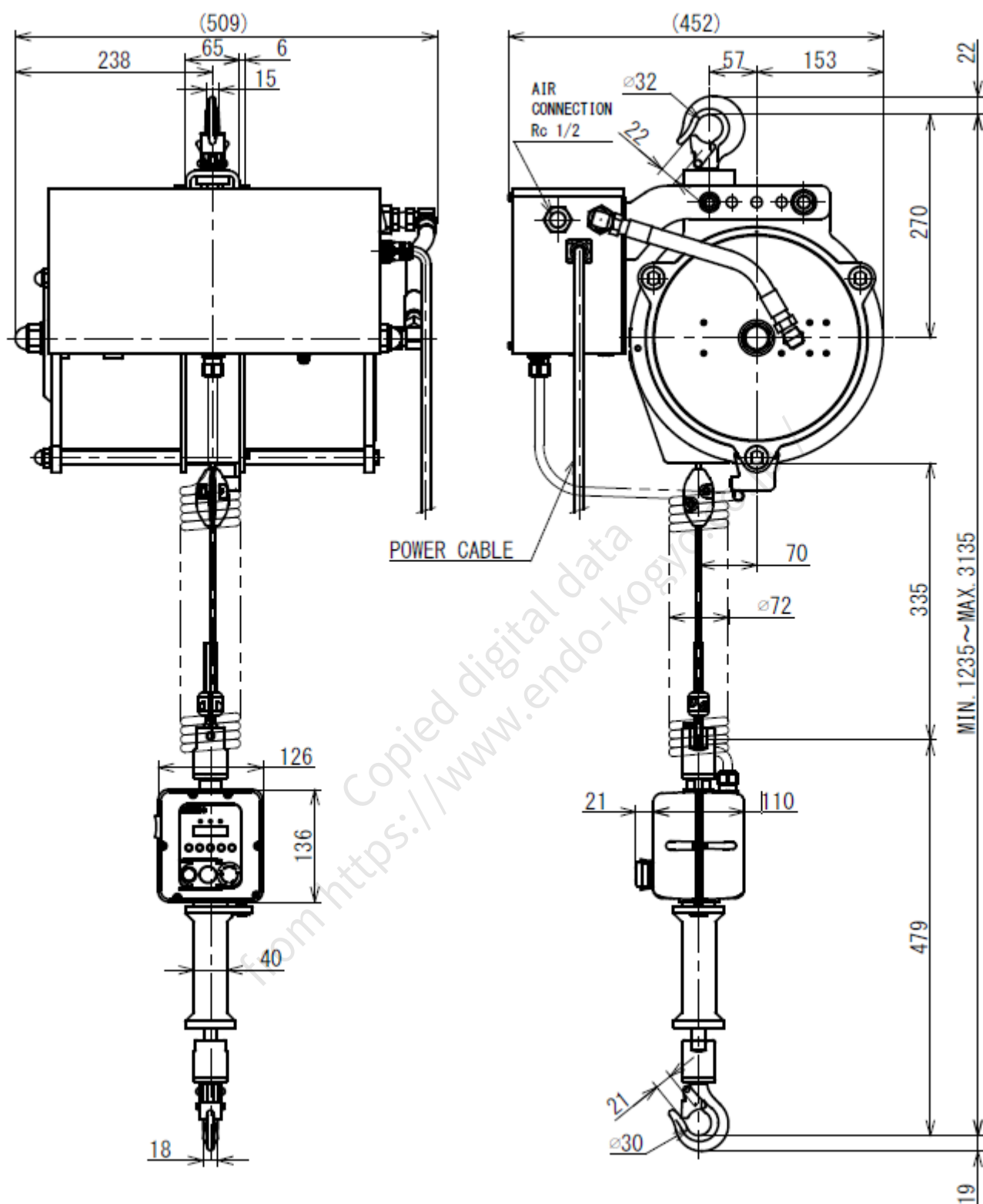
■ EDB-50



■ EDB-85



■ EDB-130



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