

Service Manual of the Ceiling Hoists

# AR-200, AR-200D, AR-260, and AR-350



## Revision table

Version	Date	Comments
V2.0	10-2017	Loose parts put together in the new Service manual
V2.1	09-05-2018	Password notification recovery (8.3). Pictures updated depending of the new version of the Ceiling Hoists. Chapters 7.9 and 7.10 added. Power Safety Mode default changed from 'off' to 'on'. Mechanical parts added (9.3/9.4) Max power consumption Motor 1 (AR-260) lowered from 16000 to 15000 (8.1).
V2.2	16-10-2018	Changes figure 2 for the new version Ceiling Hoist. Make the document compatible for black-white printing.

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# 1. Introduction

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You are now reading the Technical Manual of the PLS Ceiling Hoists AR-200, AR-200D (Detachable), AR-260 and the AR-350 in combination with the PLS Rail system. The purpose of this technical manual is aimed at the Technical Service Department of the care institution where this Ceiling Hoist is being used. Each type of Ceiling Hoist works in the same manner. The components of the Ceiling Hoists are nearly similar with the exception of some structural adjustments and software settings. The Service Manual contains:

- Technical Specifications.
- Maintenance Procedure and repairs.
- Component list with part numbers.

## 1.1. Used symbols

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Warning, potential risk of injury!



Warning, gear entrapment hazard!



Note.



Read the manual and/or use it as a reference before carrying out maintenance.



Serial number. See the user manual for further explanation.



Manufacturer of the product.



Date of manufacturing.



Product only suitable for indoor use.

## 1.2. Safety

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If any deformations to the component(s) and/or the rail or corresponding components occurred due to wrong use or transport, they may no longer be used and must be returned to the vendor.



Service and maintenance and replacing a Spreader Bar or other structural components of the Ceiling Hoist may only be carried out by demonstrably authorised persons.



The Ceiling Hoist may not be used to hoist a mass of more than the number of kg listed on the label.



Always disconnect the power supply when carrying out assembly work. A Ceiling Hoist may move in an uncontrolled manner causing the risk of pinching.



Batteries may only be charged in a properly ventilated dry room. Chargers must be connected in accordance with the applicable installation regulations. Chargers must be periodically inspected at least once a year.



Treat the Ceiling Hoist with care and ensure a clean and tidy work environment.



Only use original or parts supplied by PLS BV for repairs or replacement.



PLS BV and your distributor are not responsible for any damage caused by inadvertent, improper, incorrect or unreasonable use and/or maintenance (described above) or by unauthorised persons. Contact your distributor if you are not sure.

### 1.3. Safety facilities

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The Ceiling Hoist contains facilities that increase the safety during use. Always check the operation after repairs. The systems are described in Chapter 2.4, safety systems, of the User Manual.

Safety system	Operation
Battery monitor	Prevents fully discharging of the Batteries.
Height End Switch	Ensures that the Spreader Bar does not move higher than the maximum lifting height
Emergency stop	Turns off the Ceiling Hoist in Emergency situations when the red Cord is pulled.
Emergency lowering feature	Lowers the patient when the Emergency Cord is pulled down.
Lifting Tape tension switch	Prevents the Lifting Tape in the Ceiling Hoist from piling up when lowered without load.
Lifting Tape limit switch	Turns off the Motor of the Ceiling Hoist at the end of the Lifting Tape.

### 1.4. Commissioning

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The Ceiling Hoist is delivered with a disconnected Battery terminal. This prevents the Batteries from discharging. Connect the Battery terminal before the Ceiling Hoist is placed in the rail (see label top cover).

Check the PLS Rail System in combination with the Ceiling Hoist on the following aspects before use:

- Ensure that a weight test has been carried out for the installed rail system based on the maximum capacity of the Ceiling Hoist.
- Check the connection of the Ceiling Hoist to the rail.
- Check the connection of the Spreader Bar to the Ceiling Hoist.
- Check the status of the Battery on the Battery indicator of the Ceiling Hoist.
- Check whether the type of Sling matches the Patient or transfer.
- Check the condition of the Sling and the Clips and/or Loops.
- Check the functioning of the Coupling (if present).
- Check whether all End Stops have been attached and tightened properly.
- Check, if present, the functioning of the Turntable and/or Switch.
- Always ensure a clean and neat work environment.

The Ceiling Hoist is ready for use as described in the user manual.

## 2. Technical data

Features	Value/unit	Value/unit	Value/unit
	AR-200	AR-260	AR-350
Maximum Ceiling Hoist capacity.	200 kg	260 kg	350 kg
Minimum charge time empty (critical level).	8 hours	8 hours	8 hours
Turn-off time when not in use.	30 minutes	30 minutes	30 minutes
Turn-off time charge indication (bedroom mode).	2 minutes	2 minutes	2 minutes
Number of x lifts per load.	>40 @120 kg	>50 @150 kg	>80 @200 kg/ >35 @350kg

Specifications	Value/unit	Value/unit	Value/unit
	AR-200	AR-260	AR-350
IP value Hand Control.	IP-66	IP-66	IP-66
Lift Motor.	24 VDC – max. 10 A	2x 24 VDC – max. 10 A	2x 24 VDC – max. 10 A
Charger.	Mascot 29.7 V	Mascot 29.7 V	Mascot 29.7 V
Batteries.	(2x) 12 V – 2.9 Ah	(2x) 12 V – 5 Ah	(2x) 12 V – 5 Ah
Lifting Tape.	2400 mm x 35 mm.	2400 mm x 50 mm.	2400 mm x 50 mm.

Dimensions (Figure 1)	Value/unit	Value/unit	Value/unit
	AR-200	AR-260	AR-350
Length (A)	270 mm	377 mm	377 mm
Width (B)	307 mm	298 mm	298 mm
Height (C)	148 mm	135 mm	135 mm
Minimum Lifting Tape length (D)	85 mm	110 mm	110 mm
Maximum Lifting Tape length (E)	2230 mm	2230 mm	2230 mm

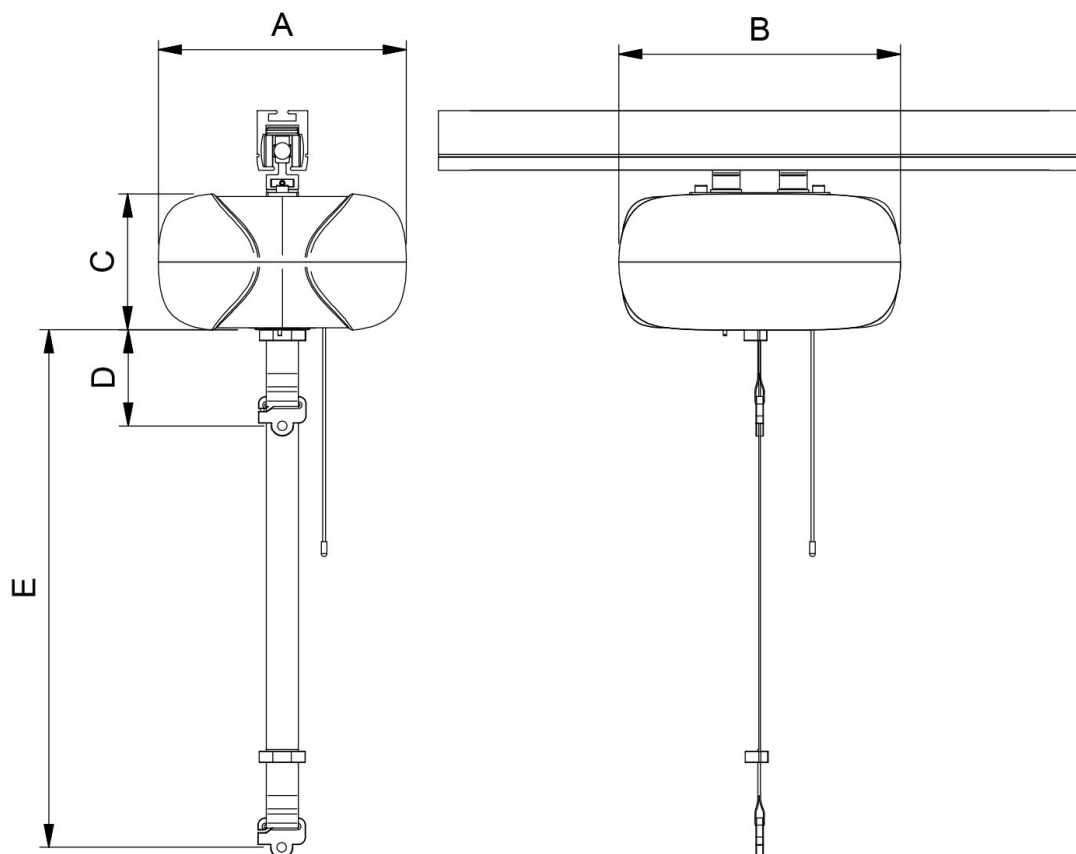


Figure 1, dimensions AR-200 (example)

### 3. Overview of Parts (AR-200)

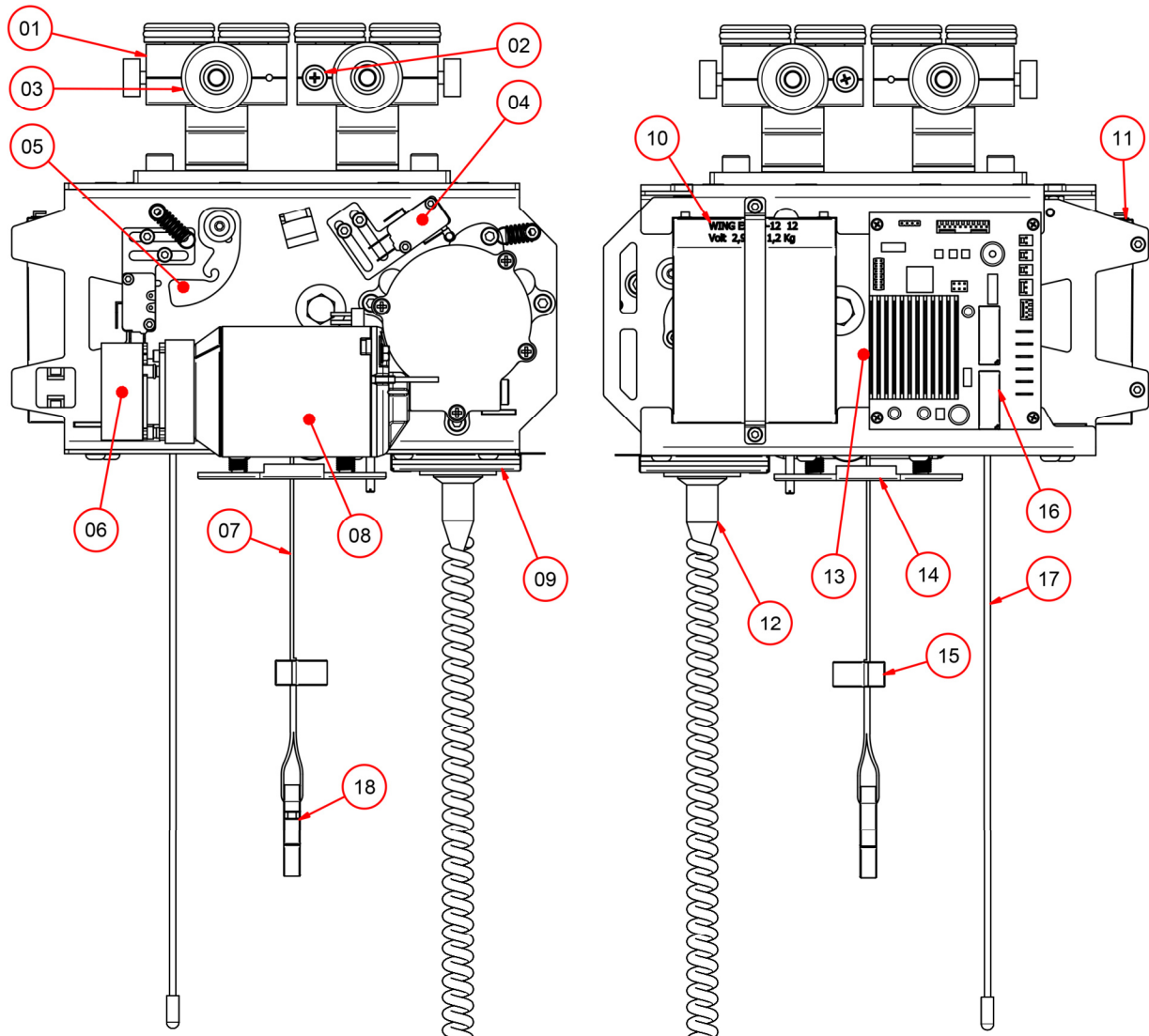


Figure 2, Overview AR-200

Number	Name	Function
01	Trolley	Move Ceiling Hoist along the rail.
02	Magnet (optional)	Activate the Sensors in a Turntable, Switch and Coupling.
03	Wheel cap	Cover on Bearing.
04	Strap Tension Switch	Activates the Ceiling Hoist when tension is put on Lifting Tape.
05	End Switch Lifting Tape	Turns off the Ceiling Hoist at the end of the Lifting Tape.
06	Electronic brake	Stops the Motor when not in use.
07	Lifting Tape	Lifting Tape used for lifting.
08	Motor	Rotates the Spool which winds the Lifting Tape.
09	LED Unit	Battery indicator Green = full, orange = charge, red = critical.
10	Battery 1	Battery 12 volt, 2.9 Amperes.
11	Battery 2	Battery 12 volt, 2.9 Amperes.
12	Hand Control	Operating and charging of Ceiling Hoist.
13	Emergency stop switch	Deactivates the Ceiling Hoist in case of Emergency and lowers load
14	Height limit plate	Stops the Ceiling Hoist at highest position.
15	Lifting Tape clamp	Pushes Height limit plate and stores Hand Control
16	Printed Circuit Board	Controls the Ceiling Hoist.
17	Emergency stop (Cord)	Deactivates the Ceiling Hoist in case of Emergency and lowers load
18	Lifting Tape connector	Attachment point for an electronic or mechanical Spreader Bar.

## 4. Overview of Parts (AR-260 and AR-350)

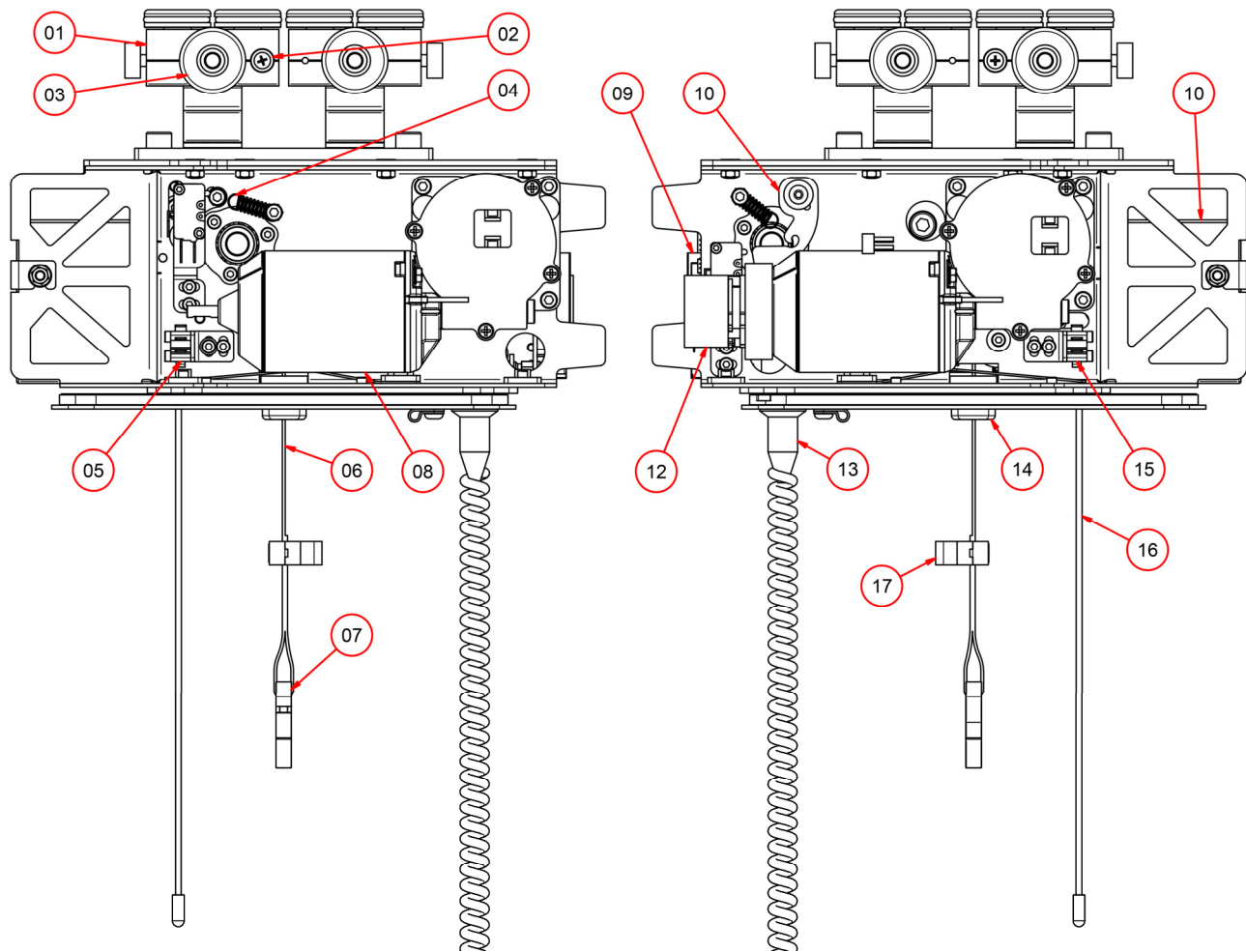


Figure 3, Overview AR-260 and AR-350

Number	Name	Function
01	Trolley	Move Ceiling Hoist along the rail.
02	Magnet (optional)	Activate the Sensors in a Turntable, Switch and Coupling.
03	Wheel Cap	Cover on Bearing.
04	Strap Tension Switch	Activates the Ceiling Hoist when tension is put on Lifting Tape.
05	Height limit switch	Turns off the Ceiling Hoist at the end of the Lifting Tape.
06	Lifting Tape	Lifting Tape used for lifting.
07	Lifting Tape connector	Attachment point for an electronic or mechanic Spreader Bar.
08	Motor	Rotates the Spool which winds the Lifting Tape
09	Printed circuit board	Controls the Ceiling Hoist.
10	End Switch Lifting Tape	Turns off the Ceiling Hoist at the end of the Lifting Tape.
11	Battery (2 pcs)	Battery 12 volt, 5 Amperes.
12	Electronic brake	Stops the Motor when not in use.
13	Hand Control	Operating and charging of Ceiling Hoist.
14	Height limit plate	Stops the Ceiling Hoist at highest position.
15	Height limit switch	Stops the Ceiling Hoist at highest position.
16	Emergency stop (Cord)	Deactivates the Ceiling Hoist in case of Emergency and lowers load.
17	Lifting Tape clamp	Pushes Height limit plate and stores Hand Control



## 5. Troubleshooting

Error	Possible cause	Possible solution
General Ceiling Hoist error.	Loose Battery terminal(s).	Connect terminal(s).
	Empty Batteries.	Replace the Batteries.
	Hand Control connector loose.	Connect connector.
	Hand Control is damaged.	Replace the Hand Control.
Lift moves down but not up.	Limit Switch has been activated	Check the Limit Switch
	Hand Control is damaged.	Replace the Hand Control.
	Batteries are empty	Charge the Batteries
Lift moves up but not down.	Lifting Tape tension switch has been activated.	Check the switch.
	No tension on the Lifting Tape.	Put tension on the Lifting Tape.
	Hand Control is damaged.	Replace the Hand Control.
Lift has difficulties moving.	Damaged wheel.	Replace the Wheel cap(s).
Lift makes (too much) noise during lifting.	Dry Gear	Lubricate the Gear.
	Dry Motor axle.	Disassemble the Motor and lubricate the axle (advice; Kroon Oil Lithep Grease EP2).
Lift does not charge.	Dirt on the charging contacts of the Hand Control.	Clean the contacts.
	Charger defect.	Replace the charger.
	Hand Control damaged.	Replace the Hand Control.
	Batteries damaged.	Replace the Batteries
Lift lacks lifting power.	Batteries are empty.	Charge the Batteries
	Batteries damaged.	Replace the Batteries
	Motor damaged.	Replace the Motor.
The mass drops slowly without using the Hand Controls.	Electronic Brake of the Motor is damaged.	Replace the Electronic Brake.
Batteries run out quickly.	Batteries are empty	Charge the Batteries
	Batteries damaged.	Replace the Batteries
	Hand Control contacts are dirty	Clean the charging contacts
	Hand Control is damaged.	Replace the Hand Control.

## 6. Maintenance

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The Ceiling Hoist must be inspected in accordance with NEN-EN-ISO 10535:2006 once per year. The chargers must also be inspected annually based on the applicable conditions. The daily and weekly inspection will be carried out by the users and is described in the manual.

### 6.1. Advice

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We as PLS BV recommend the following in addition to the annual mandatory maintenance:

- Replace the Batteries every 24 months (*chapters 7.2 and 7.3*). This aims to prevent errors/improper operation.
- Replace the Lifting Tape every 24 months (*chapters 7.5 and 7.6*). Notify the date on the Inspection and Maintenance form.
- The Lifting Tape must be checked during every inspection.

### 6.2. Six-month maintenance

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The following actions must be carried out during the six-month maintenance:

- Check the listed Inspection Requirements set out in the Manual.
- Check for potential damage.
- Check the wiring.
- Check the smooth operation in the rail.
- Check the installation equipment, brackets etc.
- Check the rail for damage and fixing points.
- Lubricate the gearwheels with, advice; Kroon Oil Lithep Grease EP2 of a comparable grease.

### 6.3. Annual inspection

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The annual inspection consists of an inspection and maintenance form (*Annex 10.4*) based on the requirements set out in NEN-EN-ISO 10535:2006.

## 7. Repairs

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The covers must be removed in order to carry out work to the Ceiling Hoist, depending on the work.



When carrying out repairs to the Ceiling Hoist, always disconnect the power supply to prevent short-circuiting or uncontrolled movements unless indicated otherwise.

### 7.1. Opening Ceiling Hoist

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1. Remove the plug of the Hand Control (*chapter 2.1.2, user manual*).
2. Remove the 4 screws (*Phillips PH-2x100*) on the bottom.
3. The bottom cover can now be removed.
4. The Ceiling Hoist must be removed from the rail to remove the top cover. Then remove the 4 screws on top of the casing.  
*AR-200; Phillips PH-2x100*  
*AR-260/ AR-350; Hex 3*
5. Place them back in the reverse order.



Do not force the covers when placing them back. Slide the covers on the pins in the frame and check whether they fit and connect properly to the bottom cover plate. Ensure that no cables get pinched. The screws can be tightened if this is correct.

### 7.2. Replace Batteries (AR-200)

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Replace the Batteries if they have been discharged too much and do not (properly) recharge.

1. Ensure that the Ceiling Hoist is turned off. You can do this by using the Emergency Stop cord.
2. Remove the Ceiling Hoist from the rail.
3. Disassemble both covers (*chapter 7.1*)
4. Disconnect the wiring from the Battery terminals.
5. Remove the screws (*hex 3*).
6. Replace the Batteries.
7. Mount the batteries in vice versa.
8. Connect the wiring to the Battery terminals.
9. Place the covers (*chapter 7.1*).



**Inspection:** Turn on the Ceiling Hoist. The control light must be green (if batteries are fully loaded).

Lift and lower a mass to test the operation.

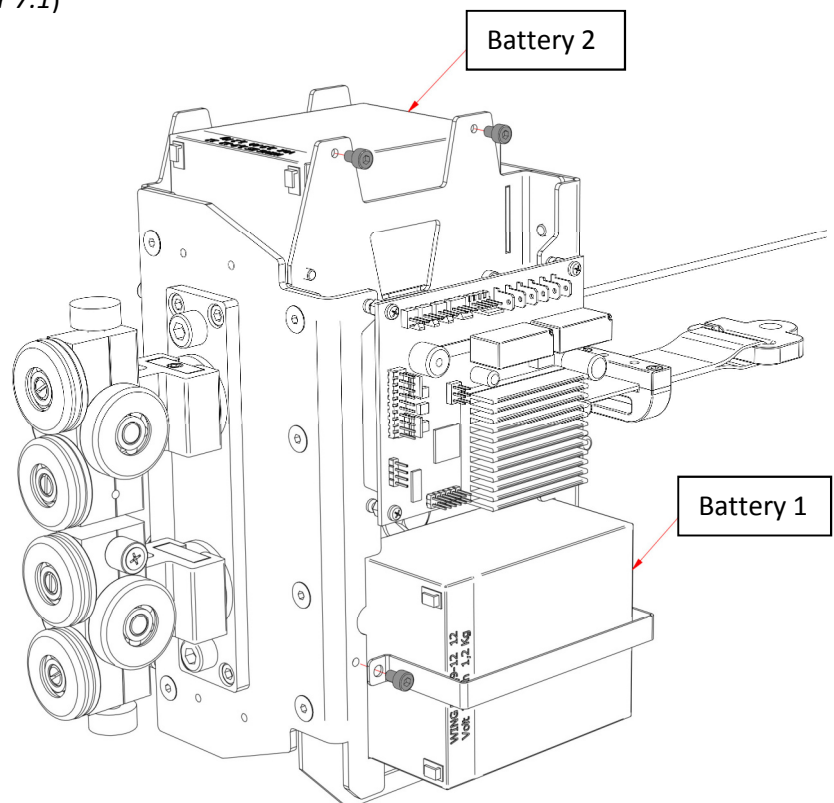


Figure 4, replace Batteries

### 7.3. Replace Batteries (AR-260 and AR-350)

Replace the batteries if they have been discharged too much and do not (properly) recharge.

1. Ensure that the Ceiling Hoist is turned off. You can do this by using the Emergency stop.
2. Remove the Ceiling Hoist from the rail.
3. Remove both covers (*chapter 7.1*)
4. Disconnect the wiring from the Battery terminals.
5. Remove the nuts from the bracket (No. 7).
6. Replace the Batteries.
7. Connect the wiring to the Battery terminals.
8. Place both nuts back with/on the bracket.
9. Place the covers (*chapter 7.1*).



**Inspection:** Turn on the Ceiling Hoist. The control light must be green (if batteries are full). Lift and lower a mass to test the operation.

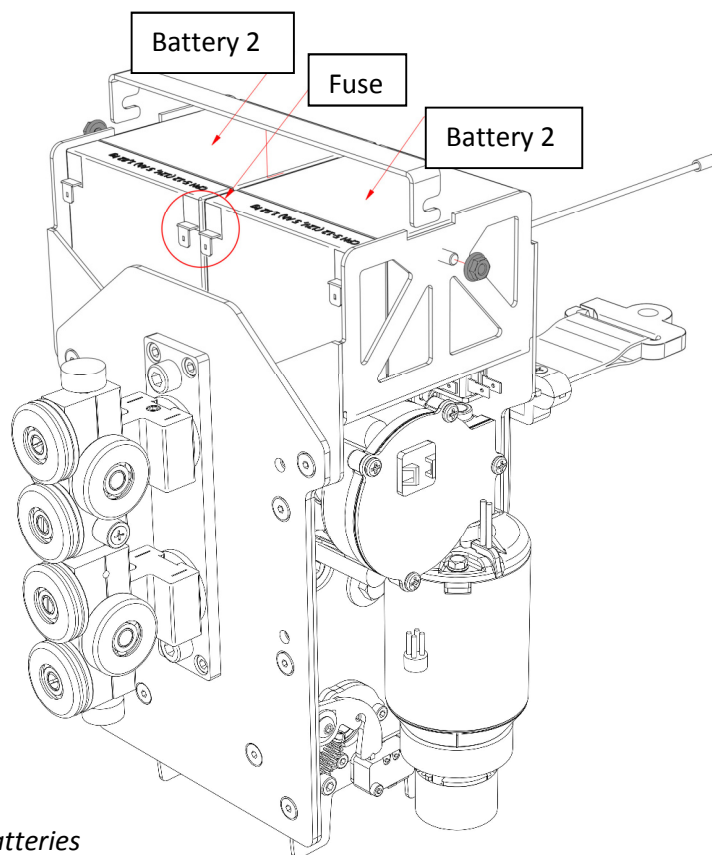


Figure 5, replace Batteries

### 7.4. Replace Electronic Brake (AR-200, AR-260 and AR-350)

Describes how the Brake can be replaced. The Motor does not need to be disassembled when the brake must be replaced.

1. Remove the bottom cover.
2. Disconnect the wire from the brake.
3. Remove the 2 black assembly screws (Hex 2.5) from the brake.
4. Place the new Brake and connect it. *Follow the above steps in the reverse order.*

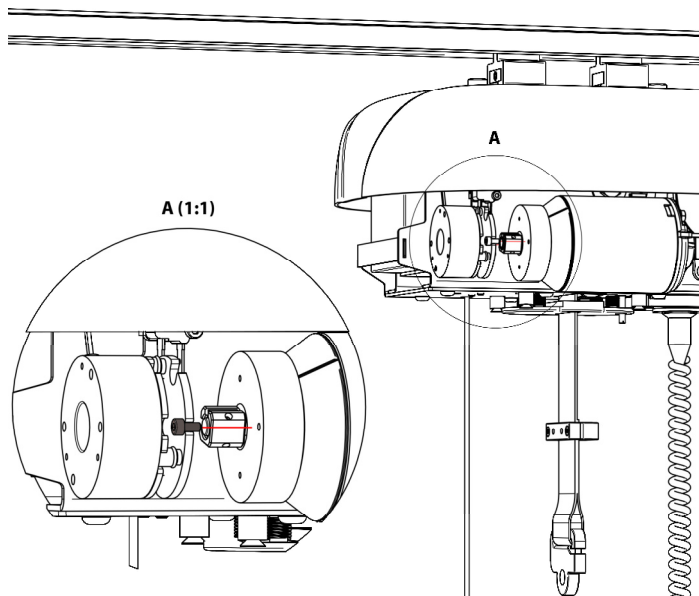


Figure 6, replace brake



**Inspection:** Check the aluminium spool on which the brake must be installed to ensure it is not too loose in relation to the Motor. When loose; glue with Loctite 603. Check the operation of the brake by dropping a weight and releasing the button of the Hand Control. The load must slow down gradually and come to full stop.

## 7.5. Replacing Lifting Tape (AR-200)

Replace the Lifting Tape in case of any kind of wear.

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers (*chapter 7.1*).
3. Place the plug of the Hand Controls in the Ceiling Hoist.
4. Remove Battery 1 (*chapter 7.2*) but keep the wiring connected.
5. Fully unwind the Lifting Tape using the Hand Control. Keep manual tension on the Lifting Tape. The bolt which attaches the Lifting Tape (step 6) is located behind Battery 1. Turn the Spool until the head of the bolt with the 'BOLT STRAP' label is visible through the 'BOLT STRAP' hole.
6. Turn off the Ceiling Hoist. You can do this by using the Emergency stop.
7. Disconnect the wiring from Battery 1.
8. Remove the screw (*Hex 4*).
9. Pull the Lifting Tape from the Ceiling Hoist.
10. Remove the Central Suspension Point of the old Lifting Tape.
11. Push the new Lifting Tape through the opening and guide it to the roll axle through the Battery space as shown in *Figure 8* (red line).
12. Push the loop through the bolt recess and apply **Loctite 243** (*Figure 7*) on the top thread of the bolt, push it through the loop and tighten it.
13. Replace the Central Suspension Point on the Lifting Tape as shown in *Figure 14* with **Loctite 243**.
14. Replace the Battery and connect it (*chapter 7.2*).
15. Check the operation by winding and unwinding the Lifting Tape.
16. Test the new Lifting Tape with a load.
17. If working properly; Place the covers (*chapter 7.1*).

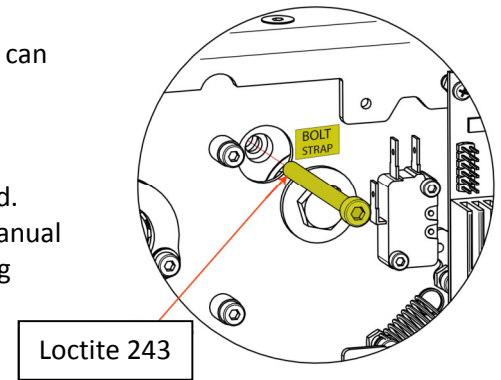


Figure 7, bolt mount Lifting Tape

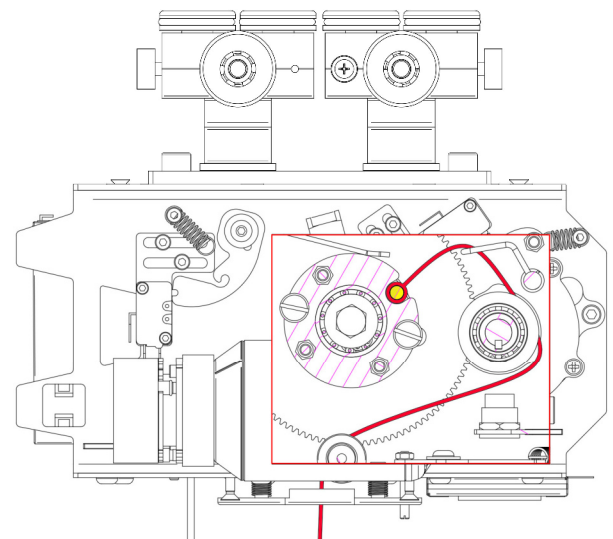


Figure 8, Lifting Tape guide



**Note!** Use the same bolt for the Lifting Tape because it is an extra strong bolt (12.9), special for that function. Place the old Central Suspension Point on the new Lifting Tape. Use **Loctite 243** to fix the bolt in place in the Central Suspension Point.



**Inspection:** Ensure that the Lifting Tape moves along 2 roles and over the axle of the Strap Tension Switch. The Ceiling Hoist will not lift if the Lifting Tape does not move along the Strap Tension Switch.

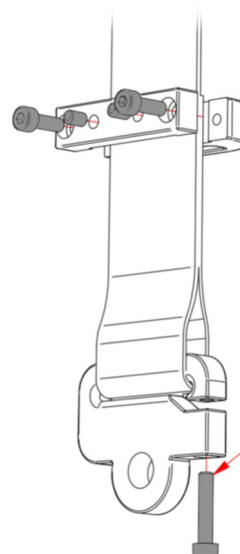


Figure 10, Assemble of CSP and Lifting Tape Block



Figure 9, example side Lifting Tape

## 7.6. Replacing Lifting Tape (AR-260 and AR-350)

Replace the Lifting Tape in case of any kind of wear.

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers (*chapter 7.1*).
3. Connect the Hand Control to the Ceiling Hoist.
4. Fully unwind the Lifting Tape using the Hand Control. Keep manual tension on the Lifting Tape. The bolt which attaches the Lifting Tape (step 6) is located behind Battery 1. Turn the Spool until the head of the bolt with the 'BOLT STRAP' label is visible through the 'BOLT STRAP' hole.
5. Turn off the Ceiling Hoist. You can do this by using the Emergency stop cord.
6. Disconnect the wiring from Battery 1.
7. Remove the screw (Hex 4).
8. Pull the Lifting Tape from the Ceiling Hoist.
9. Remove the Central Suspension Point of the old Lifting Tape.
10. Push the new Lifting Tape through the opening and guide it to the roll axle through the Battery space as shown in Figure 12 (red line).
11. Push the loop through the bolt recess and apply **Loctite 243** (*Figure 11*) on the wire of the bolt, push it through the loop and tighten it.
12. Replace the Central Suspension Point on the Lifting Tape as shown in with **Loctite 243**.
13. Replace the Battery and connect it (*chapter 7.2*).
14. Check the operation by winding and unwinding the Lifting Tape.
15. Test the new Lifting Tape with a load.
16. If working properly; Place the covers (*chapter 7.1*).

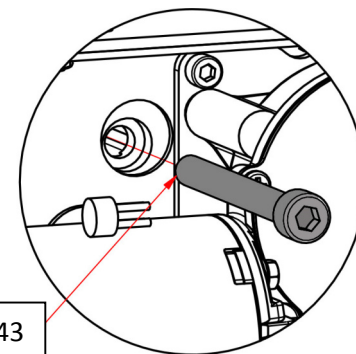


Figure 11, bolt mount Lifting Tape

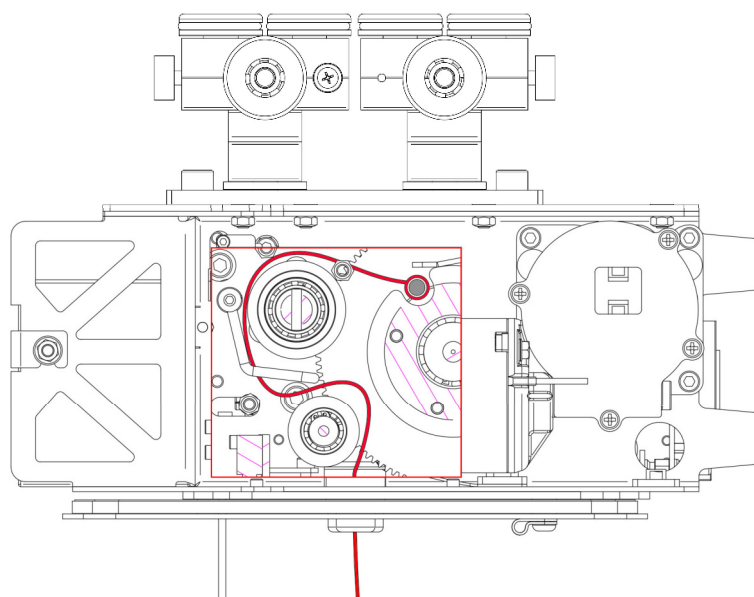


Figure 12, Lifting Tape guide



**Note!** Use the same bolt for the Lifting Tape because it is an extra strong bolt (12.9), special for that function. Place the old Central Suspension Point on the new Lifting Tape. Use **Loctite 243** to fix the bolt in place in the Central Suspension Point.



**Inspection:** Ensure that the Lifting Tape moves along 2 roles and the axle of the Lifting Tape stop. The Ceiling Hoist will not work if the Lifting Tape does not move along the Lifting Tape tension axle.

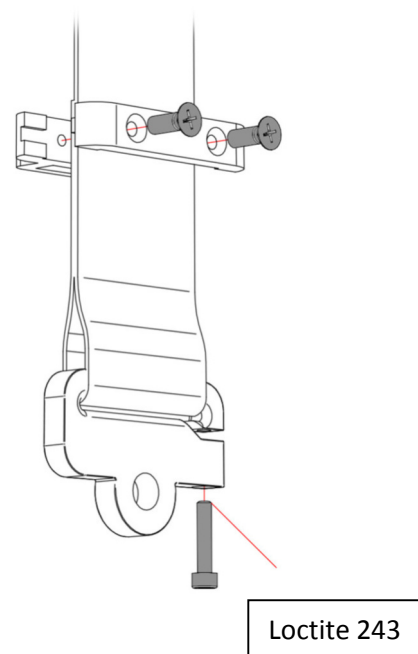


Figure 13, Assemble of CSP and Lifting Tape Block

## 7.7. Replacing Motor (AR-200)

Replace the Motor if it is broken.

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers.
3. Disconnect the wiring from the Motor.
4. Remove the three bolts (4) that hold the Motor (Hex 4).
5. Remove the Motor from the Ceiling Hoist.
6. Install the assembly plate (3) of the broken Motor on the new Motor with the three bolts (2) (Hex 4).
7. Lubricate the axle (Kroon Oil Lithep Grease EP2).
8. Place the Woodruff key (1) on the motor axle.
9. Place the Motor (5) on the Ceiling Hoist in the upright position. Guide the wedge to make it drop in the slot of the axle. This can be done using a wide flat screwdriver.
10. Install the three bolts (Hex 4).
11. Place the wiring with two tie-wraps (Figure 14).

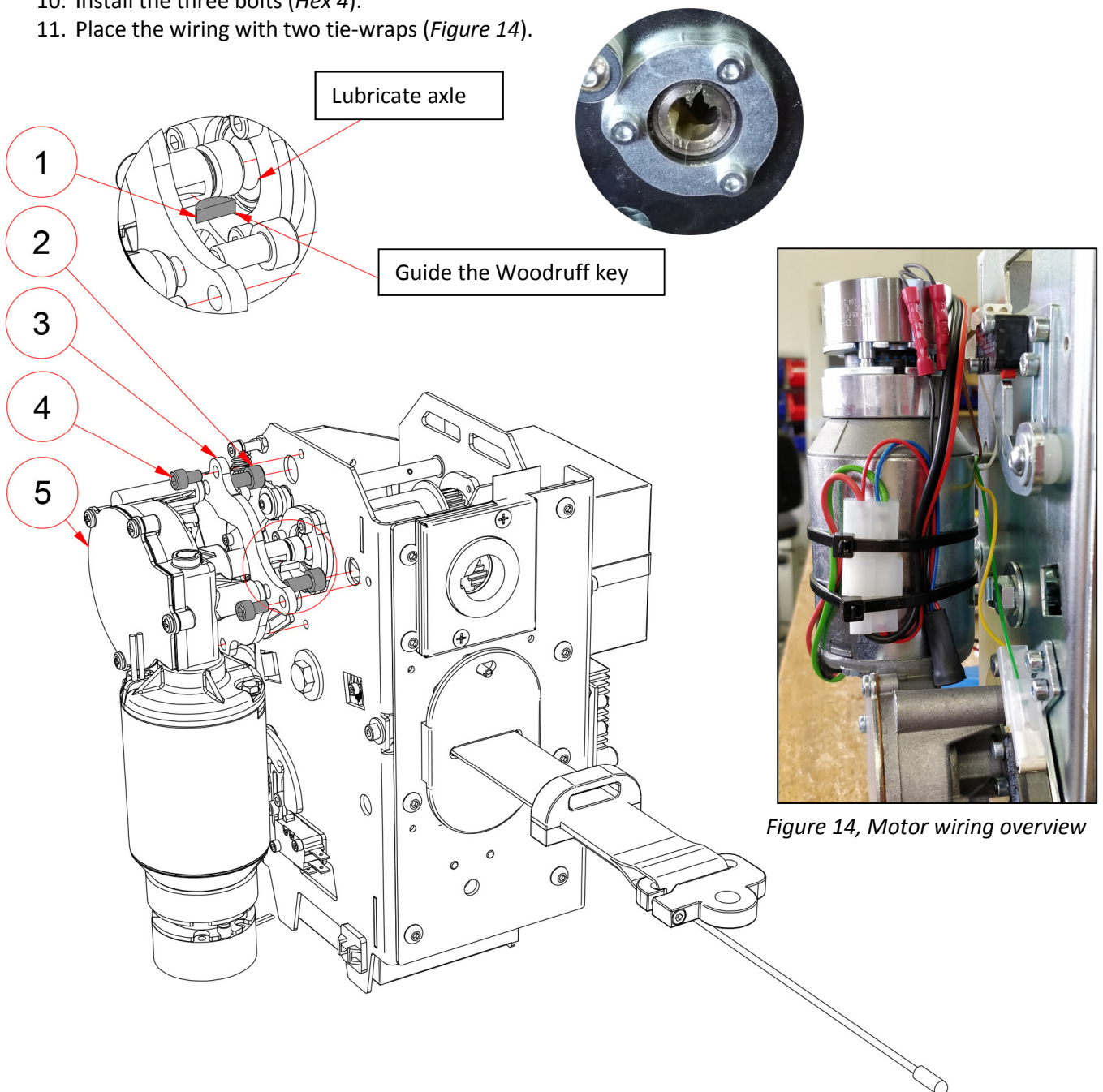


Figure 14, Motor wiring overview

Figure 15, replacing Motor

## 7.8. Replacing Motor (AR-260 and AR-350)

Replace the Motor if it is broken.

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers.
3. Disconnect the wiring from the Motor.
4. Remove the three bolts (2) that mount the Motor (*Hex 4*).
5. Remove the Motor from the Ceiling Hoist.
6. Install the assembly plate (3) of the broken Motor on the new Motor with the three bolts (2) (*Hex 4*).
7. Lubricate the axle (Kroon Oil Lithep Grease EP2).
8. Place the Woodruff key (1) on the motor axle.
9. Place the Motor (5) on the Ceiling Hoist in the upright position. Guide the wedge to make it drop in the slot of the axle. This can be done using a wide flat screwdriver.
10. Install the three bolts (*Hex 4*).
11. Place the wiring with 2 tie-wraps.

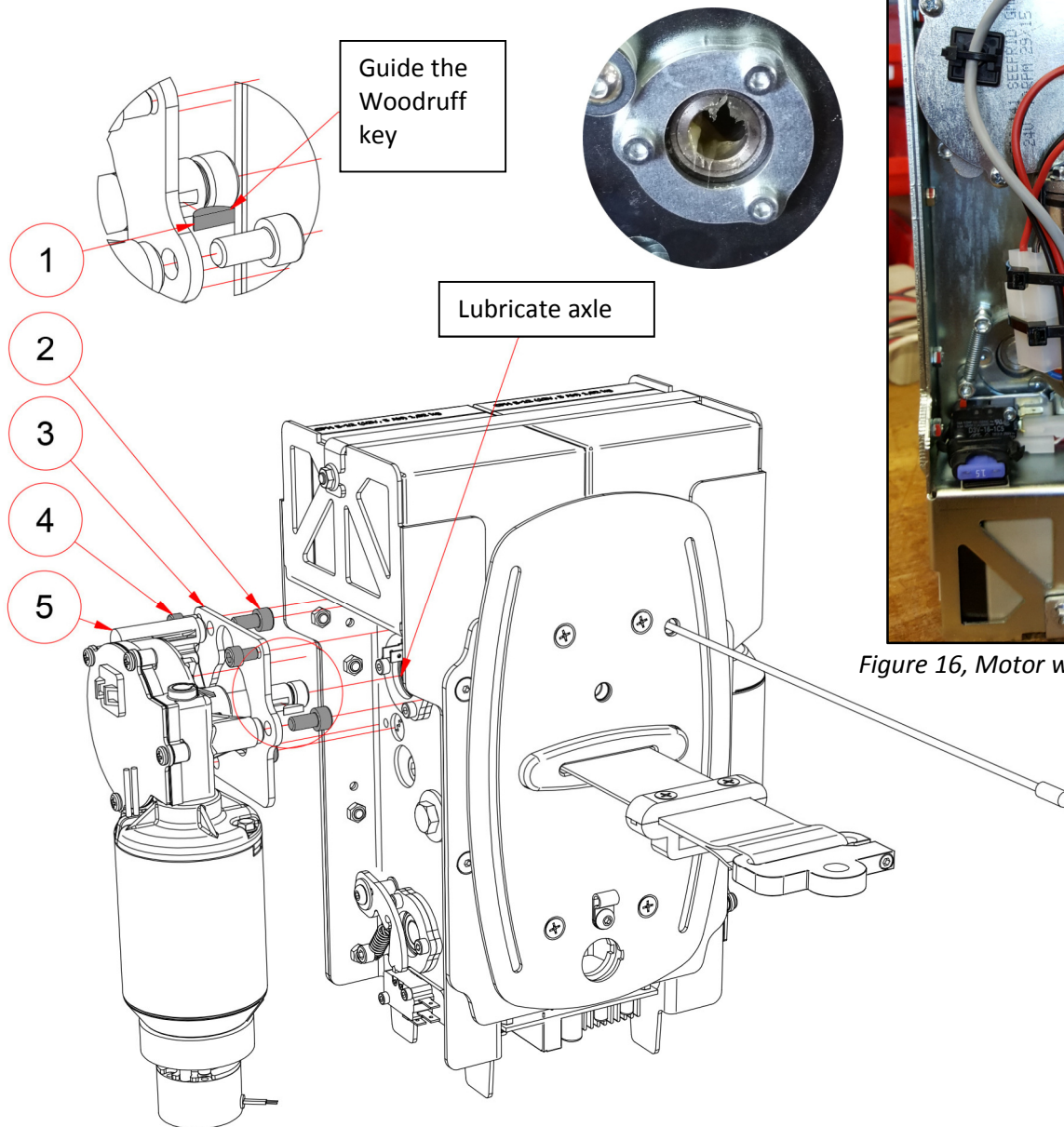


Figure 17, replacing Motor

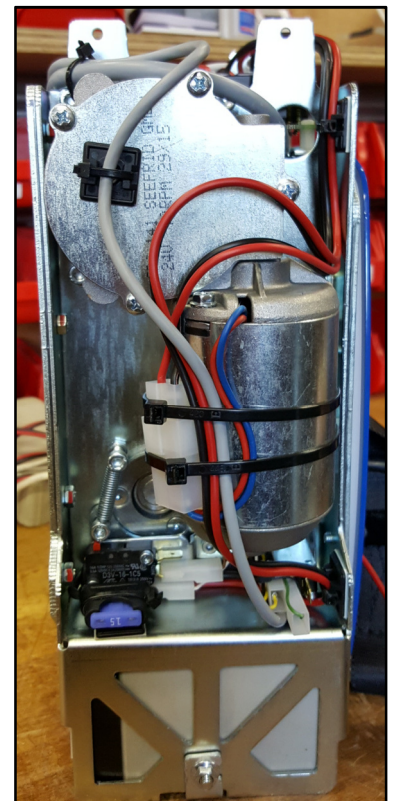


Figure 16, Motor wiring overview



## 7.9. Replacing Gears (AR-200)

Replace the gears when they are damaged or contain broken tooth.



1. Get the Ceiling hoist out of the Rail and place it where reperation is safe.
2. Disassemble both covers (*chapter 7.1*).
3. Put the connector of the Handset in the Ceiling Hoist.
4. Unroll the Lifting Tape completely.
5. Turn the Ceiling Hoist off.
6. Disassemble both batteries. (*chapter 7.2*)
7. Disassemble both Motors. (*chapter 7.7*).
8. Disassemble the PCB. (*chapter 7.11*).
9. Disassemble the Led-Unit.
10. Disassemble the Lifting Tape (*chapter 7.5*).
11. Disassemble the bolts and nuts who connect the Side Plates with the Upper Plate and Underplate.
12. Disassemble the bolts 2, 3 and 5 at both sides (*Figure 18*).
13. Remove Side Plate (7) by hitting it with a hammer of the axles.
14. Remove the Drive Shaft and the Spool by hitting it out of the Side Plate with a Nylon hammer.
15. Replace the gears of the axles. Remove also the bearings!
16. Make sure that after replacing the circlips (*Figure 19*) and Loctite placed on the 4 bolts.

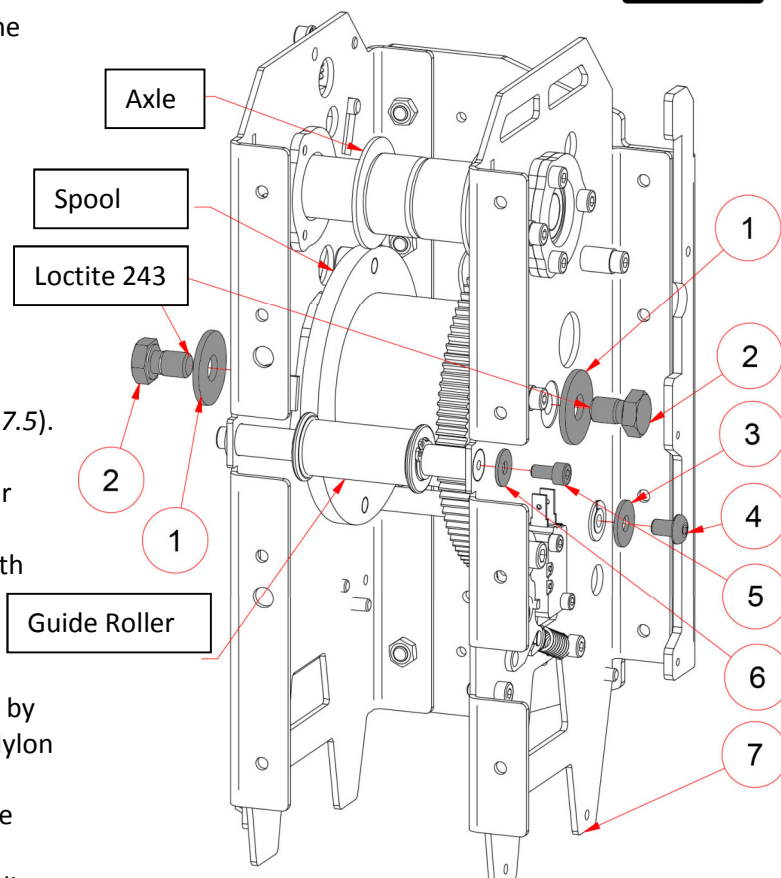


Figure 18, disassemble Side Plate

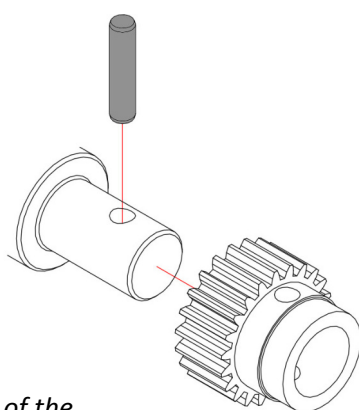


Figure 20, replacement of the gear of the Drive

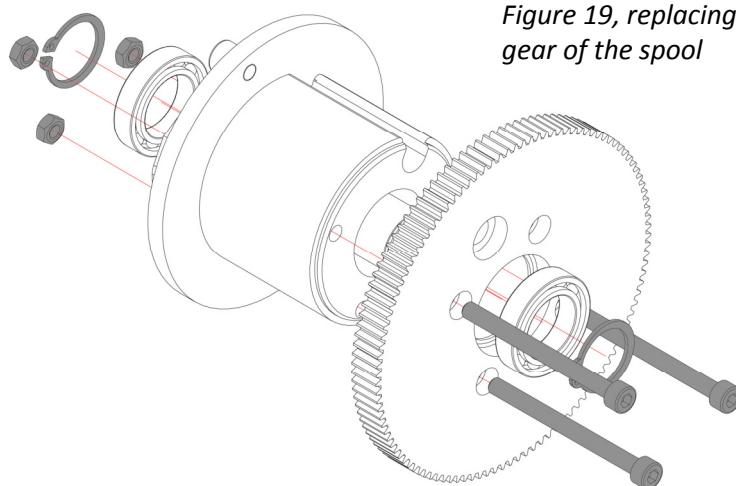


Figure 19, replacing gear of the spool

17. After replacement, hit the axles in the Ceiling Hoist as *Figure 18* with a nylon hammer.
18. Assemble the Ceiling Hoist vice versa. Add Loctite 243 (2x) on bolt 2 of *Figure 18*.
19. Lubricate the gears before the batteries are placed back (point 6). Place the Lifting Tape back on the spool (*chapter 7.5*). Roll the tape on the spool trough the Handset.

## 7.10. Replacing Gears (AR-260 and AR-350)

Replace the gears when they are damaged or contain broken tooth.



1. Get the Ceiling hoist out of the Rail and place it where reperation is safe.
2. Disassemble both covers (*chapter 7.1*).
3. Put the connector of the Handset in the Ceiling Hoist.
4. Unroll the Lifting Tape completely.
5. Turn the Ceiling Hoist off.
6. Disassemble both batteries (*chapter 7.3*)
7. Disassemble both Motors (*chapter 7.8*).
8. Disassemble the PCB (*chapter 7.12*).
9. Disassemble the Led-Unit.
10. Disassemble the Lifting Tape (*chapter 7.6*).
11. Disassemble the bolts and nuts who connect the Side Plates with the Upper Plate and Underplate.
12. Disassemble the bolts 1 and 3 at both sides (*Figure 21*).
13. Remove the Side Plate (5) by hitting it with a Nylon hammer of the Axles.
14. Remove Drive Shaft 1, 2 and the Spool by hitting it with a Nylon hammer out of the Side Plate.

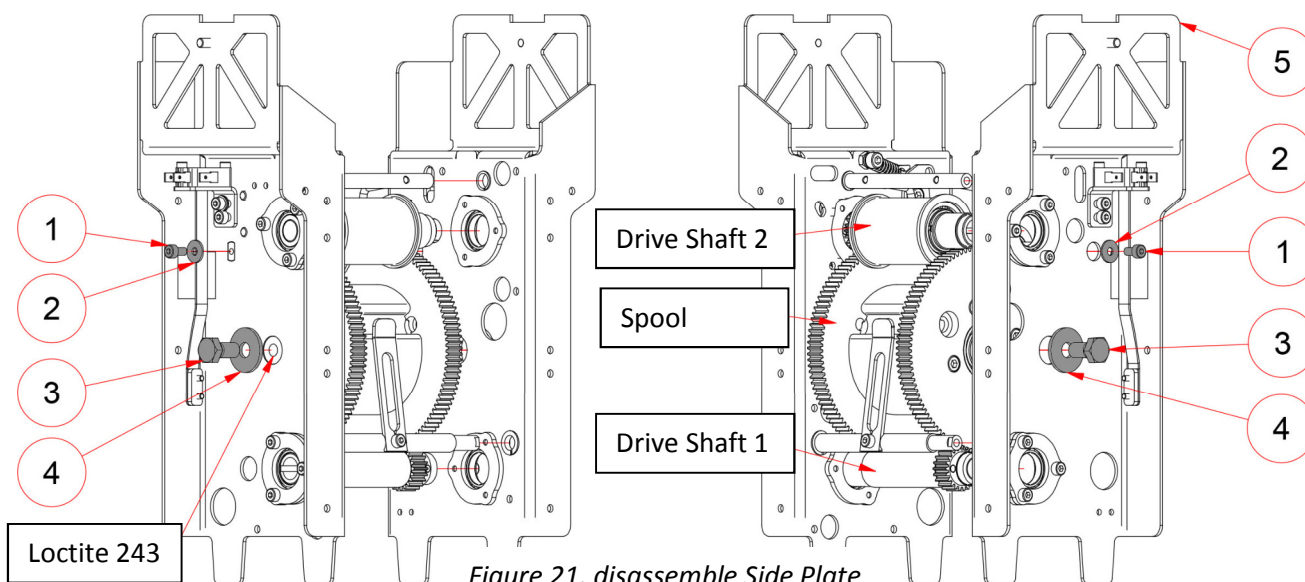


Figure 21, disassemble Side Plate

15. Replace the gears of the Axles. The gears on Drive Shaft 1 and Drive Shaft 2 are identical at each other and identical assembled. Replace also the bearings!
16. Make sure that after replacing the circlips (*Figure 22*) and Loctite placed on the 4 bolts

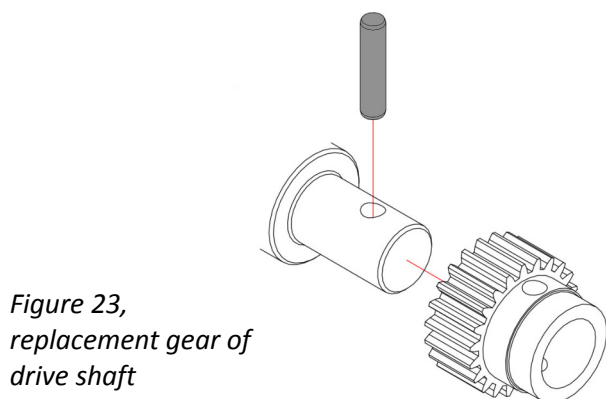


Figure 23,  
replacement gear of  
drive shaft

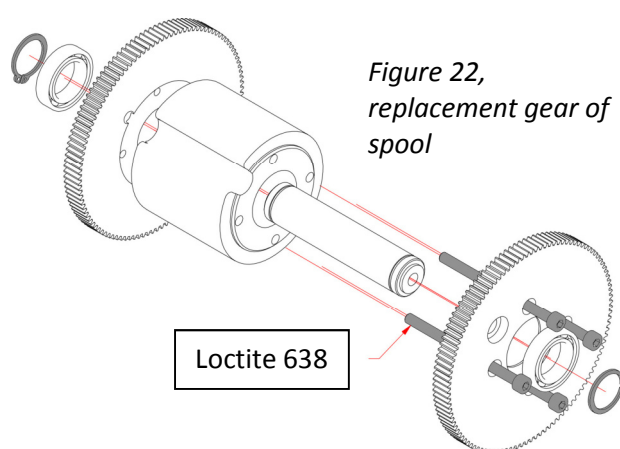


Figure 22,  
replacement gear of  
spool

17. After replacement, hit the axles in the Ceiling Hoist as *Figure 18* with a nylon hammer.
18. Assemble the Ceiling Hoist vice versa. Add Loctite 243 (2x) on bolt 2 of *Figure 21*.
19. Lubricate the gears before the batteries are placed back (point 6). Place the Lifting Tape back on the spool (*chapter 7.6*). Roll the tape on the spool trough the Handset.

## 7.11. Replacing Circuit Board (+ diagram) (AR-200)

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers.
3. Connect the Hand Control to the Ceiling Hoist.
4. Read parameters 1, 2 and 7 (*chapter 8*). Make record of the number of cycles (*chapter 8.1*) and the programming date.
5. Turn off the Ceiling Hoist.
6. Disconnect a Battery terminal to ensure that the Ceiling Hoist is turned off.
7. Remove the 4 nylon screws from the circuit board (*Philips PH-1x80*).
8. Disconnect the wiring from the circuit board one at a time and immediately move them to the new circuit board.
9. Install the new circuit board. Slowly tighten the nylon screws to avoid stripping away the threading.



**Inspection:** Test the operation of the Ceiling Hoist.

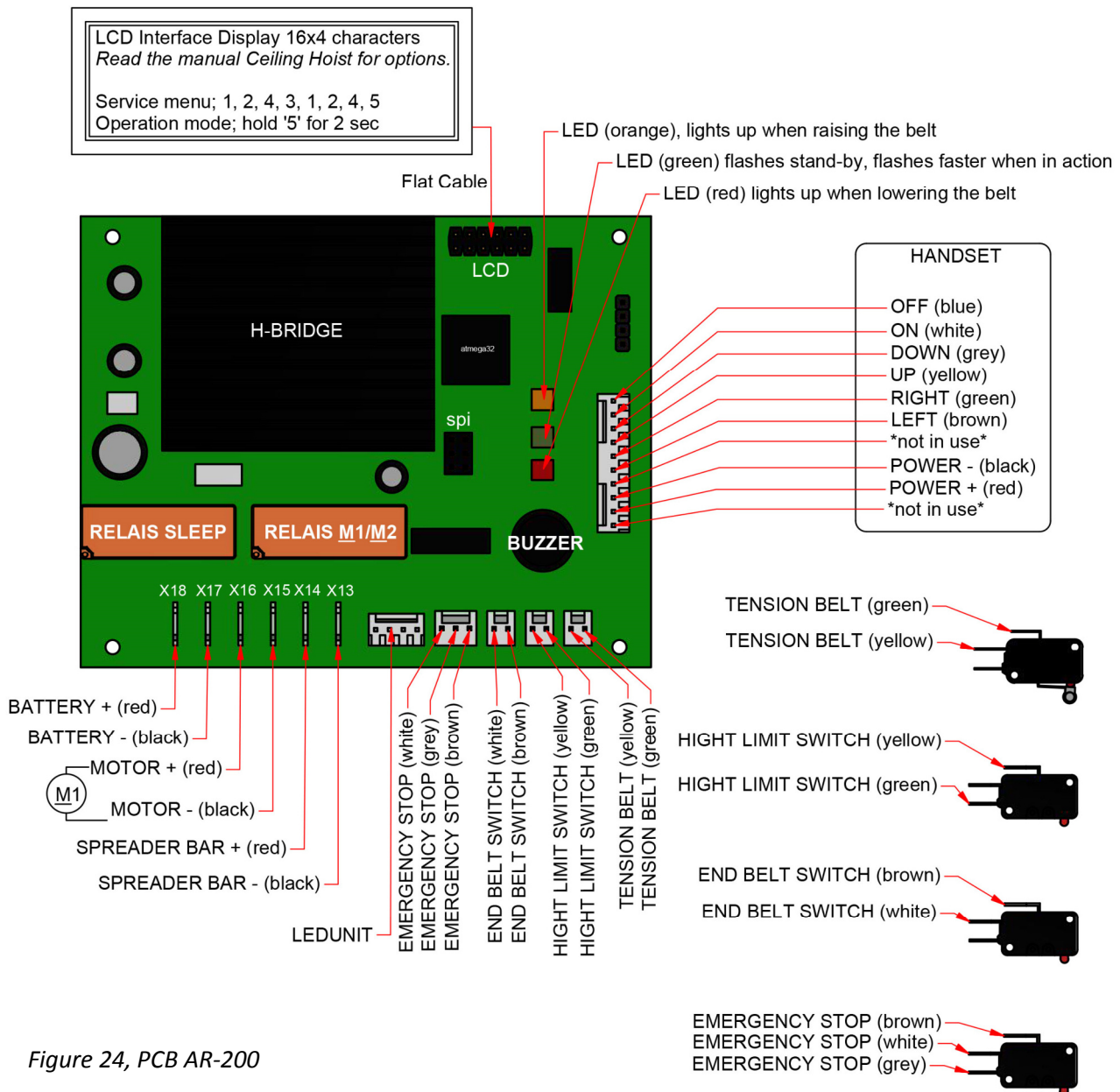


Figure 24, PCB AR-200

## 7.12. Replacing Circuit Board (+ diagram) (AR-260 and AR-350)

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers.
3. Connect the Hand Control to the Ceiling Hoist.
4. Read parameters 1, 2 and 7 (*chapter 8*). Make record of the number of cycles (*chapter 8.1*) and the programming date.
5. Turn off the Ceiling Hoist.
6. Disconnect a Battery terminal to ensure that the Ceiling Hoist is turned off.
7. Remove the 4 nylon screws from the circuit board (*Philips PH-1x80*).
8. Disconnect the wiring from the circuit board one at a time and immediately move them to the new circuit board.
9. Install the new circuit board. Slowly tighten the nylon screws to avoid stripping away the threading.



**Inspection:** Test the operation of the Ceiling Hoist.

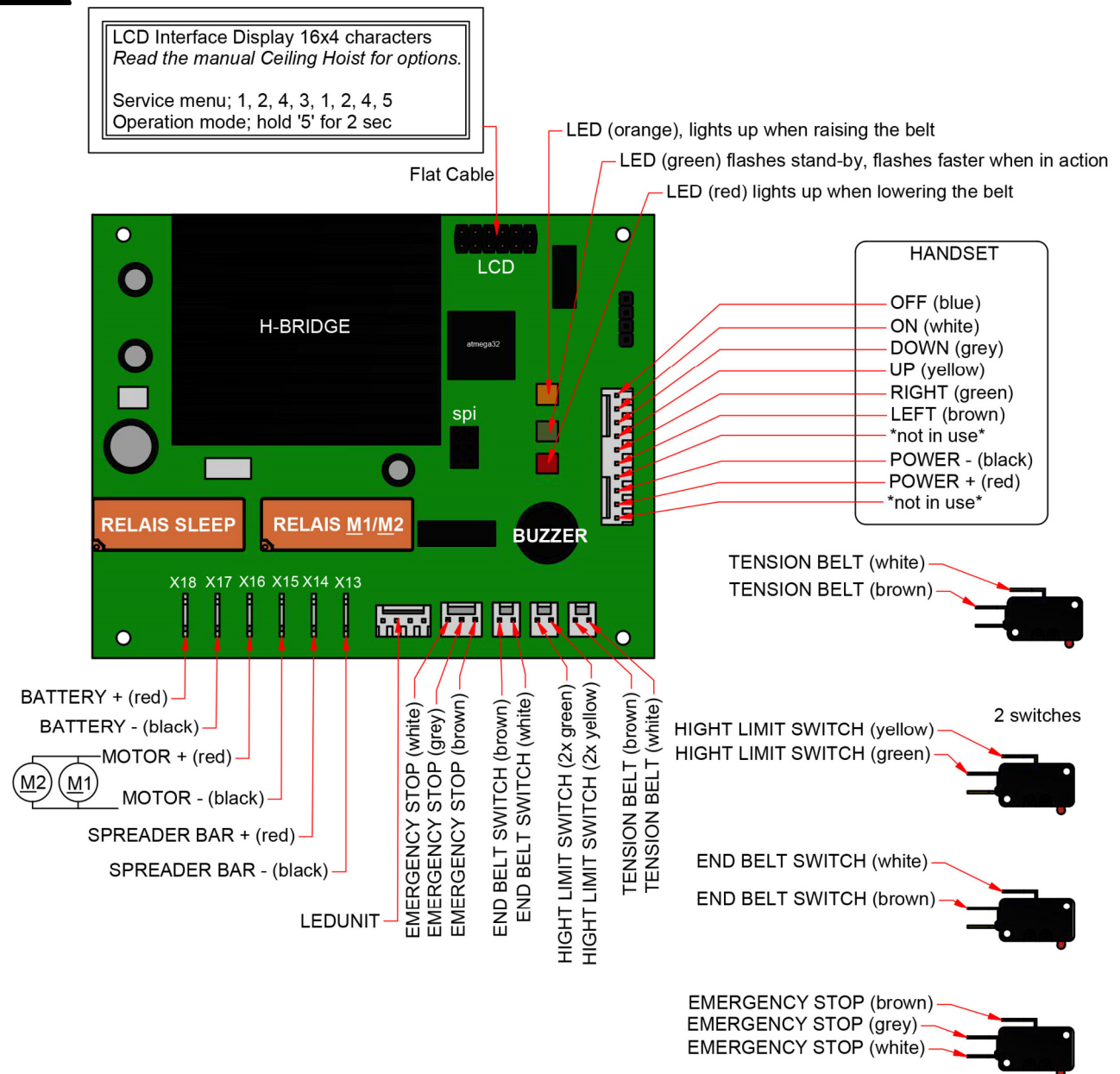


Figure 25, diagram PCB AR-260 and AR-350

### 7.13. Replacing Emergency stop Cord (AR-200, AR-260 and AR-350)

---

The Emergency stop Cord is attached with a tie-wrap. It is in all the Ceiling Hoists located behind Battery 2.

1. Remove Battery 2. Follow the steps in *chapter 7.3*.
2. Cut the tie-wrap off the Emergency stop Cord.
3. Place the new Emergency stop Cord 2 cm into the hole.
4. Place a tie-wrap as shown in *Figure 26*.
5. Install Battery 2 and covers after testing the new Cord.



Figure 26, Replacing emergency stop cord.



**Inspection:** Test the operation of the Emergency stop Cord.

### 7.14. Operation of Electrical Spreader Bar

---

1. Remove the Ceiling Hoist from the rail and place it where you can safely carry out repairs.
2. Remove both covers (*chapter 7.1*) and Battery 2 of the AR-200 and both Batteries of the AR-260 and AR-350.

*AR-200; If step 5 fails, Remove the bottom plate and the bottom 2 screws from the circuit plate for convenience.*

*AR-260 and AR-350; If step 5 fails, remove the bottom plate for convenience.*

3. Press the Cord of the Spreader Bar through the hole of the bottom plate of the Ceiling Hoist.
4. Guide the Cord to the Circuit Board.
5. Assemble the discharge plate across the Cord as shown in *Figure 27 (Hex 3)*. *Installation is possible using a perpendicular hex key.*
6. Connect the 2 contacts to the Circuit Board *Figure 24 and Figure 25*).
7. After check; install and connect the Batteries, place the covers.

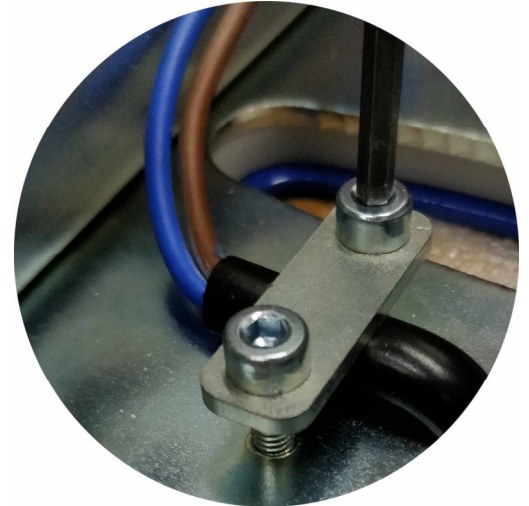


Figure 27, discharge plate Spreader Bar cord



**Note!** Ensure that the Spreader Bar Cord is away from moving components. For the AR-200, ensure that the wires of Battery 2 are on the inside of the top plate of the Ceiling Hoist during installation.



**Inspection:** pull on the Cord and check whether it is attached. Test the electric tilting Spreader Bar and whether it functions properly.

## 8. Reading and changing parameters

The Ceiling Hoist will be configured in the factory. Parameters can be read and changed. We as PLS recommend changing as little parameters as possible to avoid errors in the operation.

### 8.1. Reading Ceiling Hoist and changing parameters

The following settings can be read and changed:

Reading	Changing	Default
Cycle counter Motor 1 (main drive)	Bedroom mode	Off
Cycle counter Motor 2 (Spreader Bar motor)	Max. power consumption Motor 1 (up)	AR-200: 11000 AR-260: 15000 AR-350: 18000
Current Battery Voltage	Max. power consumption Motor 1 (down)	11000
Current power consumption Motor 1	Max. power consumption Motor 2 (left)	4000
Current power consumption Motor 2	Max. power consumption Motor 2 (Right)	5000
Software version	Power saving mode	On
Programming date		

### 8.2. Operation Mode

The settings of the Ceiling Hoist can be changed by connecting the Programming Box to the Circuit Board.

1. Turn the Ceiling Hoist off.
2. If the Ceiling Hoist has not yet been opened, remove the bottom cover (*chapter 3.1*).
3. Connect the Programming Box to the Circuit Board (*Figure 24 and Figure 28*).
4. Connect the Hand Control to the Ceiling Hoist.
5. Activate the Ceiling Hoist.
6. Hold the **'down'** and **'left'** simultaneously for 3 seconds to go, via Password Mode, to Service Menu.

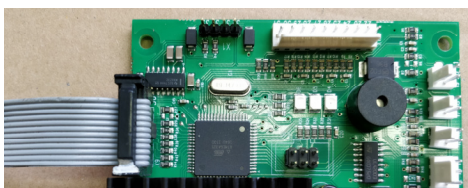


Figure 28, programming box connection

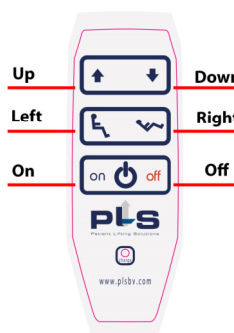


Figure 29, 2017 Hand control

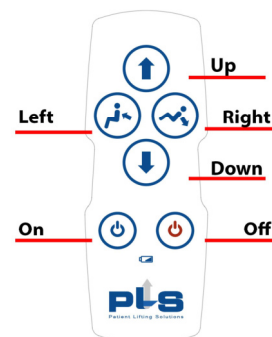


Figure 30, PLS Hand Control

The display of the Programming Box shows the following:

P	L	S		T	i	l	l	i	f	t		1	0	0	%	/	/	/	/	
C	u	r		M	1		=					0							m	A
C	u	r		M	2		=					0							m	A

- PLS tillift = manufacturer and product name (tillift = Ceiling Hoist in Dutch)  
 100% = Battery status  
 Cur M1 = number of milliamperes used by Motor 1 at that moment.  
 Cur M2 = number of milliamperes used by Motor 2 at that moment.

### 8.3. Password Mode

Password Mode gives access to the Service Menu. The Hand Control buttons now act as numbers used to enter the password.

1. Enter the password:  
1, 2, 4, 3, 1, 2, 4, 5
2. You are now in the Service Menu (Chapter 8.4).

There is no need, as long the Ceiling Hoist is on, to enter the password again.

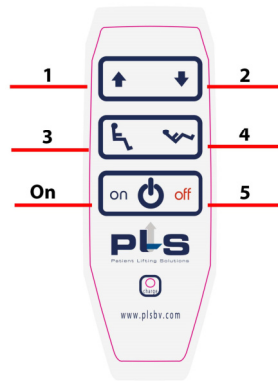


Figure 32, 2017 Hand Control

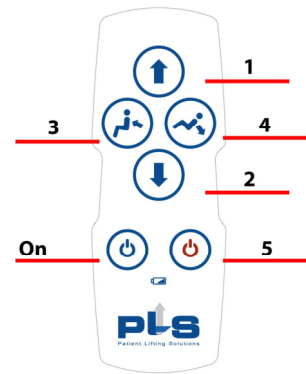


Figure 31, PLS Hand Control

### 8.4. Service Menu

1. Use the 'up' or 'down' button to select the Read Menu or (reading parameters) Edit Menu (changing settings).
2. Press 'Enter' to enter the menu.
3. Once in the Edit Menu or Read menu, return to the Service Menu by pressing 'Enter'.



Figure 33, 2017 Hand Control

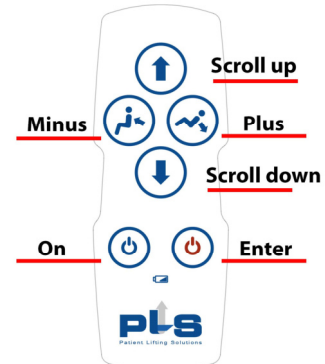


Figure 34, PLS Hand Control

S	e	r	v	i	c	e	M	e	n	u								P	L	S
R	e	a	d	M	e	n	u	<	-											
E	d	i	t	M	e	n	u													

- Service Menu = you are now in the Service Menu.
- Read Menu = Menu to read the parameters of the Ceiling Hoist.
- Edit Menu = Menu to change the settings of the Ceiling Hoist.
- <- = Option arrow.

## 8.5. Read Menu

1. Choose the desired button using the '**up**' and/or '**down**' buttons
2. Press '**Enter**' shortly.
3. You are now in the chosen parameter.
4. Press '**Enter**' to go back to Service Menu.

The following parameters can be read in the Read Menu:

Number	Parameter	Explanation
1	Cycle Counter M1	Cycle counter Motor 1 (main drive)
2	Cycle Counter M2	Cycle counter Motor 2 (Spreader Bar drive)
3	Act Battery [mV]	Current Battery voltage
4	Act Cur M1 [mA]	Current power consumption Motor 1
5	Act Cur M2 [mA]	Current power consumption Motor 2
6	Software Version	Software version
7	Program Date	Programming date

The display of the Programming Box shows the following:

R	e	a	d		M	e	n	u									P	L	S
1	.		C	y	c	l	e		C	o	u	N	t	e	r		M	1	
?	?	?	?	?	?	?	?	?											

??????? = the value of the parameter, 36 for example. This means that M1 has undergone 36 cycles.

## 8.6. Edit Menu

1. Choose the desired parameter with the buttons '**Up**' and '**Down**'.
2. Change the parameter by pressing the buttons '**Minus**' and '**Plus**'.
3. By holding '**Enter**' for 2 seconds, the settings will be saved, and you return to Operation Mode.

You can change the following parameters in the Edit Menu:

Number	Parameter	Explanation
1	Bedroom mode	Bedroom mode
2	MaxCurM1 CW [mA]	Maximum power consumption Motor 1 (up)
3	MaxCurM1 CCW [mA]	Maximum power consumption Motor 1 (down)
4	MaxCurM2 CW [mA]	Maximum power consumption Motor 2 (left)
5	MaxCurM2 CCW [mA]	Maximum power consumption Motor 2 (Right)
6	Battery Save Mode	Power saving mode
7	Bedroom mode	Bedroom mode

The display of the Programming Box shows the following with in the lowest rule the parameter:

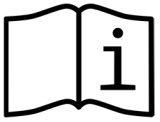
E	d	i	t		M	e	n	u										P	L	S
1	.		B	e	d	r	o	o	m		M	o	d	e						
O	N																			



Never change the Maximum power consumption of the Motors when there is no need! PLS programmed the maximum current in the PCB for that specific Ceiling Hoist. Too much current (power) results in lifting more weight by the care recipient with can be fatal for the construction.



## 9. Components



Components can be ordered using the following order numbers. Components that have been removed can be returned to the distributor or manufacturer. If you destroy components yourself, you must handle the Batteries as minor chemical waste and the electronic components in accordance with the WEEE directive.

### 9.1. Electronic components (AR-200)

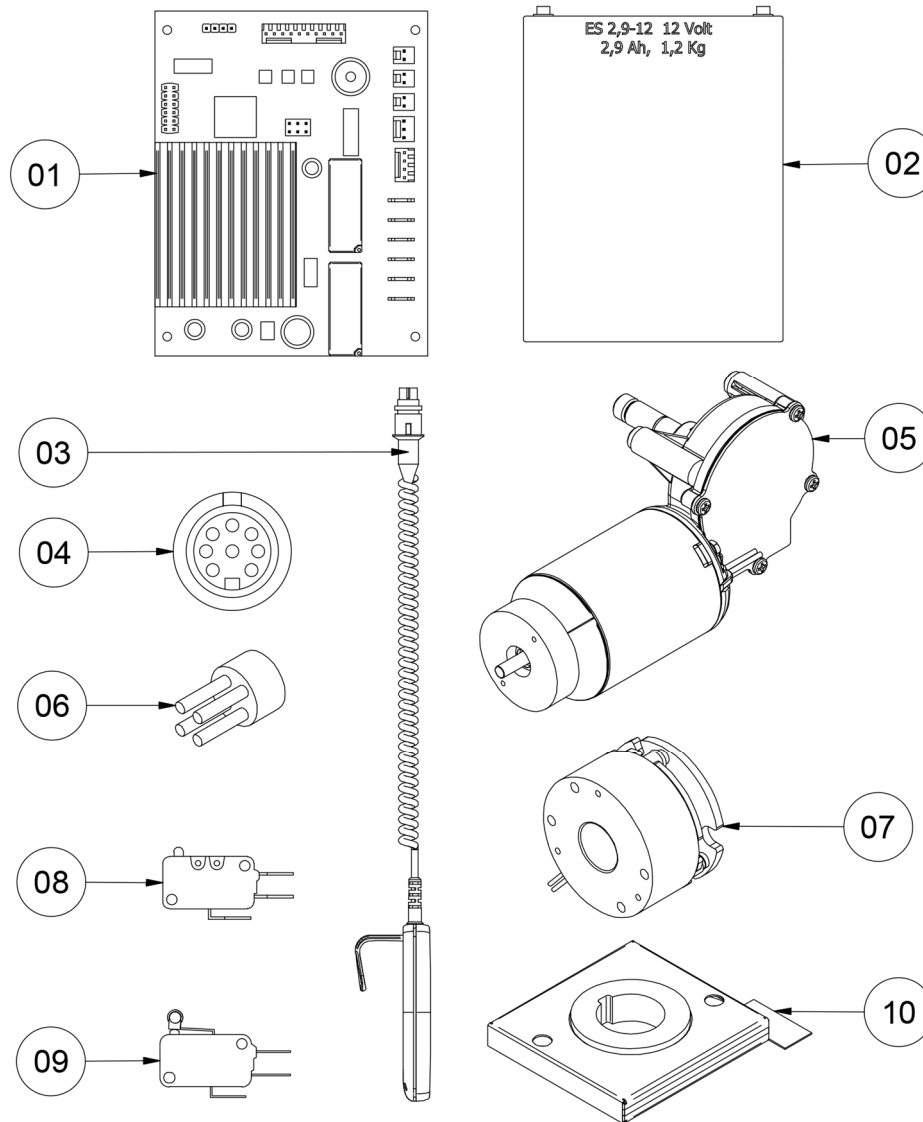


Figure 35, overview of electronic components

Number	Name	Position in AR-200	Item
01	Circuit Board (EM-319v.3)	Slide plate PCB	5247
02	Battery 12V (Wing ES 2.9-12)	Side plates	7129
03	Hand Controls with charging function	External	5017
04	Hand Control connector Female	Bottom plate	7130
05	Motor 24 VDC	Side plate Motor side	5211
06	Rectifier 2A/ 200V	Motor	5168
07	Electronic brake 457-02	Motor	7135
08	Micro Switch (D3V-16-1C5)	End of Lifting Tape turn-off, Emergency stop, height turn-off	7131
09	Roller Switch (D3V-165-1C5)	Lifting Tape tension	5609
10	LED unit	Bottom plate	5248

## 9.2. Electronic components (AR-260 and AR-350)

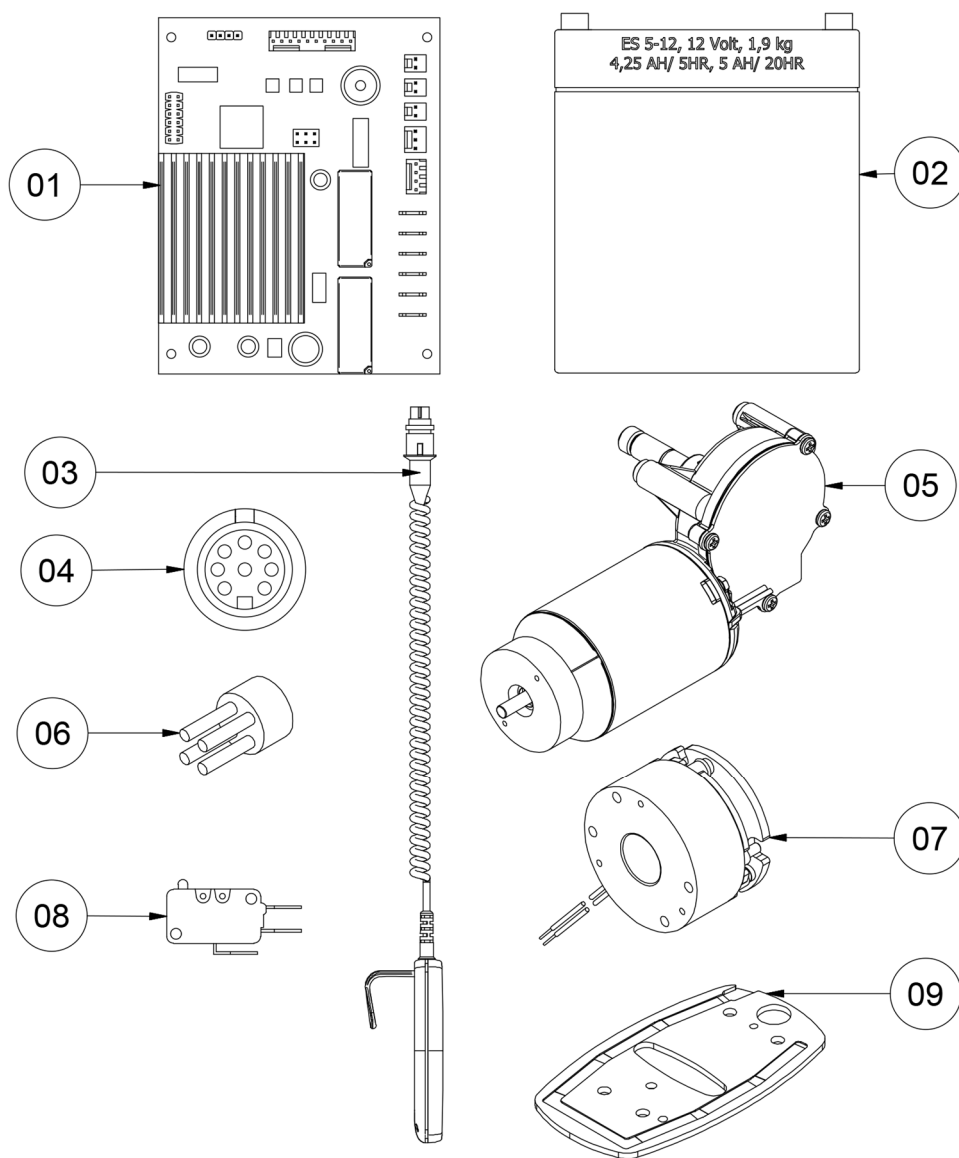


Figure 36, overview of electronic components

Number	Name	Position in AR-260	Item
01	Circuit Board (EM-319v.3)	Side plates	5247
02	Battery 12V (ES-5-12)	Side plates	5281
03	Hand Control with charging function	External	5017
04	Hand Control contact Female	Side plates	7130
05	Motor 24 VDC	Side plates	5211
06	Rectifier 2A 200V	Motor	5168
07	Electronic brake	Motor	7136
08	Micro Switch (D3V-16-1C5)	End of Lifting Tape turn-off, Emergency stop, height turn-off	7131
09	LED unit	Bottom plate	5249

### 9.3. Mechanical (wear) Components (AR-200)

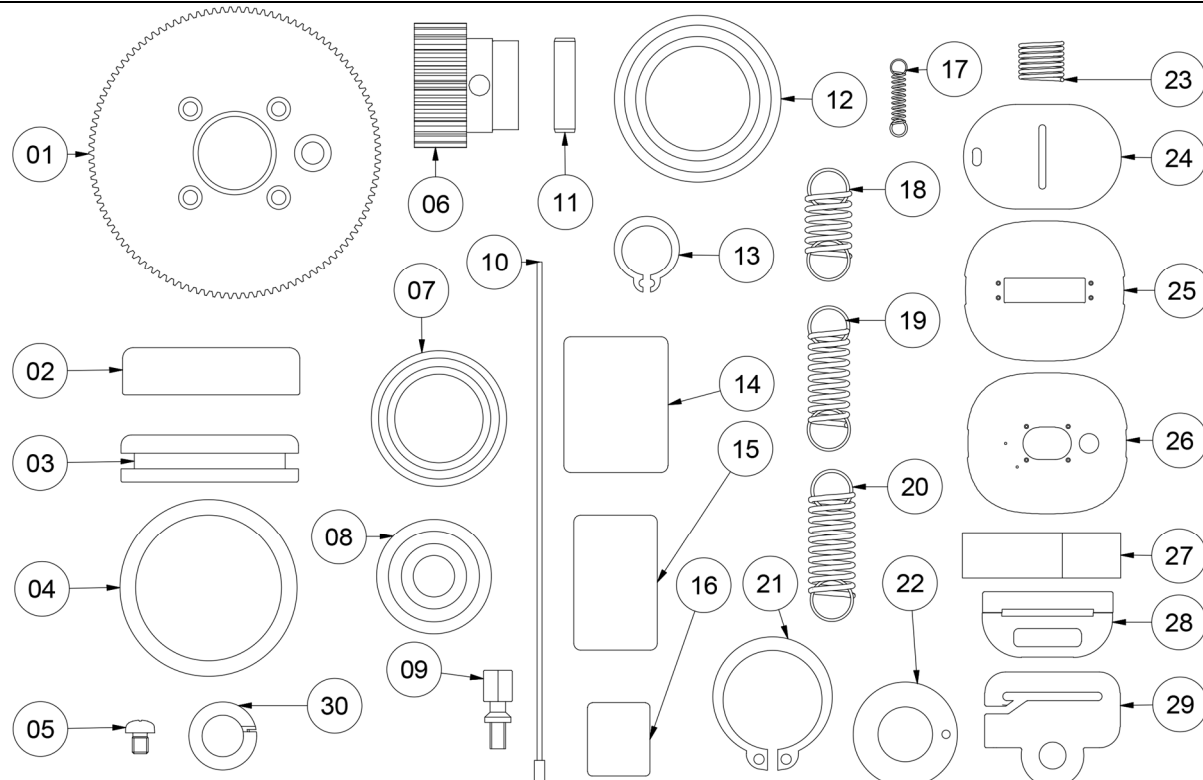


Figure 37, overview of mechanical Components

Number	Name	Position in AR-200	Item
01	Gear (Z=100 M=1.0 B=10)	Spool	7058
02	Wheel cap 34mm r2	Trolley	7005
03	Steering wheel cap 34mm	Trolley	7008
04	O-ring 28x3	Trolley	7860
05	Nylon screw (ISO 7045 - M3 x 4)	Printed Circuit Board	7051
06	Gear (Z=22 M=1.0 B=10)	Drive shaft	7057
07	Bearing (DIN 625 - 6803 2RS)	Side plates (axles)	113052
08	Bearing (DIN 625 - 608-RSH)	Trolley	5608
09	Circuit Board foot 10mm	Side plate PCB/Circuit Board	5411
10	Emergency stop Cord	Emergency stop	7029
11	Pin for gear (ISO 2338 - 4 m6 x 12)	Driveshaft	5418
12	Bearing (DIN 625 - 6804 RS)	Spool	12119
13	Circlip (DIN 471 - 10 x 1)	End of Lifting Tape turn-off, Axle Lifting Tape guide	5110
14	Needle Bearing (DIN 618 - HK2020)	Drive shaft	7055
15	Needle Bearing (DIN 618 - HK2016)	Drive shaft	7045
16	Needle Bearing (DIN 618 - HK1015)	Axle Lifting Tape guide	7053
17	Pull spring (RZ-015HI)	Spool	7025
18	Pull spring (TR540)	Lifting Tape tension	7540
19	Pull spring (TR430)	End of Lifting Tape turn-off, Emergency stop	7430
20	Pull spring (TR440)	Hand Controls lock	7440
21	Circlip (DIN 471 - 20x1.2)	Spool	7025
22	Axial Washer	Trolley	112289
23	Pressure spring (PLSRE001)	Height limit	7144
23	Height Limit Plate Blue	Height limit	7143
24	Height Limit Plate White	Height limit	7142
25	Top cover	Casing	7140
26	Bottom cover	Casing	7141
27	Lifting Tape 35mm	Spool	7116
28	Lifting Tape Block 35 mm	Lifting Tape	7001
29	Central Suspension Point (CSP)	Lifting Tape	7016
30	Nylon bearing 8mm	Side plates	7488

## 9.4. Mechanical (wear) components (AR-260 and AR-350)

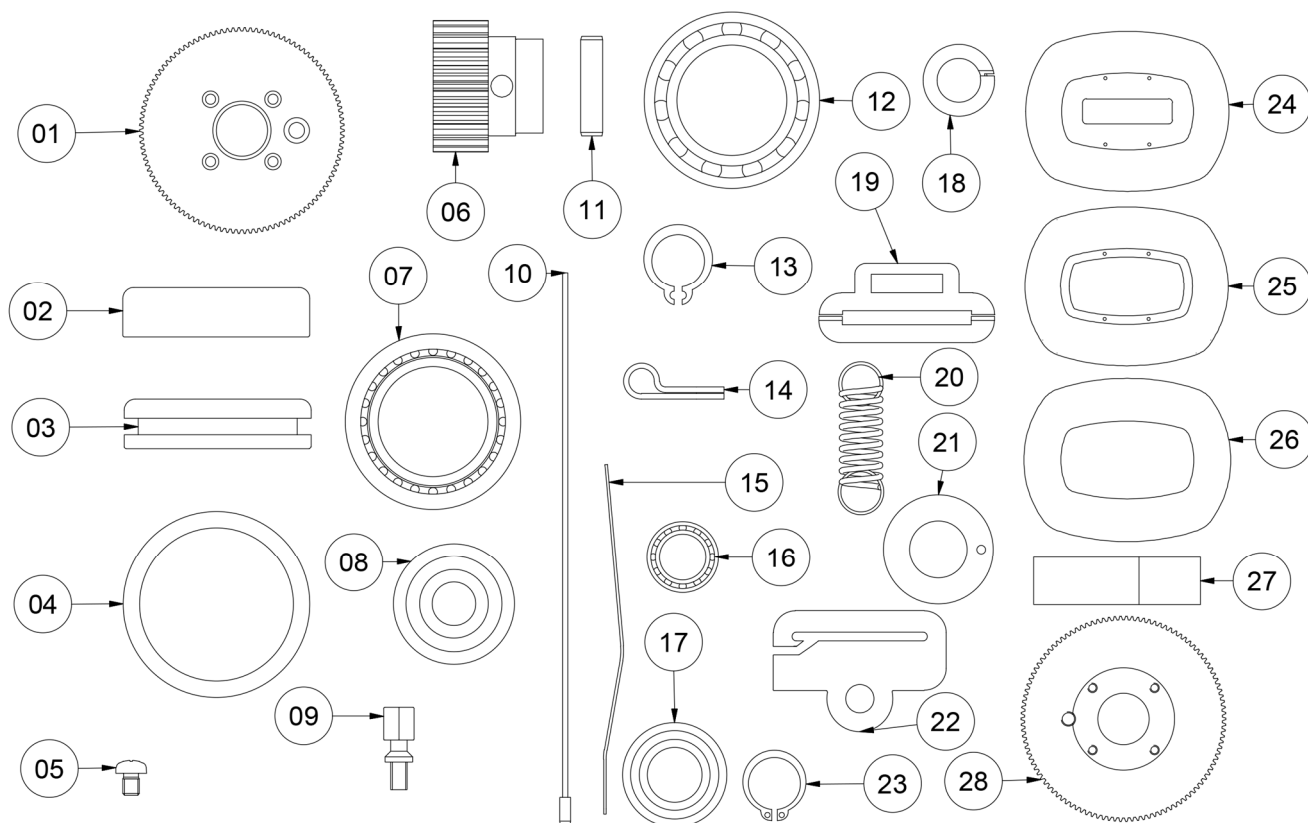


Figure 38, overview of mechanical components

Number	Name	Position in AR-260/ AR-350	Item
01	Gear (Z=100 M=1.0 B=10)	Spool	7058
02	Wheel cover 34mm r2	Trolley	7005
03	Steering wheel cover 34mm	Trolley	7008
04	O-ring 28x3	Trolley	7860
05	Nylon screw (ISO 7045 - M3 x 4)	Printed Circuit Board	7051
06	Gear (Z=22 M=1.0 B=10)	Drive shaft	7057
07	Needle bearing INA NKI 20-16 (32x32x16)	Driveshaft	7054
08	Needle bearing (DIN 625 - 608-RSH)	Trolley	5608
09	Circuit Board foot 10mm	Side plate PCB/Circuit Board	5411
10	Emergency stop Cord	Emergency stop	7029
11	Pin for gearwheel (ISO 2338 - 4 m6 x 12)	Driveshaft	5418
12	Bearing (DIN 625 - 6804-RS)	Spool	12119
13	Circlip (DIN 471 - 10 x 1)	Axle Lifting Tape guide	5110
14	P-CLIP 4.6x10x1.5	LED unit	7489
15	Flat Spring	Side plates, height turn-off	035-00
16	Bearing (DIN 625 - 6803 2RS)	Side Plates	113052
17	Bearing (DIN 625 - 6800 RS)	Axle Lifting Tape guide	61800
18	PLATE BEARING 8MM	Side plates	7488
19	Lifting Tape Block Handset 50mm	Lifting Tape	7000
20	Pull spring (TR430)	Lifting Tape Limit, Emergency stop, Tape Tension	7430
21	Axial Washer	Trolley	112289
22	Central Suspension Point (CSP)	Lifting Tape	7002
23	Circlip (DIN 471 - 20x1.2)	Spool	7025
24	Top cover AR-260	Casing	7240
25	Top cover AR-350	Casing	7242
26	Bottom cover AR-260/AR-350	Casing	7241
27	Lifting Tape 50mm	Spool	7115
28	Gear (Z=100 M=1.0 B=10)	Spool	7063

## 10. Annex

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Warranty provisions, about the manufacturer, contact details and the maintenance and inspection form.

### 10.1. Warranty provisions

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PLS BV grants 2 years of warranty on the Rail Components. PLS BV does not grant warranty on components that are prone to wear and tear such as wheels and bearings.

The warranty does not apply to damage or defects of Rail Components resulting from wrong or improper use and from repairs carried out by persons who are not demonstrably authorised to do so. This will be assessed by PLS BV or the distributor.

PLS BV reserves the right to make changes to the product, deviating from what is described in this manual. This is not accountable.

If changes are so significant that the function, operation and form changes to the extent the user can or may no longer use the Rail Component without further instructions, PLS BV will inform the distributor through a refreshed documentation package. The distributor is responsible for providing this information to the user.

### 10.2. About Patient Lifting Solutions B.V.

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Patient Lifting Solutions B.V. (PLS BV) designs, develops and manufactures Ceiling Hoist Solutions for the healthcare sector. A reliable hoisting system can be created for each ceiling and in all situations. PLS BV aims to offer a user-friendly and high-quality Ceiling Hoist System.

The products of PLS BV are manufactured in the Netherlands and distributed by your local distributor.

### 10.3. Contact details Patient Lifting Solutions B.V.

---

Patient Lifting Solutions B.V.  
Barneveldsestraat 26a  
3927 CC Renswoude  
Netherlands

Email: [info@plsbv.com](mailto:info@plsbv.com)  
Web: [www.plsbv.com](http://www.plsbv.com)  
Tel: +31 (0)318 57 66 68



## 10.4. Inspection and maintenance form PLS Ceiling Hoists

In accordance with NEN-EN-ISO 10535:2006

Name of institute					Date								
Address					Time								
Postal code													
Place					Serial Number								
Contact person					Article/ item code								
Department													
Phone no.					Form Number								
<i>Good, Repairs, Replacement.</i>					<i>Good, Repairs, Replacement.</i>								
Inspection point				G	R	Re	Inspection point				G	R	Re
Wall Charger and Hand Control?							Mechanical inspection (confirmations and general condition)						
Documentation package							Wall/ceiling mount(s)?						
(Short) Manual present?							Trolley on Ceiling Hoist?						
Log present?							Structure of the Ceiling Hoist?						
<i>Name, Address and Residence</i>							Spreader Bar on Central Suspension Point?						
<i>Location of use</i>							Inspection of wheelset						
<i>Serial and type number</i>							Mounting of the Trolley?						
<i>Brand and type version</i>							Mobility by rail(s)?						
<i>Construction year</i>							Wheel rotation?						
<i>Overview of performed inspections and name of inspector(s).</i>							Wear of the wheels?						
<i>Overview of maintenance and repairs with the name of the maintenance technician/service-technician.</i>							Noise produced by rail(s)						
Weight test							Electrical installation						
Visual inspection (broken and damage)							Plugs/connectors?						
Hand Control and use?							Wiring?						
Lifting Tape tension?							Charger?						
Height limit?							Batteries (12 volt, 2.9Ah) / (12 volt, 5Ah)?						
End Lifting Tape?							Motor(s)?						
Emergency stop/ emergency drop feature?							Emergency lowering feature>						
LED unit (Green, orange and red)?							Lifting Tape						
Label present/readable?							Stitching?						
Welded joints?							Damage/wear?						
Corrosion?							Bearings?						
Gear wheels?							Lubrication of the gear wheels?						
Product adjustment(s), not corresponding to factory specification? <b>G</b> = no, <b>R</b> = yes (Mark if present).													
Lift cycles							Used materials:						
Measured Battery voltage													
Weight test; only on Central Suspension Point. A Spreader Bar/Lifting Tape can have different specifications.													
Date replacement of Lifting Tape?													
Name of technician													
Time of arrival:													
Time of departure:													
Hours worked:													
Notes/observation/ signature of technician;													