

# Repair Manual

# Spring Balancer

ELF-3

ELF-5

ELF-9



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 of this product, make sure to transfer the manual to the new owner.

# Introduction



Thank you very much for your purchasing of the Spring Balancer. To prevent any trouble and obtain the best performance, please be sure to read this 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 three stages: "WARNING", "CAUTION", and "NOTICE". Thoroughly read and fully understand the indicated items before operating the product and performing maintenance procedures. The indications for "WARNING", "CAUTION", and "NOTICE" are in order of risk significance (WARNING > CAUTION > NOTICE). Their details are described below.

 <b>WARNING</b>	A situation that, if mishandled, may cause death or serious disability.
 <b>CAUTION</b>	A situation that, if mishandled, may cause minor or moderate injury.
<b>NOTICE</b>	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.

Other than WARNING, CAUTION, and NOTICE described above, matters important to workers are indicated using the following format.

 <b>REMINDER</b>
Describes important details to be remembered for the operation.

### Symbols

This Users Manual uses the following symbols to simply provide information in addition to the indications above.

	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 that it is necessary to thoroughly read the manual and the relevant documents.

### Illustrations

This manual covers multiple models of the Spring Balancer. If their functions and details of operations are identical and can be correctly described in the same way, illustrations are provided taking a specific model as an example. Therefore, please note that the illustrations may be different from the actual equipment.

## 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. For details, contact us or your dealer.
2. The warranty will be void in the following cases:
  - 1) Change of ownership.
  - 2) Repair 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-authorized 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.

Either during or after the warranty period, opportunity loss, damage to anything other than our product(s), or other duties imposed on you/your customer as a result of the failure of our product(s) are outside the scope of the warranty.

### Copyright and liabilities

The copyright for this manual is issued to Endo Kogyo Co., Ltd.

The 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. Please note this in advance.

## Definition of intended users for this manual

This manual has been prepared to help all intended users involved with this product. From the stand point 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.

<b>Operator</b>	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 the main equipment. The operator should read the manual thoroughly and carry out their work with complete understanding of the operating procedures.
<b>Maintenance operator</b>	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 develop sufficient knowledge and operating skill for this product. The maintenance operator should read the manual thoroughly and carry out their work with complete understanding of the equipment's characteristics and all work contents.
<b>Management supervisor</b>	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.
<b>Service engineer</b>	In The service engineer is 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 (the work by the service engineer) is performed by our service technicians or authorized service technicians.

## Emergency contact in case of malfunctions

If any problem with the product arises, contact us or your dealer.







## CONTENTS

<b>Introduction .....</b>	<b>1</b>
Notation in this manual .....	1
Scope of warranty and liabilities for the equipment .....	2
Definition of intended users for this manual .....	3
Emergency contact in case of malfunctions .....	3
<b>1. Precautions for handling .....</b>	<b>5</b>
<b>2. Maintenance .....</b>	<b>6</b>
2-1 Daily inspections .....	6
2-2 Periodical inspections .....	6
2-3 Replacement of the wire rope .....	8
2-4 Replacement of the spring .....	9
2-5 Spring disposal.....	11

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

# 1. Precautions for handling

Incorrect handling of this product may cause damage to the product itself as well as a fire or injury. Thoroughly read the following precautions and be sure to heed the instructions when handling the machinery.

 WARNING	
	<ul style="list-style-type: none"><li>• Do not use in explosive, flammable gas, or dusty atmospheres, any place where water or oil may splash, or near combustibles. This may cause fire and injury.</li><li>• Do not perform any modifications to the product.</li></ul>
	<p>The maintenance should be performed by a maintenance operator who has developed sufficient knowledge and operating skill for the balancer.</p>
	<ul style="list-style-type: none"><li>• Incorrect usage of the product may cause injury. Use the product correctly in accordance with the descriptions in this manual.</li><li>• Particularly, “WARNING”, “CAUTION”, and “NOTICE” described in this manual must be fully understood and always observed.</li><li>• Install the product correctly in accordance with the descriptions in this manual.</li></ul>
 CAUTION	
	<ul style="list-style-type: none"><li>• Be sure to perform daily and periodic inspections.</li><li>• Be sure to use the product within the capacity range that is described in “4-3-1 Specifications” of the Users Manual.</li></ul>

## 2. Maintenance

### ⚠ WARNING



The maintenance should be performed by a maintenance operator who has developed sufficient knowledge and operating skill for the balancer.

### ⚠ CAUTION



Replace any parts using genuine parts only.

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. For details, contact us or your dealer.

## 2-1 Daily inspections

Before starting the operation, refer to “6-1 Pre-operation inspections and checks” of the separate Users Manual and perform the inspections and checks daily.

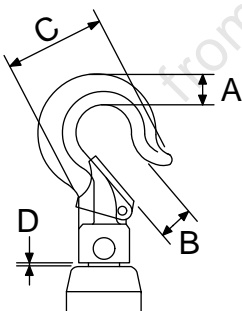
## 2-2 Periodical inspections

Perform an inspection at least once per month. If the product is used in an unfavorable environment or used frequently, reduce the interval between the inspections.

### 2-2-1 Inspection of the hook

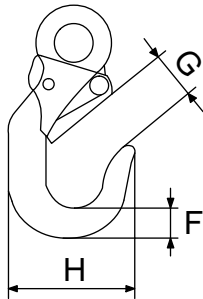
See the figure below and measure the dimensions of the hook. The hook must be replaced when any dimensions have reached the limiting dimensions. Stop using the balancer, and contact us or your dealer.

#### ■ Operating limit of the top hook



Model	Limiting dimension (mm)			
	A	B	C	D
ELF-3	11.7	15.5	44.0	1.5
ELF-5				
ELF-9				

## ■ Operating limit of the bottom hook

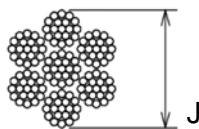


Model	Limiting dimension (mm)		
	F	G	H
ELF-3	8.0	16.5	41.0
ELF-5			
ELF-9			

### 2-2-2 Inspection of the wire rope

See the figure below and measure the dimension of the wire rope. The wire rope must be replaced when the dimension has reached the limiting dimension or the limiting number of broken wires within one pitch. Stop using the balancer and change the wire rope (see "2-3 Replacement of the wire rope"), or contact us or your dealer.

## ■ Operating limit of the wire rope



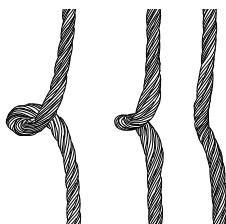
Model	Dimension J (mm)		Limiting number of broken wires within one pitch
	Reference dimension	Limiting dimension	
ELF-3	3.0	2.7	11
ELF-5			
ELF-9			

## ■ Check of the state of the wire rope

Check that there is no deformation or kink in the wire rope.



Deformation



Kink

Note: Kink is the state in which the wire rope is partially deformed due to torsion or looseness.



## 2-3 Replacement of the wire rope

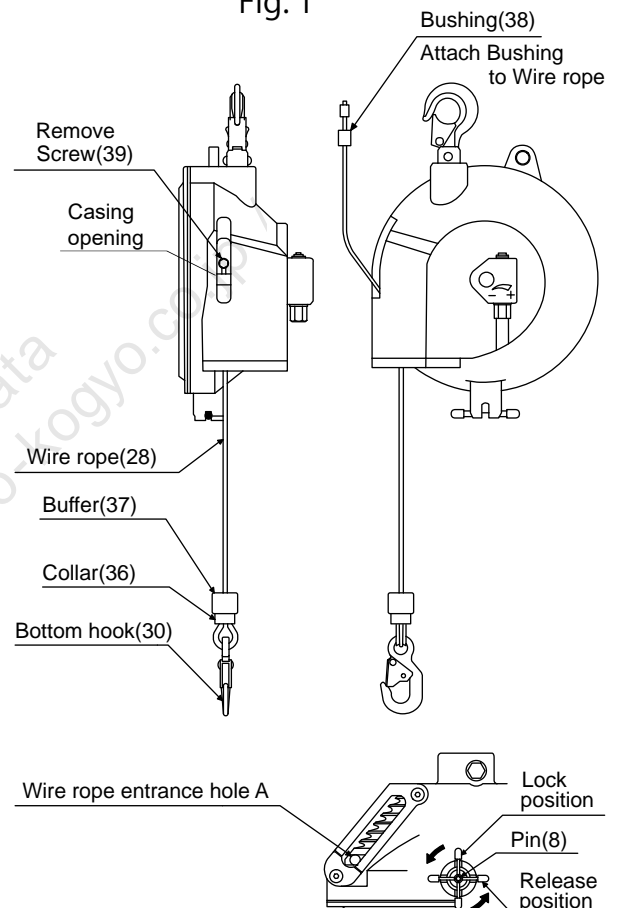
### ⚠ WARNING



**Do not release the drum lock when the balancer is not loaded or after the tool (equipment) is replaced with one with a different mass (weight). If the drum lock is released in such situations, the wire rope may be quickly wound up as soon as the lock is released, the tool may fall, or an injury may be caused. Attach the tool and adjust the spring tension before releasing the drum lock.**

- 1 Lower the tool / device, extending Wire rope (21) to the maximum cable travel.
- 2 Position Plug (31) at the casing opening as shown in Fig.1, and engage the drum lock.  
See Users Manual "6-3 Operation method of the drum lock"
- 3 Move the tool / device upward and downward to check Drum (16) is locked securely.  
Remove the tool / device from bottom Hook (30) .
- 4 Remove the balancer from the fitting and place on the floor.
- 5 Remove Screw (39), and Bushing(38), Then remove old Wire rope from Drum.  
See Users Manual "6-3 Operation method of the drum lock"
- 6 Insert new Wire rope from the A-side, attach Bushing(38) to the Wire rope, and then pass it through Drum and fasten with Screw(39) .
- 7 Install the balancer on the fitting.  
See Users Manual "5-2 Installation procedures"
- 8 Attach the tool / device to bottom Hook (30), and release the drum lock.

Fig. 1

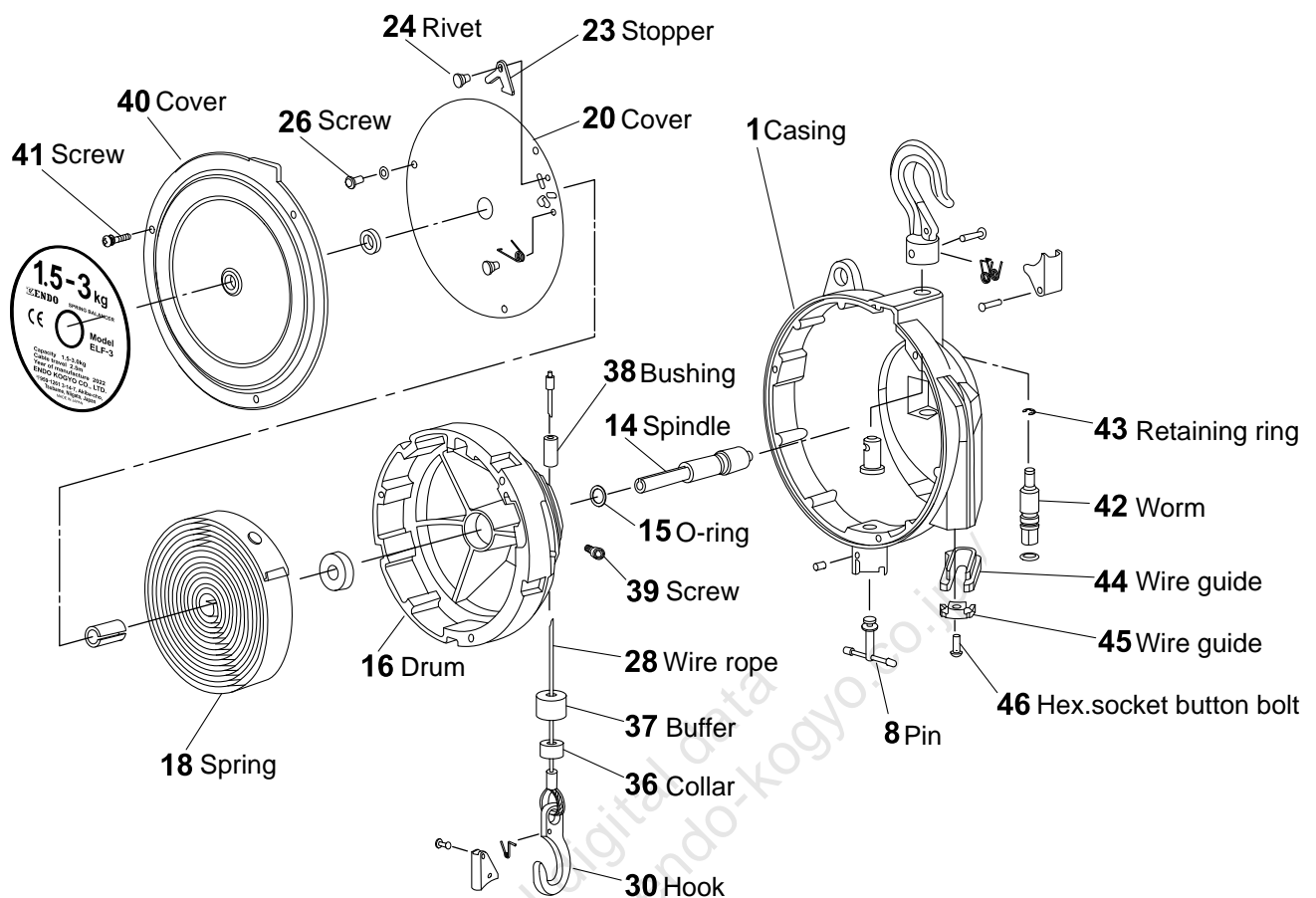


### ⚠ WARNING



**Never release the drum lock before attaching the tool / device. If released, Wire rope (21) will snap back and could cause personal injury.**

■ disassembly drawing



## 2-4 Replacement of the spring

Never remove the spring from drum unless the replacement is required.  
Replace O-ring and the spring at the same time.

### WARNING



- The spring is extremely dangerous. Be careful when handling the spring.
- Never pull the center of the spring when removing the spring from the drum. if pulled, the spring will expand explosively and cause personal injury.

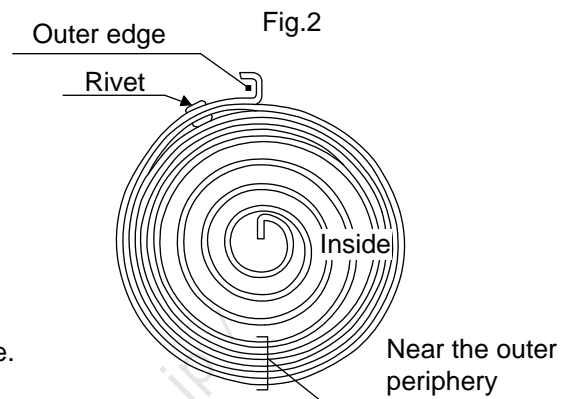
Referring to the disassembly drawing (on pages 10), replace the spring using the following procedure.

- 1 A. When the spring has broken;  
Remove the tool / device from bottom Hook (30).  
B. When the spring has not broken;  
Lift then remove the tool / device from bottom hook (30) when Wire rope (28) is fully retracted into Drum (16).
- 2 Remove the balancer from the fitting and place on the floor.
- 3 Remove Retaining ring (43) from Worm (42). Release all spring tension by turning Worm (42) to the “-” side ( counterclockwise) until Worm can almost be removed.

**NOTE:** Check the spring tension by pulling Wire rope.

- 4 Turn Worm (42) further and remove it.
- 5 Remove Screw (39), Bushing (38) and the Wire rope (28) from Drum(16).
- 6 Loosen Screws (41) and remove Cover (40).
- 7 Remove Drum (16) and Spindle (14) together from Casing (1). Then remove Spindle (14) from Drum (16).
- 8 Loosen Screws (26) and remove Cover (20) from Drum (16).

- 9 Check where is the broken portison of spring (18). Check that the rivet of Spring is not broken. If Spring is broken near the outer periphery where is no space between each turn or the rivet of Spring (18) is broken (see Fig.2), stop the replacement work. Reassemble Cover(20) and contact the dealer. Check Stopper(23) and Rivet(24) when spring breakage. Replace them if they are broken.



**! WARNING**



**Never remove Spring (14) from Drum (13) when Spring (14) is broken near the outer periphery or the rivet of Spring is broken (see Fig.2). If removed, Spring (14) will expand explosively and cause personal injury.**

- 10 Remove Spindle (14) from Drum (16) and remove Spring(18).
- 11 Remove O-ring(15) from Spindle(14).

- 12 Reassemble in reverse order.
  - First install Spindle (14) in Casing (1), then lubricate O-ring(15) with grease. And lubricate Spring with grease.
  - When installing Cover (20) on Drum (16), place Stopper (23) in outer edge of Spring(18), (See fig. 3)
 Cheek Stopper can move smoothly after installing.

- 13 Wind Spring (18) by turning Worm (42) to the “ + ” side (clockwise).  
**NOTE:** While turning Worm, Wire rope (28) will be retracted into Drum (16). Pay attention Wire rope does not slip out from the drum groove.  
 After Wire rope is fully retracted, turn Worm by the number of turns shown in Table1.

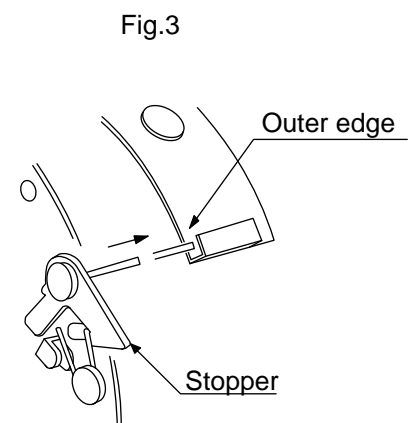


Table-1

Model	ELF-3	ELF5	ELF-9
Number of turns	Approx. 90	Approx. 90	Approx. 85
Numbers above are for the middle value of the capacity range.	2.3kg	2.3kg	2.3kg

## 2-5 Spring disposal

### WARNING



**The spring is dangerous due to remaining tension even if it is broken.**

Give a warning to disposal companies that the spring will expand explosively and cause danger if the spring is treated roughly or the center of the spring is pulled.

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

**ENDO 遠藤工業株式会社**

〒959-1261 新潟県燕市秋葉町3丁目14番7号  
TEL:0256-62-5133 FAX:0256-62-5772  
<https://www.endo-kogyo.co.jp>

事業所情報につきましては、  
二次元バーコードよりご確認ください。



**ENDO ENDO KOGYO CO., LTD.**

3-14-7, Akiba cho, Tsubame, Niigata 959-1261, Japan  
<https://www.endo-kogyo.co.jp/english> TEL: 81-256-62-5133

- 本書ならびに本商品の仕様は改善のために予告なしに変更することがあります。
- 本書の内容の無断転載を禁止します。
- This manual and the specifications of this product are subject to change for improvement without advance notice.
- It is strictly prohibited to reprint or copy any information contained in this manual.