ekso EVO



Operating Manual

ekso BIONICS®

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Chapter 1

INTRODUCTION

Ekso EVO is an upper body exoskeleton that alleviates the burden of repetitive work on the shoulders, which is the most common cause of lost workdays due to workplace injuries. Based on collaboration and insights from Ekso's global install base and experience with its ground-breaking EksoVest technology, Ekso EVO is designed to improve the user experience and drive adoption.

Stacked link structure.
Ekso EVO's patented stacked-link structure seamlessly follows the user's arm through the full range of motion while providing proper joint alignment. Extreme positions like reaching directly overhead, across the body, or even into a back pocket for a phone are unrestricted.

Independent load path.
Completely decoupled left and right shoulder support structures allow full flexibility of the user's torso and waist, such that twisting and bending to the side feel completely natural. The user's back is also completely free of structure, allowing unrestricted airflow and leaving plenty of room for a fall harness.

Minimized body contact.
Ekso EVO is designed to only contact the user's body where it is absolutely essential, while still staying firmly in place during use. The result is more comfortable and cooler to wear than even a backpack, especially in hot environments.

Adjustable high force actuator.
Ekso EVO's actuators are proven to be extremely durable with millions of cycles of testing and field data. The assistance level can be adjusted for the user and task by easily swapping out the set of compact gas springs. Different levels can even be selected for each arm if appropriate for the task.

Light weight, no compromises.
Light weight can be achieved without sacrificing functionality. Ekso EVO strikes the optimal balance between device weight, functionality, assistance levels, and durability.

Compact storage.
With the included durable, 66 cm tool bag-style carrying case, Ekso EVO stores, ships and transports to and around the job site easily and conveniently. Interior storage bag pockets provide ample storage of accessories and other tools.

Scan this code for videos on how to get started using your Ekso EVO

Chapter 2

700001 – WHAT IS INCLUDED

The mechanical and hardware components of each Ekso EVO are identified in the following drawing and table.



Item	Description	Details
1	Left Arm Assembly	108831
2	Large Torso Tube (22 cm)	108795
3	Hip Belt	109020
4	Right Arm Assembly	108830
5	Spring Assembly, Level 2	109189
6	Small Torso Tube (14,5 cm)	108794
7	XL Torso Tub Size (29,5 cm)	108979

Chapter 3

EKSO EVO SIZING AND FIT ADJUSTMENTS

Ekso EVO is designed to be custom fit for each operator (see MEASUREMENT AND FITTING INFORMATION below). Record the operator's measurements to find the ideal size configuration for a secure and comfortable fit.

Measurement And Fitting Information

To find the initial size configuration for your Ekso EVO, take the measurements listed below using a flexible measuring tape. Use these measurements to look up the operator's correct size configuration according to the fitting guide tables. These values serve as a starting point, and additional adjustments may be required.

	Sizing Capacity
Waist Circumference	63,5 - 142 cm
Bicep Circumference	23 - 74 cm
Torso Length	36 - 59 cm

Belt Size

Measure the distance around your back between your 2 hip/pelvic bones (the iliac crest). Be sure to make the measurement over your typical work clothes.

Measurement _____cm



Figure 1:
Hip-to-Hip Measurement

Arm Cuff Size

Measure the circumference of your bicep at the widest point in a relaxed position. Be sure to make the measurement over your typical work clothes.

Measurement _____cm

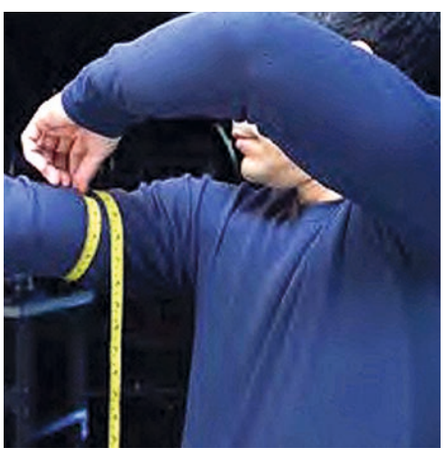


Figure 2:
Bicep Measurement

Torso Tube Size

Place your hands on your hips with your index finger resting on your hip bone. Extend your thumbs toward each other around the center of your back. Have an assistant measure the distance from the imaginary line between your thumbs to the bony protrusion at the base of your neck.

Measurement _____cm

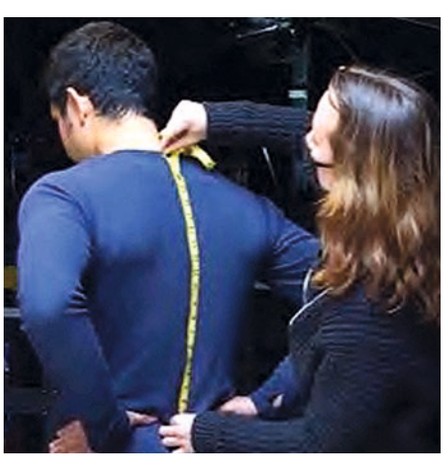


Figure 3:
Torso Measurement

FIT GUIDE TABLES

Table 1: Belt Size

Hip Belt Ratchet Strap Position	Belt size Measurement Hip-to-Hip Distance
1	53 - 55 cm
2	55 - 57 cm
3	57 - 59 cm
4	59 - 61 cm
5	61 - 63 cm
6	63 - 65 cm
7	65 - 67 cm
8	67 - 69 cm
9	69 - 71 cm
10	71 - 73 cm
11	73 - 75 cm
12	75 - 77 cm
13	77 - 79 cm
14	79 - 81 cm
15	81 - 83 cm
16	83 - 85 cm
17	85 - 87 cm
18	87 - 89 cm
19	89 - 91 cm
20	91 - 93 cm
21	93 - 95 cm



Figure 4:
Hip Belt Sizing Positions

ADJUSTING HIP BELT SIZING

To adjust the size of the hip belt to a smaller setting, slide the ratchet straps further in towards the waist plate. To adjust the size of the hip belt to a larger setting, first pull up on the ratchet buckles on the waist plate to release them. Then, slide the ratchet straps outwards to the preferred setting. For the most comfortable fit, ensure that all 4 ratchet straps are at the same length setting and the cutouts in the middle of the hip pads are resting directly over the front of your hip bones.



Figure 5:
Adjusting Hip Belt Sizing

Table 2: Arm Cuff Size

Arm Cuff Size	Arm Cuff Measurement
S	23 - 29 cm
M	29 - 36 cm
L	36 - 43 cm
XL	43 - 51 cm

CHANGING ARM CUFFS



Figure 6: Changing Arm Cuffs

To remove the arm cuff, first undo the snap connection between the elastic strap and the arm cuff bone. Next, pull the Velcro strap out through the slot on the arm cuff bone.



Figure 7: Changing Arm Cuffs

Locate the snap pocket inside the arm cuff, undo the snap, and open the flap to separate the arm cuff from the cuff bone. Finally, pull the arm cuff straight up to remove it from the cuff bone. Reverse the process to install the preferred arm cuff size onto Ekso EVO.

Table 3: Torso Length

Lower Torso Tube Size	Upper Torso Tube Position	Lower Torso Tube Size
Small Tube	1	35.5 - 37 cm
	2	37 - 38.5 cm
	3	38.5 - 40 cm
	4	40 - 41.5 cm
	5	41.5 - 43 cm
	6	43 - 44.5 cm
Large Tube	1	43 - 44.5 cm
	2	44.5 - 46 cm
	3	46 - 47.5 cm
	4	47.5 - 49 cm
	5	49 - 50.5 cm
	6	50.5 - 52 cm
X-Large Tube	1	50.5 - 52 cm
	2	52 - 53.5 cm
	3	53.5 - 55 cm
	4	55 - 56.5 cm
	5	56.5 - 58 cm
	6	58 - 59.5 cm

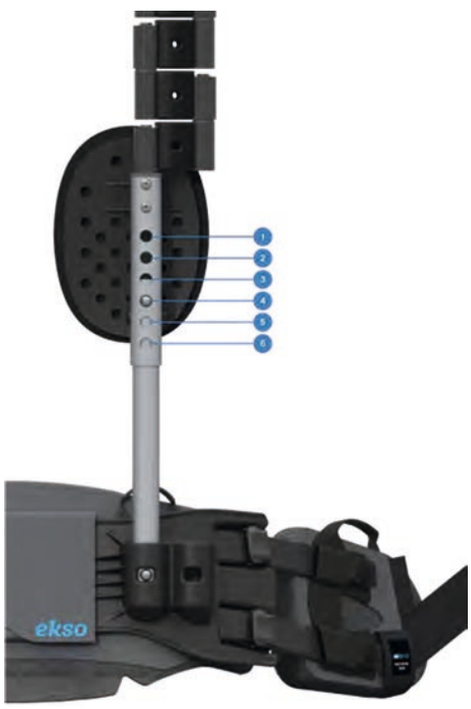


Figure 8:
Upper Torso Tube Positions

ADJUSTING TORSO LENGTH

To adjust the torso length, unzip the neoprene cover to reveal the upper torso tube. Press the button pin in and slide the lower tube into the preferred position. Make sure the button pin engages in the upper torso tube hole to lock in your new torso tube length.



Figure 9:
Adjusting Torso Length

Note: For the best fit and comfort, be sure that the tops of the actuators are slightly higher than the tops of the user's shoulders. Adjust the torso lengths if necessary to achieve proper alignment.



Figure 10:
Proper Ekso EVO Actuator Height Alignment

INSTALLING ARMS AND ADJUSTING ARM POSITION

Get ready to use Ekso EVO by installing the arms into the hip belt. To install the arms, press the button pin on the bottom of the lower torso tube and slide the tube into the hole on the waist plate. Make sure the left and right arms are installed on the correct side. Start with the arms installed in the inner (narrow) position. If you feel restricted when moving your arm across your body in front of you, or have very broad shoulders, try the outer (wide) arm position.



Figure 11:
Ekso EVO in narrow position



Figure 12:
Ekso EVO in wide position



INSTALLING SUSPENDERS - OPTIONAL

For some users, Ekso EVO may slide down over time regardless of how tight the hip belt is. To ensure a proper fit for all users, Ekso EVO has been designed to be compatible with most off-the-shelf suspenders. To install suspenders on your Ekso EVO, follow the steps below:

1. Clip the back of the suspenders onto the two loops of the lumbar pad.

2. Route the left and right sides of the suspenders through the left and right arm cuffs. Secure with Velcro.

3. Drape Ekso EVO over your shoulders.

4. Secure the hip belt using the buckle. Position the hip pads so they are covering your hip bones, then tighten the belt by pulling the webbing straps inward. The belt should be tight enough to avoid shifting, but not uncomfortable.

5. Release the left and right sides of the suspenders. Attach them to the loops on the top side of the left and right hip pads.

6. Slip each arm through the arm cuff. Use the pull handle strap to fully open the cuff to allow for easier insertion.

7. Tighten the three straps on each arm from bottom to top for a snug but comfortable fit.

8. Adjust the length of the suspenders. They should be sized to prevent Ekso EVO from sliding down without putting excessive pressure on your shoulders.

Figure 13:
Installing Ekso EVO Suspenders

Chapter 4

DONNING AND DOFFING EKSO EVO



Now that the Ekso EVO has been custom fit to the operator, it is time to put it on.

Donning Ekso EVO

1. Before putting on Ekso EVO, make sure to unbuckle the hip belt, loosen the hip belt webbing, and loosen the arm cuff straps.



2. Start by draping the Ekso EVO over your shoulders.



3. Secure the hip belt using the buckle. Position the hip pads so they are covering your hip bones, then tighten the belt by pulling the webbing straps inward. The belt should be tight enough to avoid shifting, but not uncomfortable. Excess webbing can be stored in the elastic strap on the hip belt.



4. Slip each arm through the arm cuff. Use the blue pull handle strap to fully open the cuff to allow for easier insertion.



5. Tighten the three straps on each arm from bottom to top for a snug but comfortable fit.

NOTE:
The Ekso EVO must be switched off.

Figure 14: Donning Ekso EVO



Donning Ekso EVO

1. Undo and loosen the arm cuff straps. Use the pull handle strap to slide each arm out of the arm cuff.



2. Drape the Ekso EVO arms over your shoulders.



3. Loosen the hip belt webbing, then release the hip belt buckle.



4. Lift Ekso EVO off your shoulders and disassemble arms from the hip belt by pressing the silver buttons on the bottom of the torso tubes. Place all components back into the Ekso carrying bag.

Figure 15: Doffing Ekso EVO

NOTE:
The Ekso EVO must be switched off.

Chapter 5

TURNING EKSO EVO ON AND OFF

Each Ekso EVO arm has an ON / OFF switch (with tether) located on the actuator housing. Moving the switch to the ON position activates the spring support of the actuator. Take care if activating the switch while the Ekso EVO is not being worn, as the arm can raise up in an uncontrolled manner.

Turning Ekso EVO On

To turn Ekso EVO on, the operator must keep their arm fully down by their side. The switch on the actuator can then be flipped to the ON position. Do this for both arms before starting to use Ekso EVO.

DO NOT FORCE THE SWITCH, this can damage the actuator. If the switch is not rotating freely, lower your arm further before turning the switch to the ON position.



Figure 16: Turning Ekso EVO On

Turning Ekso EVO Off

To turn Ekso EVO off, the operator must lower their arm fully to their side. The switch on the actuator can then be flipped to the OFF position. Do this for both arms before doffing Ekso EVO.

DO NOT FORCE THE SWITCH, this can damage the actuator. If the switch is not rotating freely, lower your arm further before turning the switch to the OFF position.

Chapter 6

INSTALLING AND CHANGING ACTUATOR SPRINGS

Ekso EVO Actuator Spring Support Levels

The force assistance level provided by Ekso EVO can be adjusted by changing the actuator springs in each arm. There are five (5) sets of actuator spring levels to choose from. Each spring level corresponds to an approximate amount of lift assist support.

The support level of each spring is shown on the spring's end cap. Level 1 provides the least amount of arm support, while Level 5 provides the most. The following table shows the different spring labels and the approximate lift support offered by each of the five different actuator springs.

Table 4: Spring Labels and Approximate Spring Support

Support Level 1	Support Level 2	Support Level 3	Support Level 4	Support Level 5
				
2,3 kg	3,6 kg	4,7 kg	5,8 kg	7,1 kg

When sizing Ekso EVO, Ekso Bionics recommends beginning with a lower force spring to get used to the device and changing to a higher force level if needed.



Figure 17:
Installing Actuator Springs

Installing Actuator Springs

Installing/changing the actuator springs should be performed when the Ekso EVO is not being worn. To change the actuator springs, follow the steps below:

1. Secure one arm of Ekso EVO in the lowered (down) position. Flip the actuator switch to the ON position.
2. Carefully guide the Ekso EVO arm upwards to the fully raised (up) position.
3. Unscrew and remove the spring from actuator cylinder chamber.
4. Select the desired spring and insert into actuator cylinder chamber. Screw in the spring until hand-tight.
5. Carefully guide the Ekso EVO arm downwards into the fully lowered (down) position. Flip the actuator switch to the OFF position.

Chapter 7

ADJUSTING THE ACTIVATION ZONE

Ekso EVO features an adjustable “activation zone”. The activation zone is the area in which Ekso EVO provides support to the operator’s arms while performing in front and overhead work.

Ekso EVO can be adjusted between 3 activation zone settings:

- H (high) setting – Ekso EVO begins to engage later and provides the most support with the operator’s arms in a more vertical position. This position is best for direct overhead work.
- “Standard” setting - Marked by the middle line on the end link, this position is best for more variable applications and a good starting point for new users.
- L (low) setting – Ekso EVO begins to engage sooner and provides the most support with the operator’s arms in a more horizontal position. This position is’ best for chest height work.

The Figure shows how each setting changes the activation zone starting points and max support areas. The table below lists the approximate angle (from 0° fully lowered position) for each activation zone starting point and max support point.

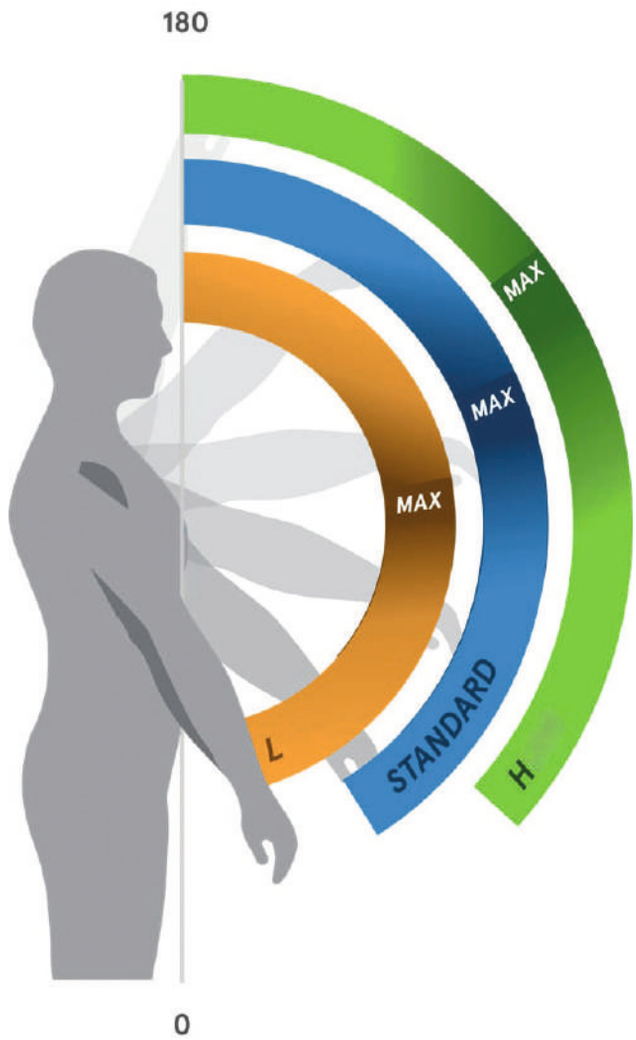


Figure 18:
Activation Zone Settings

Table 5: Activation and Support Angles

Activation Setting	Degree (from 0°) for Starting Support Point (approximate)	Degree (from 0°) for Max Support Point (approximate)
Low Setting	15°	105°
Standard Setting	25°	115°
High Setting	35°	125°

As described in the following procedure, adjusting the activation zone must be done when the Ekso EVO is not being worn. Personal comfort and preference should always guide which activation zone setting to use for each arm.



Figure 19:
Loosening End Link Screw

To adjust the activation zone:

1. Secure one arm of the Ekso EVO in the down (lowered) position. Enable that actuator by flipping the switch to the ON position.
2. Carefully guide the Ekso EVO arm upwards to the fully raised (up) position.
3. Use T25 driver to loosen the top socket head cap screw on the end link. Loosen the screw approximately one-quarter turn.



Figure 20:
High, Standard, and Low Activation Settings

4. Using the end link graphic as a guide, adjust the dial to H (high) or L (low) setting as desired; default adjustment will be set at the "standard" setting (middle line).

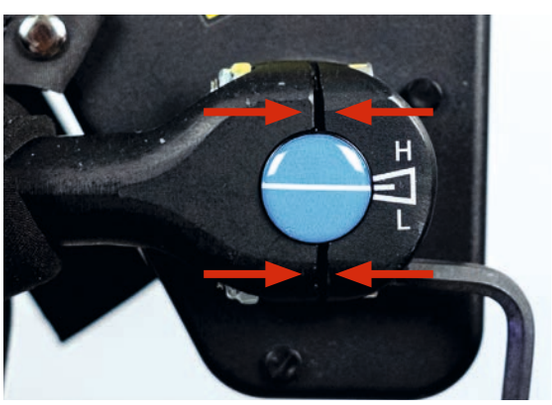


Figure 21:
Evenly Spaced Split Clamp

5. When the indicator is at the desired setting, retighten the screw. The split clamp should be evenly spaced.
6. Carefully guide the Ekso EVO arm downwards into the fully lowered (down) position. Flip the actuator switch to the OFF position.
7. Repeat steps 1 through 6 on the opposite side, as needed.

Chapter 8

FIT ADJUSTMENT TROUBLESHOOTING

Before the operator starts using the Ekso EVO, some fit adjustments may be required for maximum comfort. If the operator is feeling any discomfort, try the adjustments described below.

Table 6: Fit Adjustment Troubleshooting

Issue	Solution
You feel excessive pressure on the underside of your arm near the elbow when you raise your arm.	Torso length likely too short. Try increasing torso tube length by 1 notch. Ensure waist belt is not sliding down.
You feel excessive pressure on the top of your bicep when you raise your arm.	Torso length likely too short. Try increasing torso tube length by 1 notch. Ensure waist belt is not sliding down.
You feel excessive pressure on the underside of your arm near your armpit.	Torso length likely too long. Try decreasing torso tube length by 1 notch.
Your arm is not aligned with the Ekso EVO actuator arm.	Make sure that hip belt is properly positioned and tightened. Adjust torso length if needed.
The arm cuff slides up and down on your arm.	The arm cuff straps are likely too loose. Readjust and tighten arm cuff straps as needed.
The webbing straps are digging into your waist.	Check the position of the hip pads, and adjust to ensure they are centered over your hip bones. The center relief channel on the hip pads should be directly over your hip bones.
The arm cuff is too tight no matter how it is adjusted.	If wearing extra layers, the padding in the arm cuff can be removed for a more accommodating fit. Otherwise, try swapping to a larger arm cuff size.
You feel restricted when moving your arm across your body.	For operators with larger shoulders, try moving the arms of Ekso EVO from the inner lug position on the hip belt to the outer lug position. If this doesn't fix the issue, the torso setting could be too short. Try increasing the length of the torso tube by 1 notch.
You feel discomfort when moving your arm across your body.	The arm cuff straps are likely too loose. Readjust and tighten arm cuff straps as needed.

Chapter 9

MAINTENANCE AND TROUBLESHOOTING

Table 7: Maintenance and Additional Troubleshooting

Issue	Solution/Maintenance	Frequency of Maintenance
Soft goods are dirty and/or sweaty.	• Wash soft goods in washing machine using laundry detergent and cold water; use a low-heat dryer cycle. • Ensure that all Velcro straps are secured before washing. • Ekso Bionics recommends washing and drying items in a mesh bag.	As needed from wear
Soft goods are damaged.	• Examine all soft goods (arm cuffs, torso pads, hip pads, and lumbar pad) for wear or damage. • Examine both sides of each soft good and all stitching for visible damage, discoloration, or deterioration; manually inspect the material with fingers to feel for wear, such as tearing, fraying, unevenness, or loose threads. • Examine snaps, straps, and buckles for proper operation. • If any damage or deterioration is discovered, discontinue use and contact Ekso Bionics for replacements	Weekly
Actuator spring does not thread in smoothly.	• Inspect actuator spring threads. • If dirty or dusty, clean with cloth and/or compressed air before inserting spring into actuator assembly.	As needed

Chapter 10

COMPONENTS AND ACCESSORIES

The items below are included with every Ekso EVO

Table 8: Components and Accessories

Item	QTY	Details	Ekso EVO Kit	Notes
Ekso EVO Arm Assembly	2	108830 (Right) 108831 (Left)	Included	
X-Large Torso Tubes	2	108979	Included	
Large Torso Tubes	2	108795	Included	
Small Torso Tube	2	108794	Included	
Hip Belt	1	109020	Included	
Arm Cuffs	8	108661 (Left M) 108660 (Right M)	One Set (Medium Arm Cuffs) Included	Additional sizes available if needed (SM, LG, XL)
Actuator Springs	2	Level 2: 109189	One Set (Level 2 Springs) Included	Additional spring levels available if needed(Level 1, 3, 4, 5)
Storage Bag	1	108779	Included	

Item number	Arm Cuff Sets
109205	ACCESSORY PACK, CUFFS, S, EVO
109206	ACCESSORY PACK, CUFFS, M, EVO
109207	ACCESSORY PACK, CUFFS, L, EVO
109208	ACCESSORY PACK, CUFFS, XL, EVO

Item number	Spring Kits
109188	ACCESSORY PACK, SPRINGS, LVL 1, EVO
109189	ACCESSORY PACK, SPRINGS, LVL 2, EVO
109190	ACCESSORY PACK, SPRINGS, LVL 3, EVO
109191	ACCESSORY PACK, SPRINGS, LVL 4, EVO
109192	ACCESSORY PACK, SPRINGS, LVL 5, EVO

Item number	Full Sizing Kits
109304	Ekso EVO ARM CUFF SIZING KIT (SM, LG, XL)
108855	Ekso EVO FULL SPRING KIT (LEVELS 1,3,4,5)

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