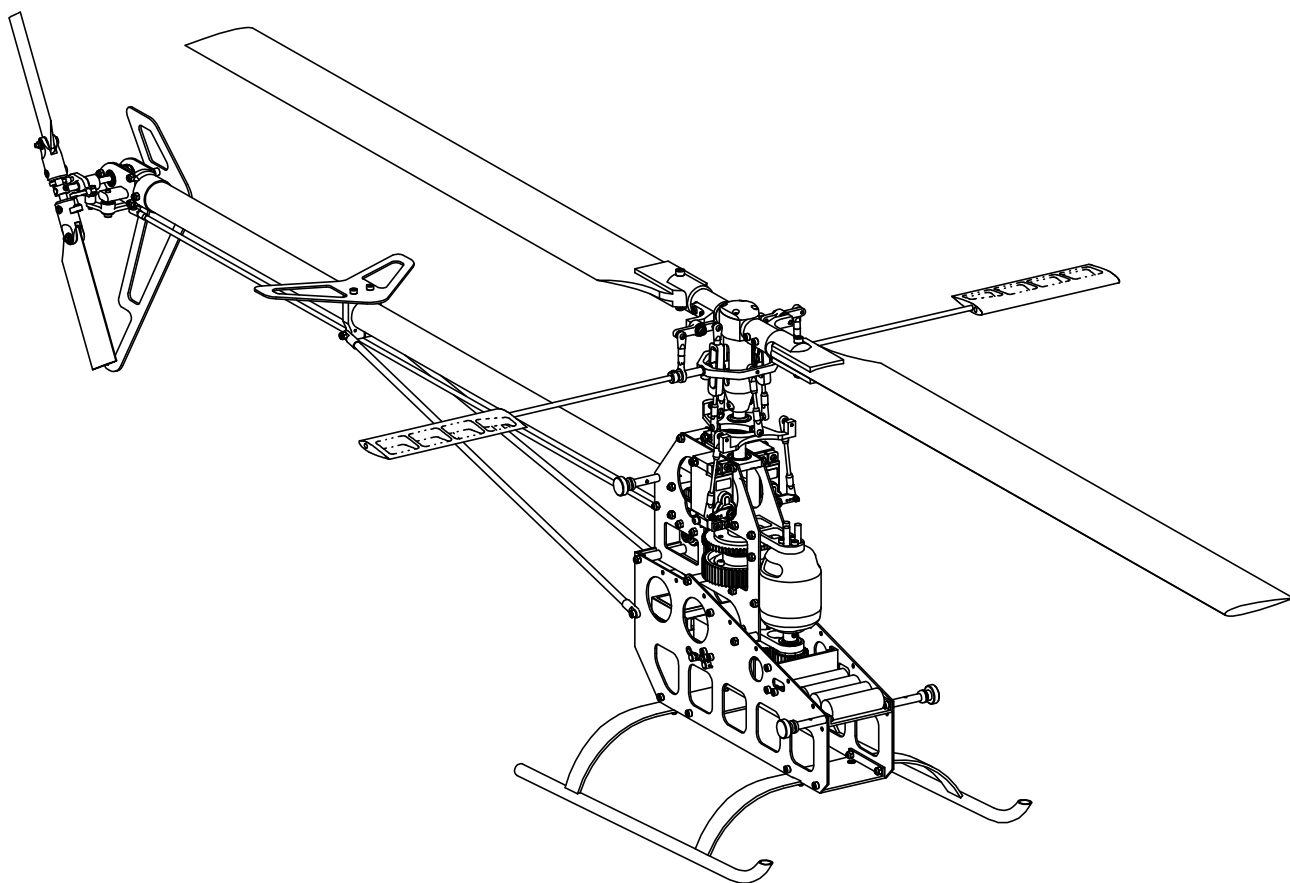


JOKER CX

Ord.-No. 2000
manual



minicopter

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34246 Vellmar

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www.minicopter.de

Version 10
Date: 16.09.03

minicopter

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Congratulations for the purchase of your *Joker* - helicopter.

With this model you have a long-life product in your hands, which is manufactured to the highest quality standards. So flying and servicing will give you a great deal of fun for a long time.

The manual contains many detailed graphics so that you should have no problems when building the helicopter. Please take a little time to study the manual before beginning. Then you get an overview of the building process.

The kit contains some hexagon wrenches. Additionally you need the following tools:

Tools:

socket wrenches with grip for nuts 5,5 and 7 mm with a thin outer diameter.

open wrench 4,5/5,5 mm

hexagon wrenches with axial grip 2/2,5/3 mm

hexagon wrench with cross grip 4 mm (2 parts for feathering spindle)

sharp tongs with 45° cranked head

Phillips screwdriver small

screwdriver flat

screw lock (for example Loctite 243 blue)

Special Tools:

ball joint tongs f.e. Robbe S 1360

pitch gauge f.e. Robbe S1366

paddle gauge f.e. Robbe S1368

Lubricants:

axial bearings: normal machine lubricant (from toolmarket)

autorotation coupling: synthetic motor oil

The gear wheels don't use lubricant.

Recommended RC-equipment:

receiver: PCM-system with 10bit and double superhet

RC-battery: 4 cells Sanyo KR 1400AE

swash-plate servos: Futaba S9202 or better

gyro: Futaba GY 401 with servo S9253

interference elimination filter between receiver and controller

If you have problems when building your model please e-mail us. We help you!

And now: Much fun by building your *Joker* !

Safety rules:

Radio controlled helicopters are **not toys**. The wrong use of such models can cause accidents with serious injuries.

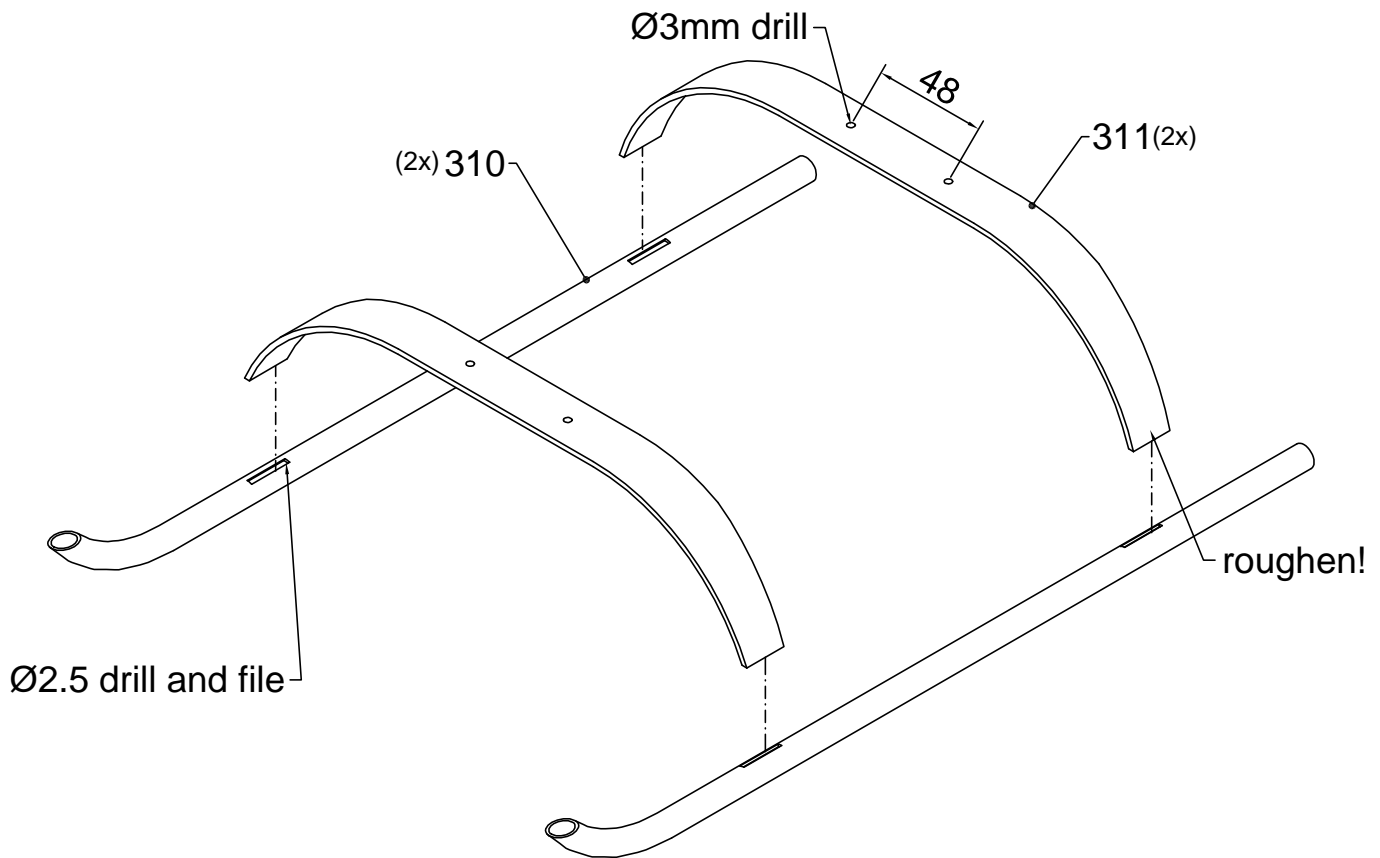
Therefore please bear the following rules in mind:

- For engine running tests on your workbench remove the complete mainrotor including all rods and the tailrotor blades. Make sure that nothing can come in contact with the tailrotor assembly.
- With an electric helicopter there is a danger of sudden engine starts. So remove the main- and tailrotor before connecting the battery packs.
- Don't switch the controller off and on suddenly when running up. Wait some seconds if retrying.
- In hovering flight please keep a distance of at least 5 metres from the helicopter.
- When flying DON'T aim at persons or other creatures and keep a safe distance of at least 20 metres.
- Don't fly in forward flight if your battery is nearly empty, if you can't autorotate in all situations. For landing calculate a safety reserve of at least 30 seconds or better one minute. Empty the battery while hovering.
- Don't empty the battery absolutely completely in hovering, otherwise the battery can be damaged.
- For the first flight a partner should tell you the flight time in intervals of 30 seconds so that you get a feeling for electric flight. After some time you feel an empty battery by giving full pitch for a moment. When the rotorspeed shuts down then you should search the ground for landing.
- Practice autorotations with running engine as soon as possible.
- When you see that a crash is unavoidable try to stop the engine before ground contact.

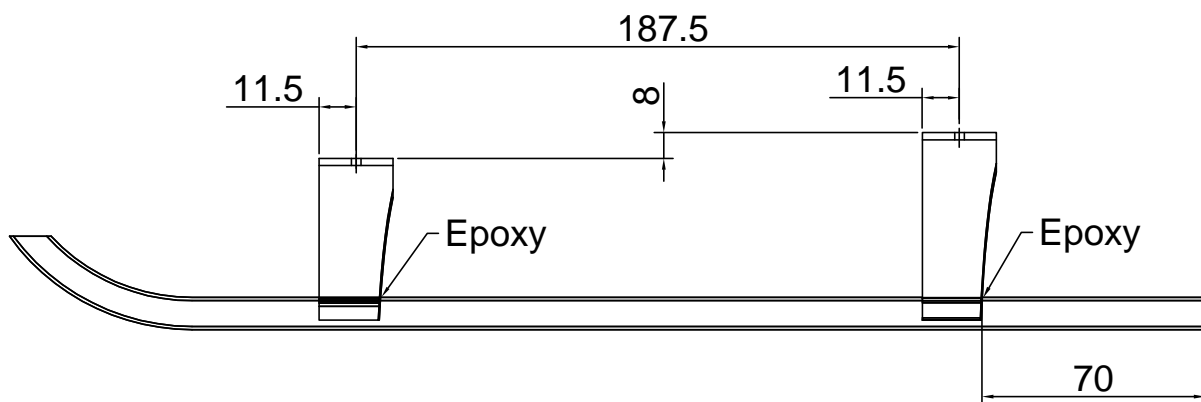
Liability exclusion:

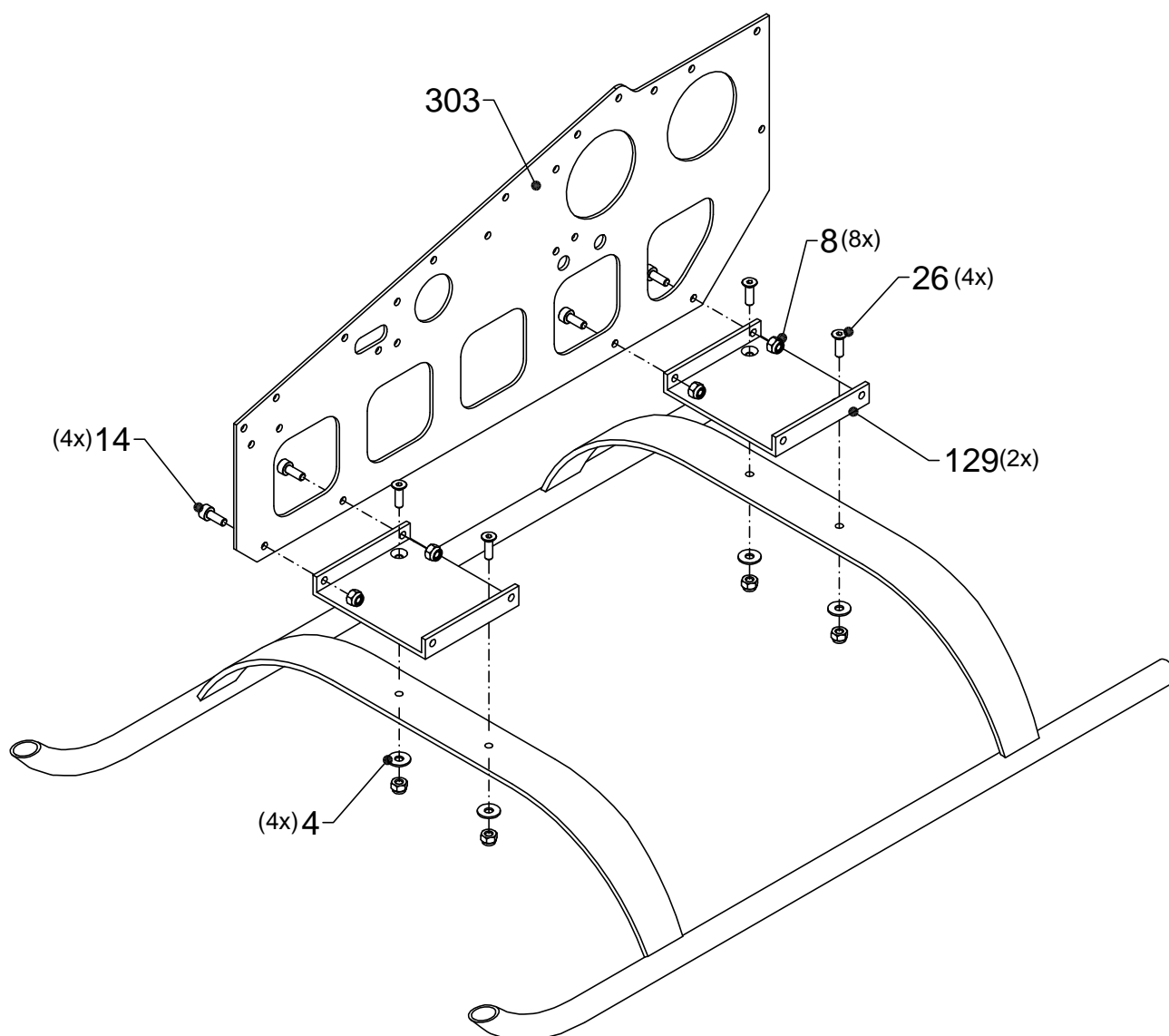
We can't check for correct building, adjustment, maintenance and usage.
So **no guarantee is possible**.

Vellmar, in november 2001

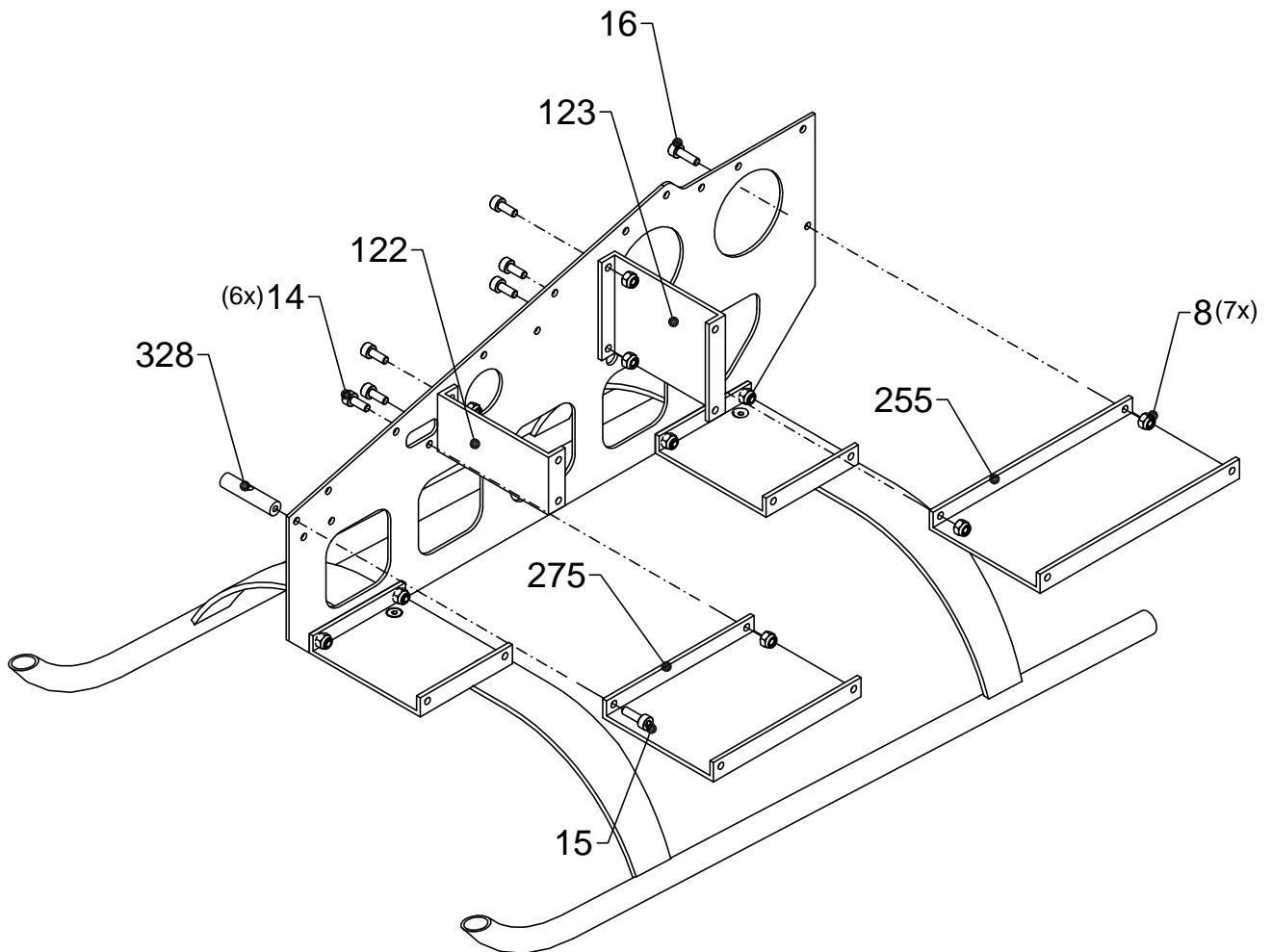


Tip: Use chassis to mark holes!

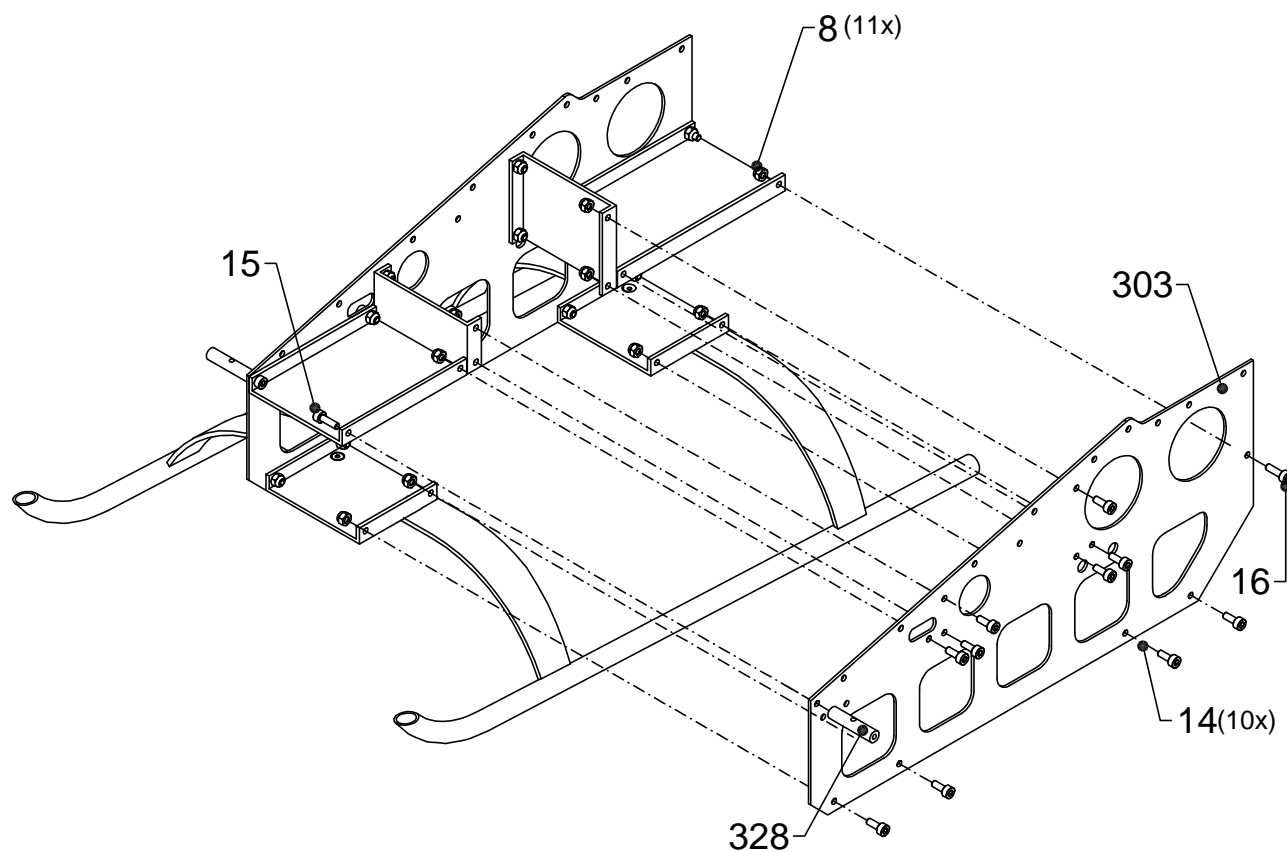




8 = nut with lock ring M3
14 = hexagon socket screw M3 x 8
26 = hexagon flat head screw M3 x 10

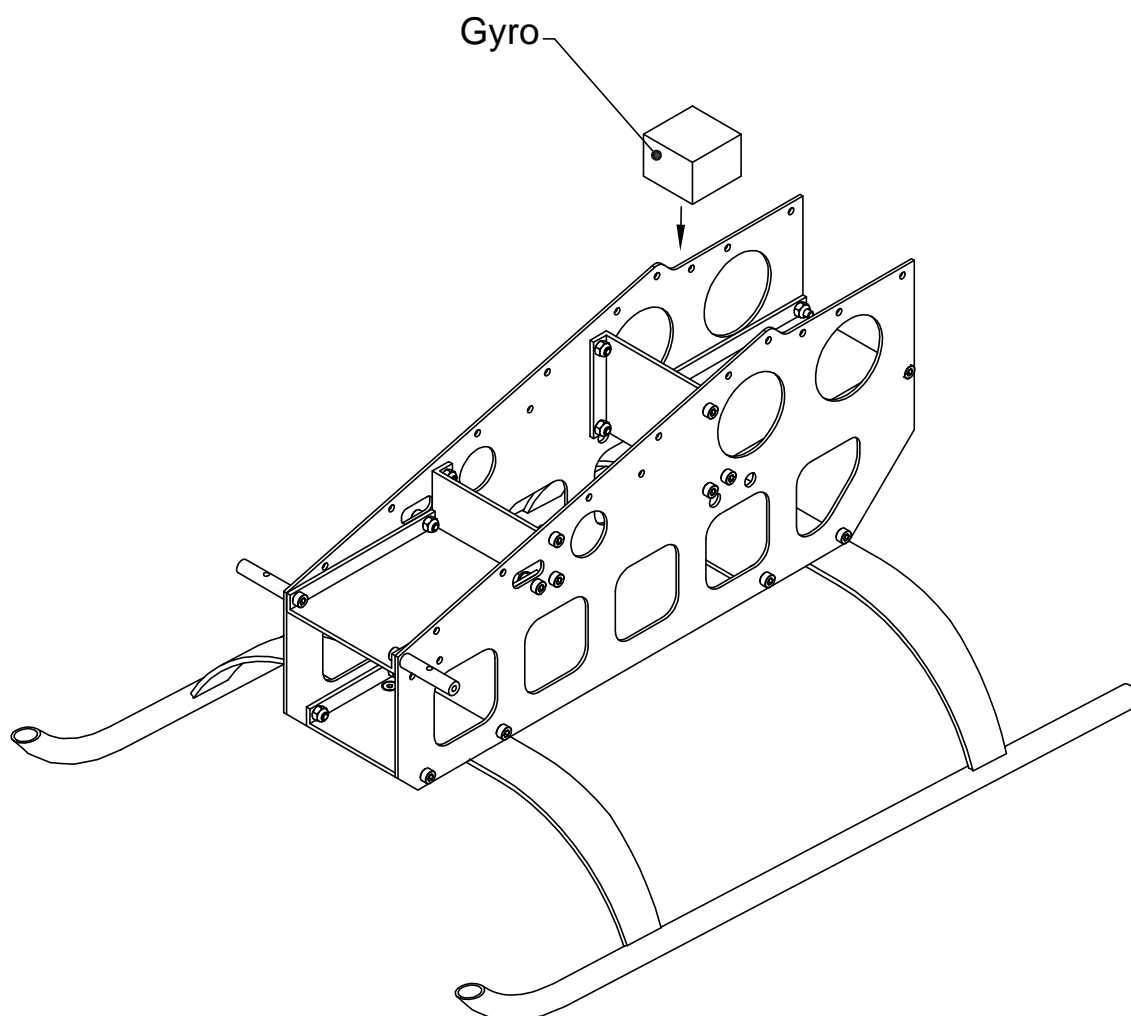


- 8 = nut with lock ring M3
14 = hexagon socket screw M3 x 8
15 = hexagon socket screw M3 x 10
16 = hexagon socket screw M3 x 12

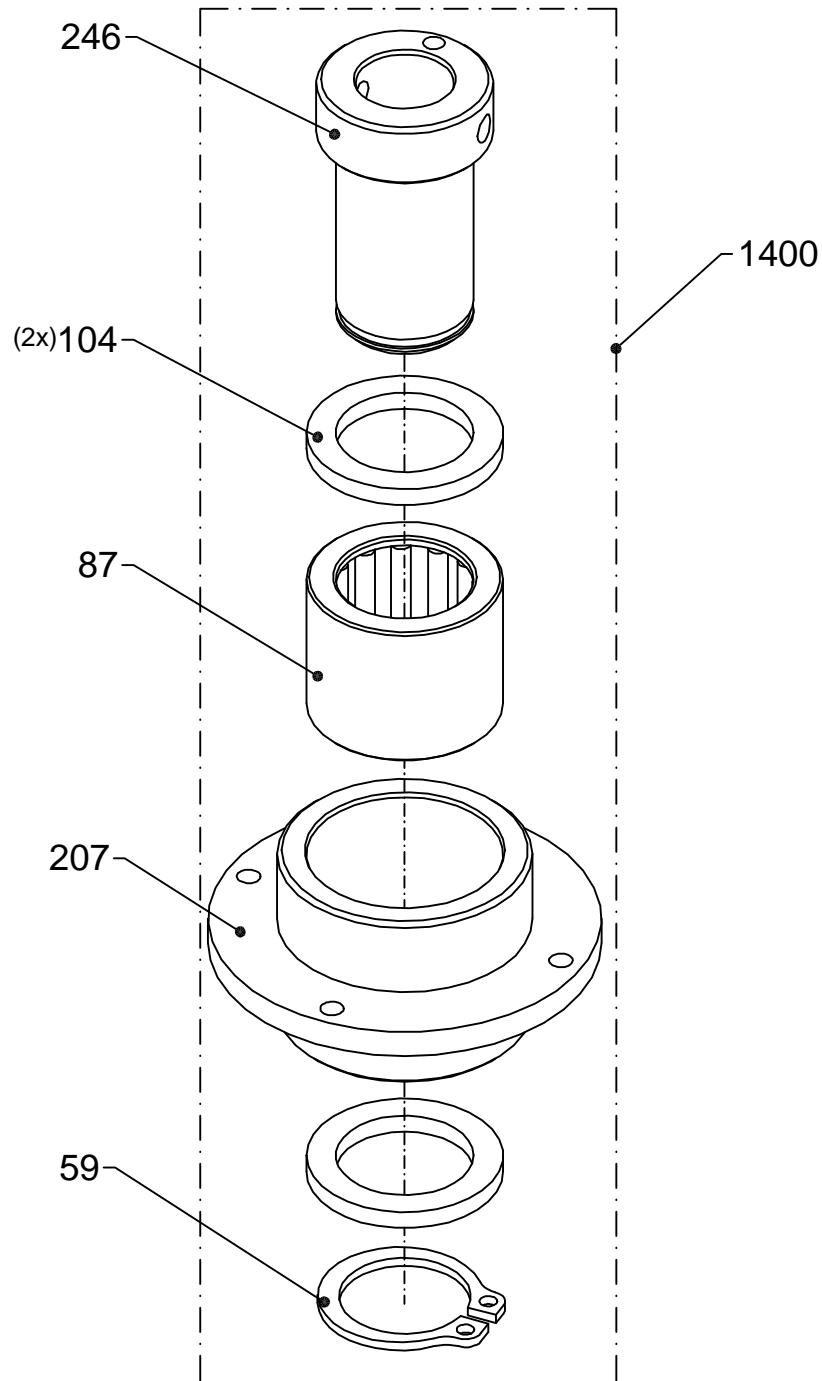


- 8 = nut with lock ring M3
- 14 = hexagon socket screw M3 x 8
- 15 = hexagon socket screw M3 x 10
- 16 = hexagon socket screw M3 x 12

4a

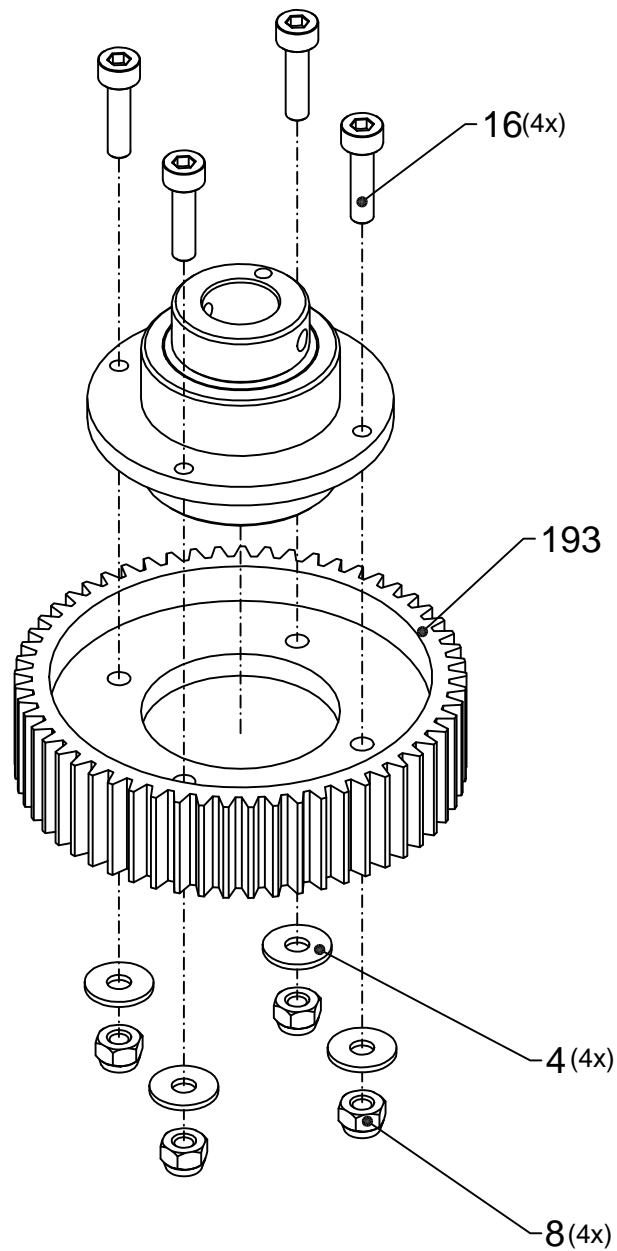


Tip: mount gyro in such position that you can use switches and potentiometers

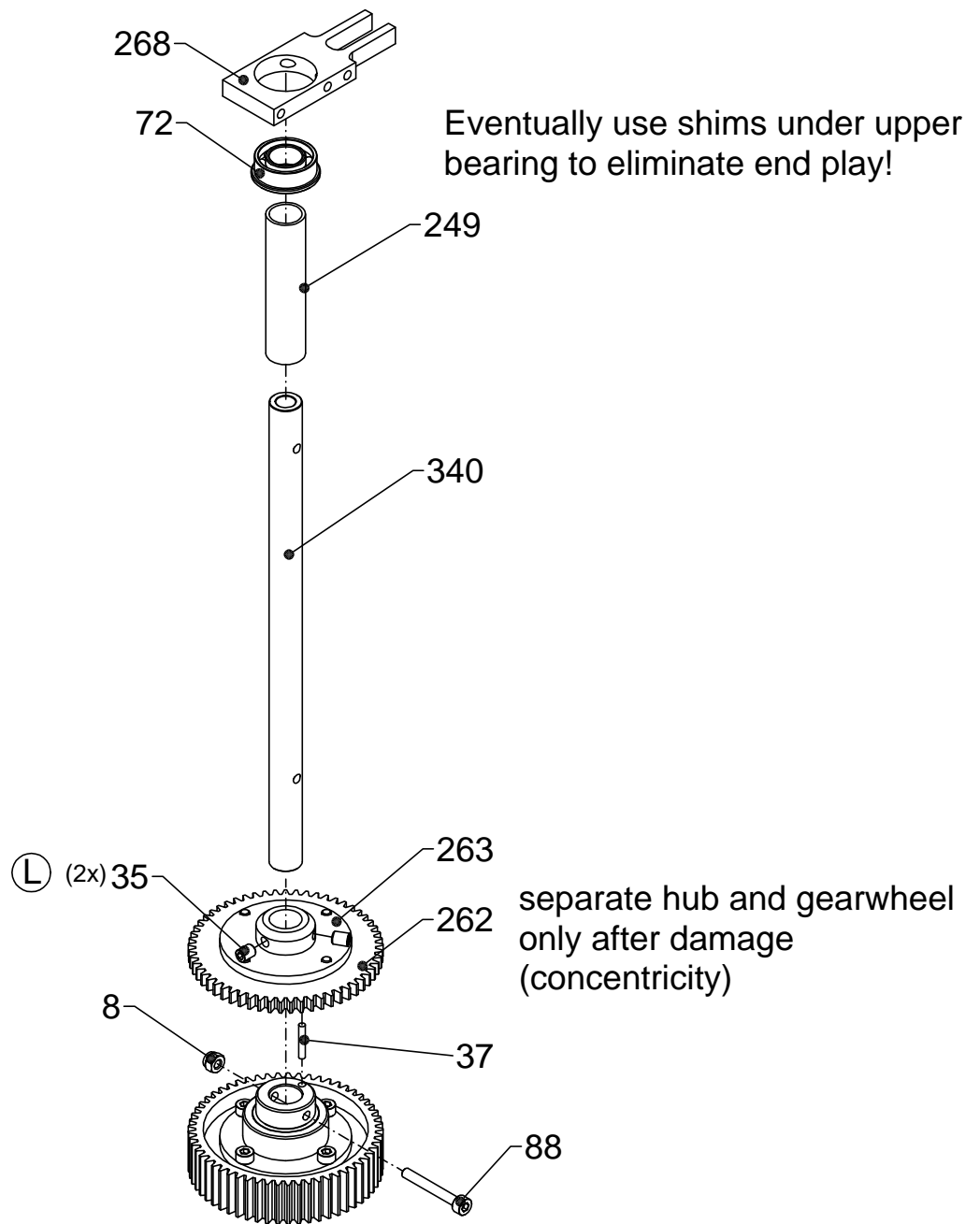


for other rotation sense turn bush No.246
(open snap ring No.59 with pliers)

Lubricate the clutch only with synthetic motor oil, never with grease!

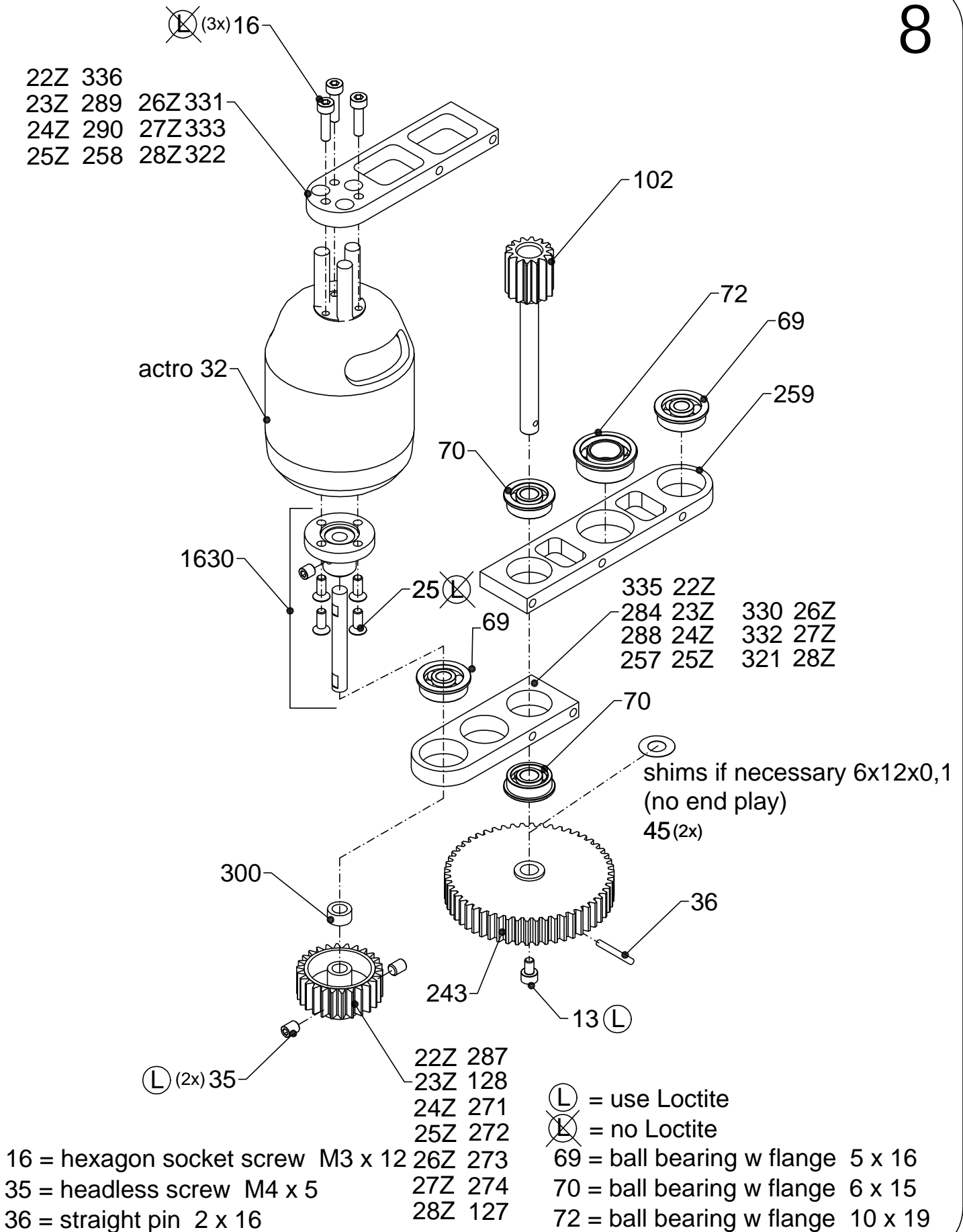


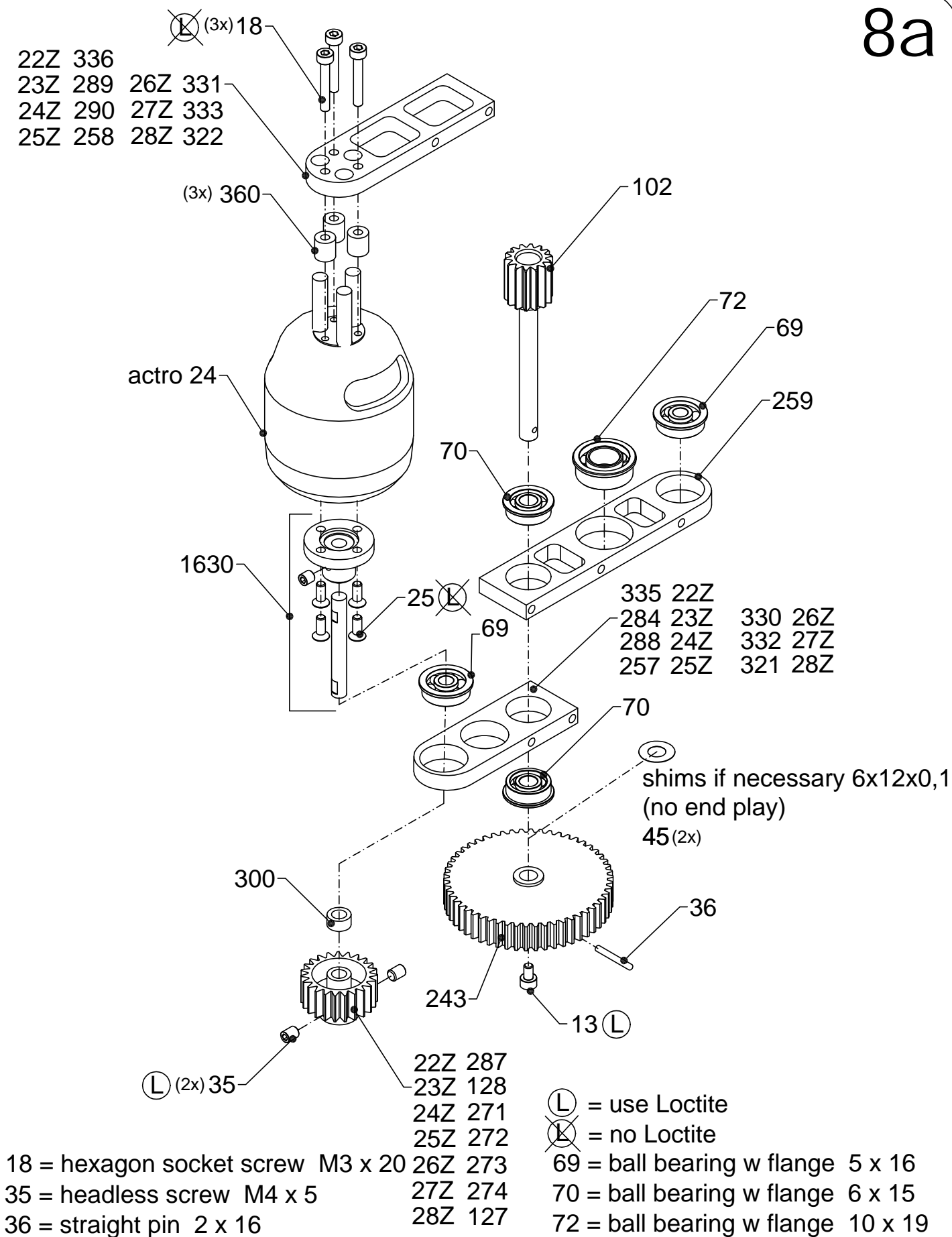
4 = washer M3 large
8 = nut with lock ring M3
16 = hexagon socket screw M3 x 12



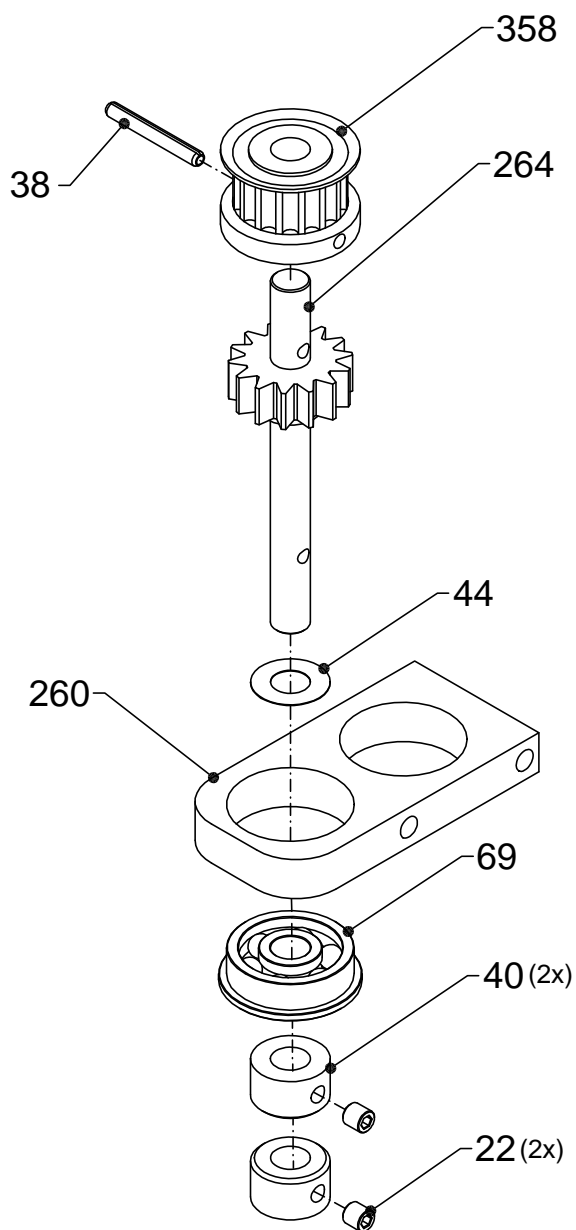
- 8 = nut with lock ring M3
 35 = headless screw M4 x 5
 37 = straight pin 2 x 8 hardened
 72 = ball bearing with flange 10 x 19
 88 = hexagon socket screw M3 x 23 special

Ⓛ = use Loctite

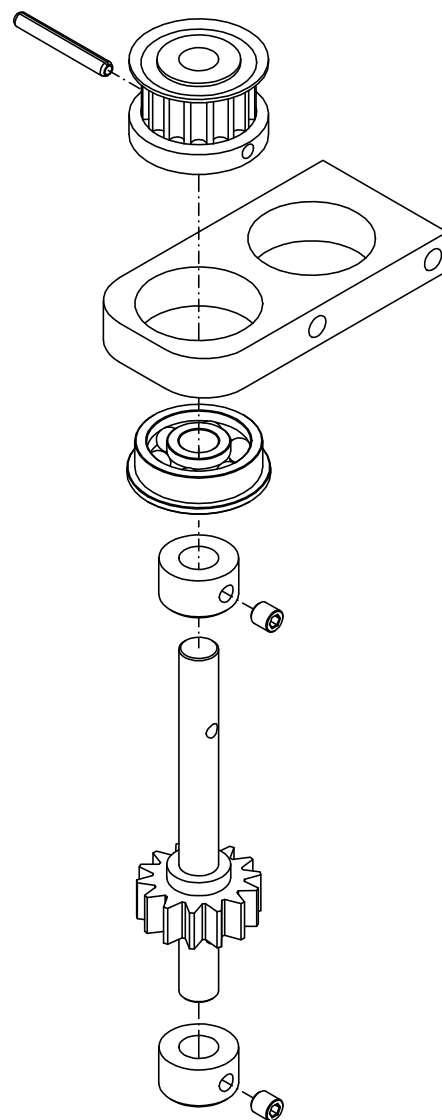




A tail rotor running in autorotation (recommended)

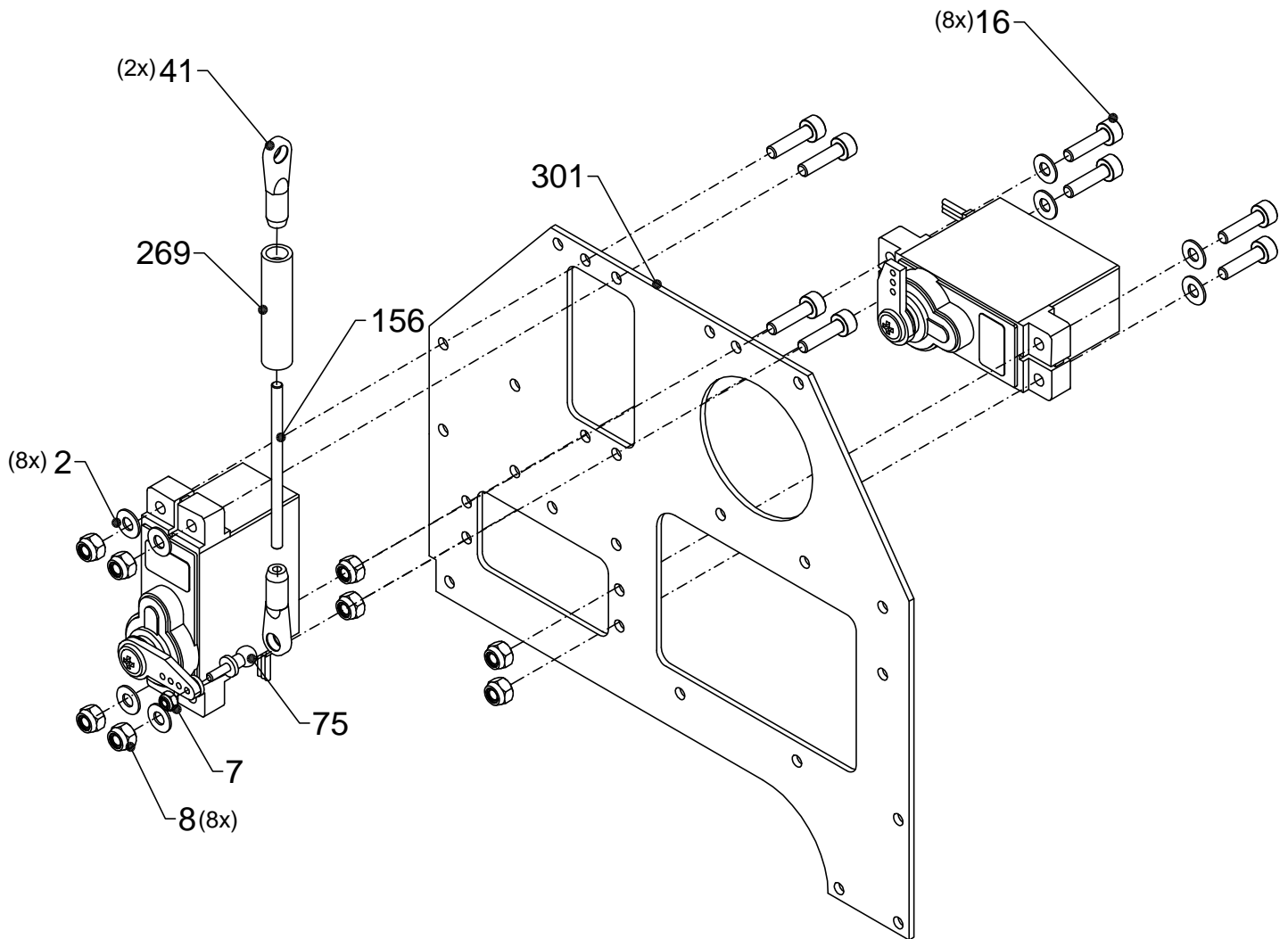


B tail rotor stationary in autorotation

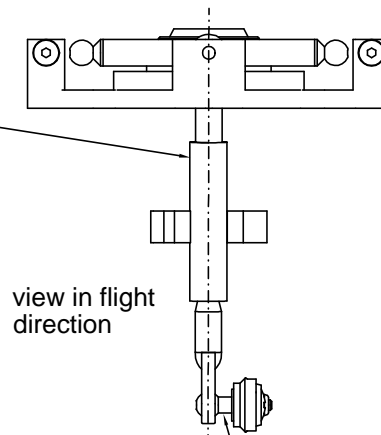


22 = headless screw M3 x 3
39 = rolled pin 2 x 14
40 = collar 5
69 = ball bearing with flange 5 x 16

44 = shim 5 x 10 x 0.1



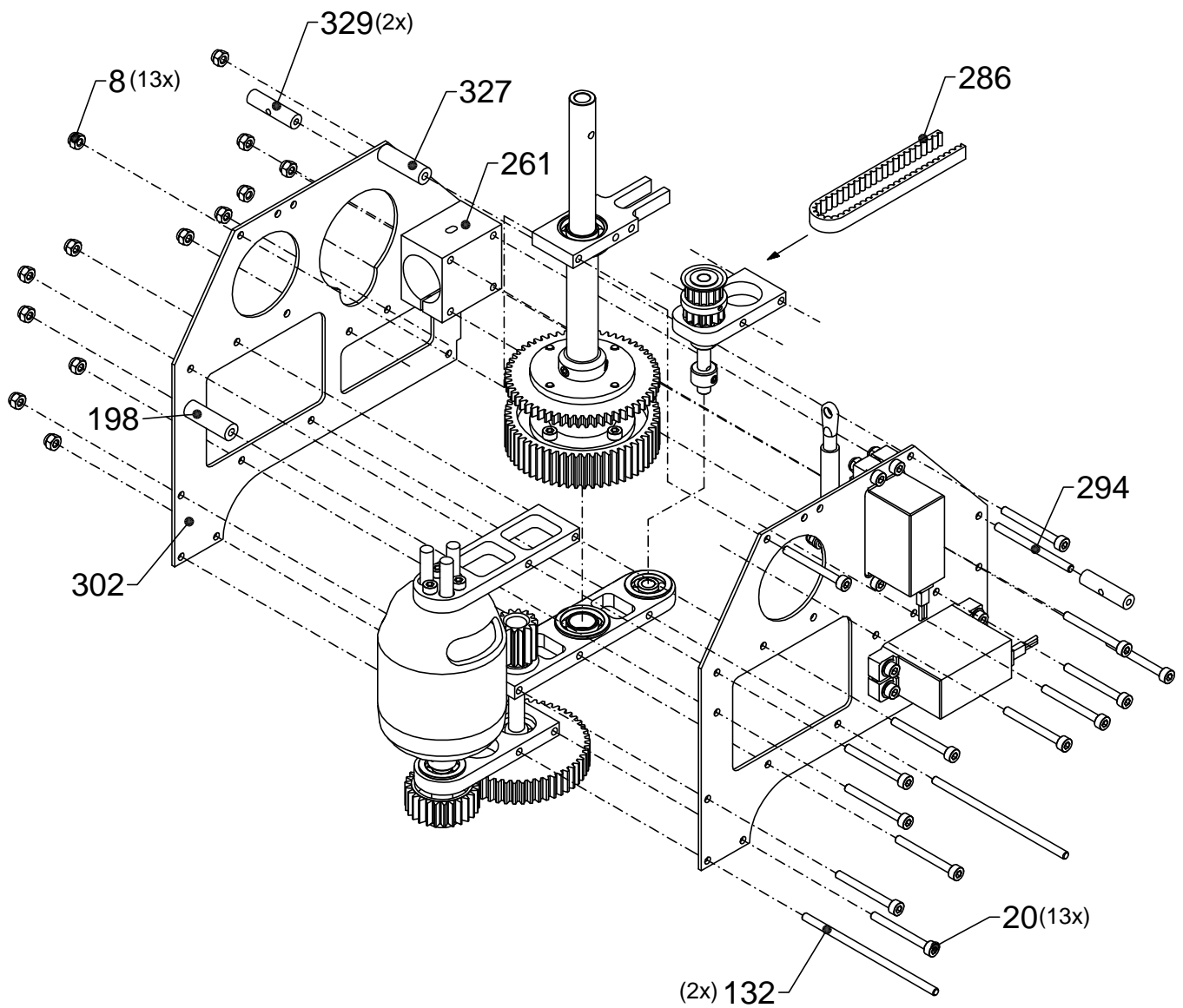
align rod vertical



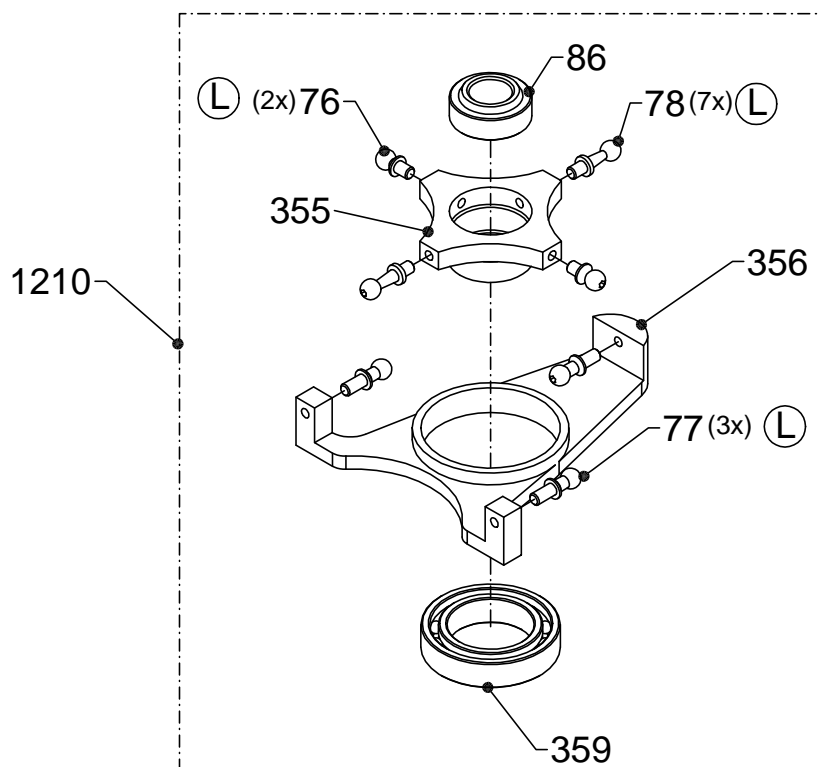
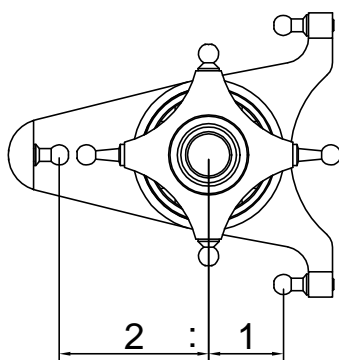
view in flight
direction

if necessary use
washers 2mm
to align rod vertical

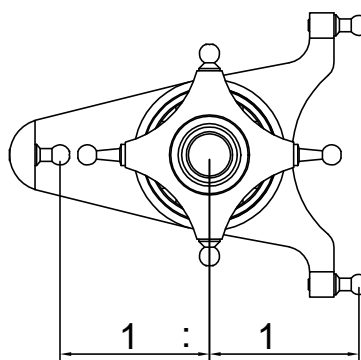
- 2 = washer M2
- 7 = nut with lock ring M2
- 8 = nut with lock ring M3
- 16 = hexagon socket screw M3 x 12
- 41 = ball joint 2,5
- 75 = joint bolt M2 x 6



8 = nut with lock ring M3
 20 = hexagon socket screw M3 x 30

120°-mode
(preset)

140°-mode

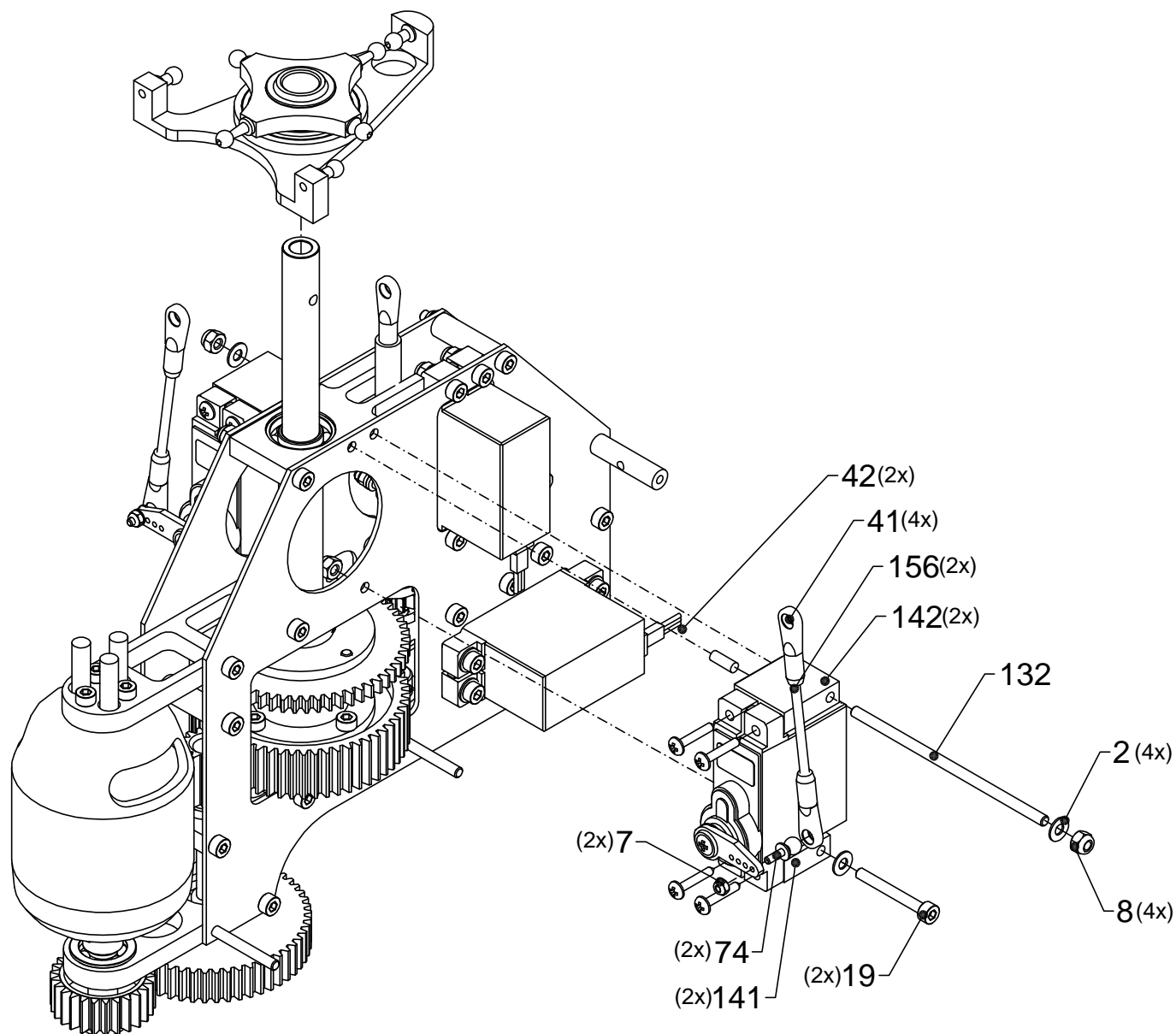


76 = joint bolt M 3 x 4

77 = joint bolt M 3 x 6

78 = joint bolt M 3 x 9

Ⓛ = use Loctite



2 = washer M3

7 = nut with lock ring M2

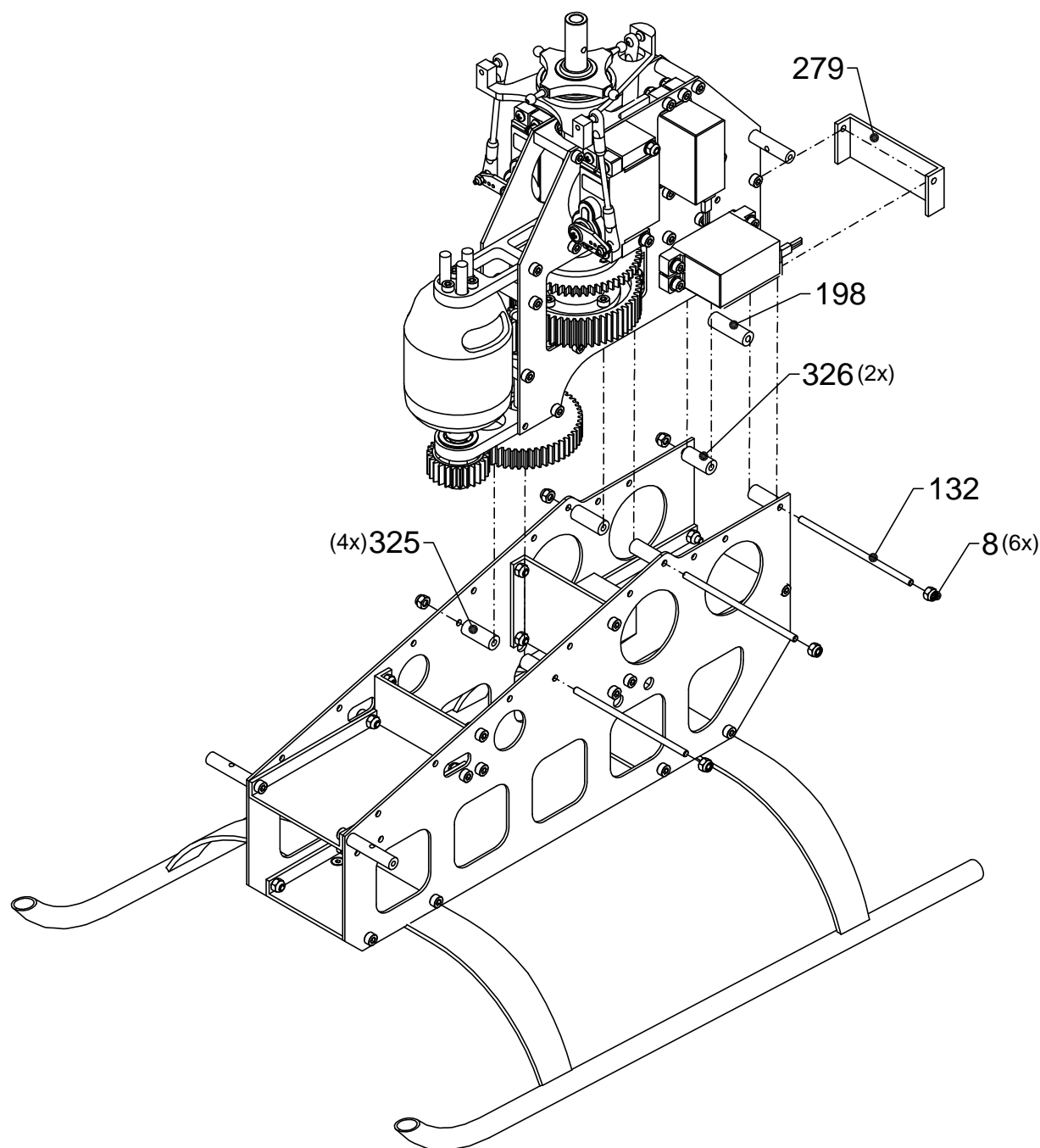
8 = nut with lock ring M3

19 = hexagon socket screw M3 x 25

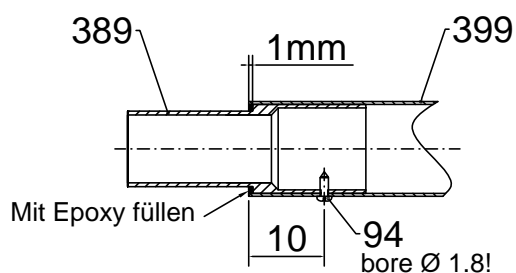
41 = ball joint 2,5

42 = pin 3 x 8

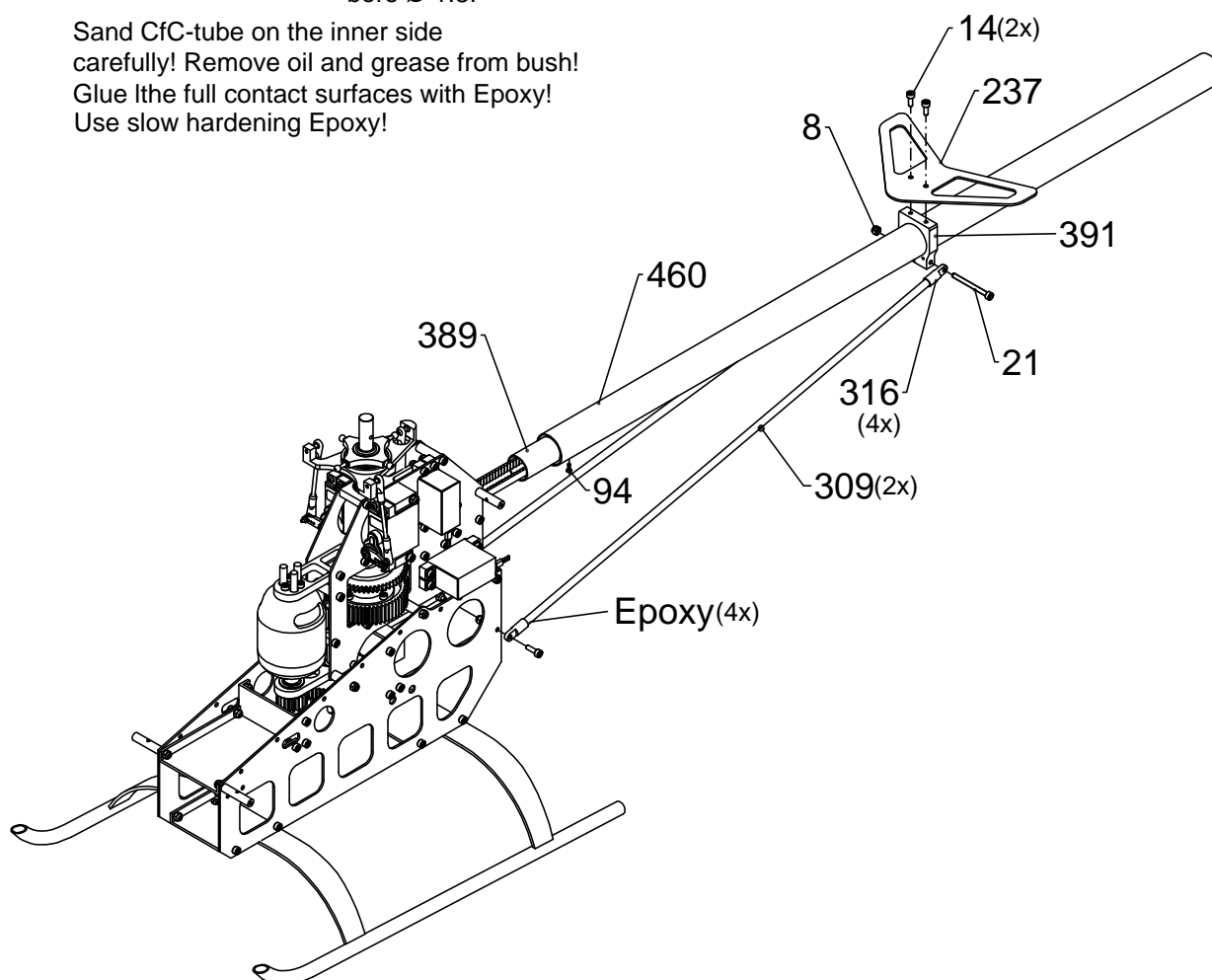
74 = joint bolt M2 x 4



8 = nut with lock ring M3
198 = distance bush 22.0
325 = distance bush 17.0
326 = distance bush 15.0



Sand CfC-tube on the inner side carefully! Remove oil and grease from bush!
Glue the full contact surfaces with Epoxy!
Use slow hardening Epoxy!



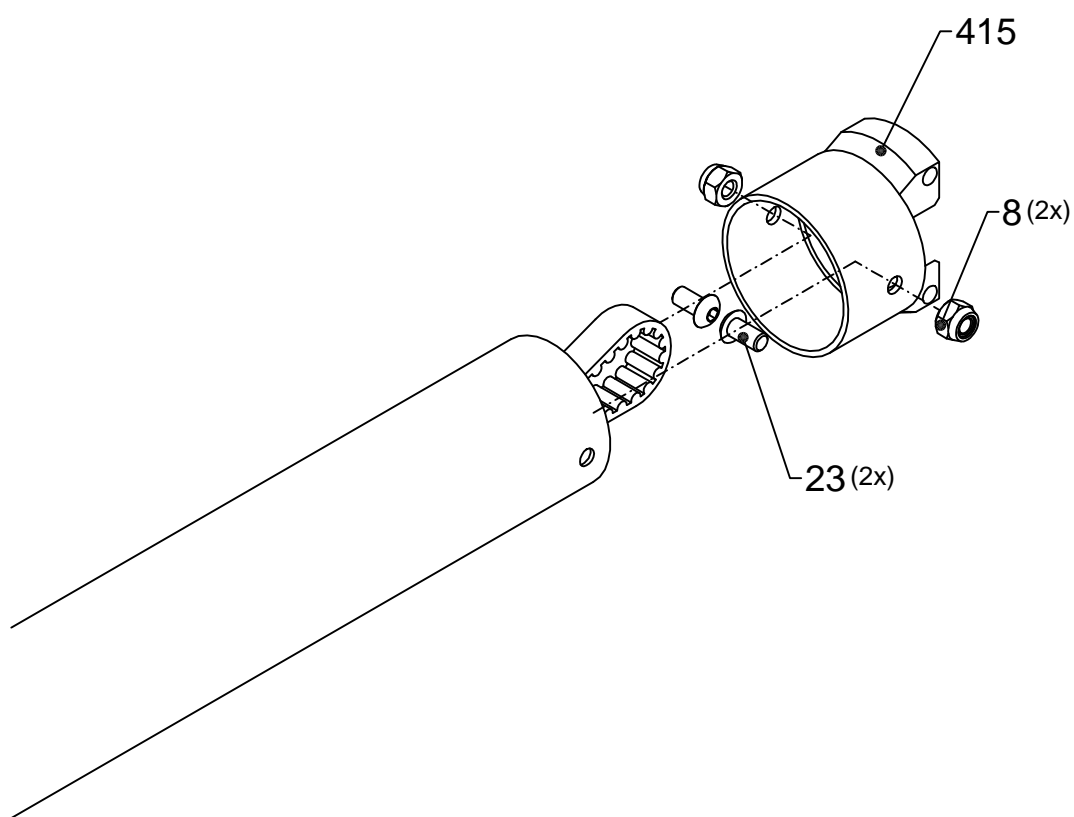
Tip: Pull belt thru tube with a cranked steel wire!

2 = washer M3

8 = nut with lock ring M3

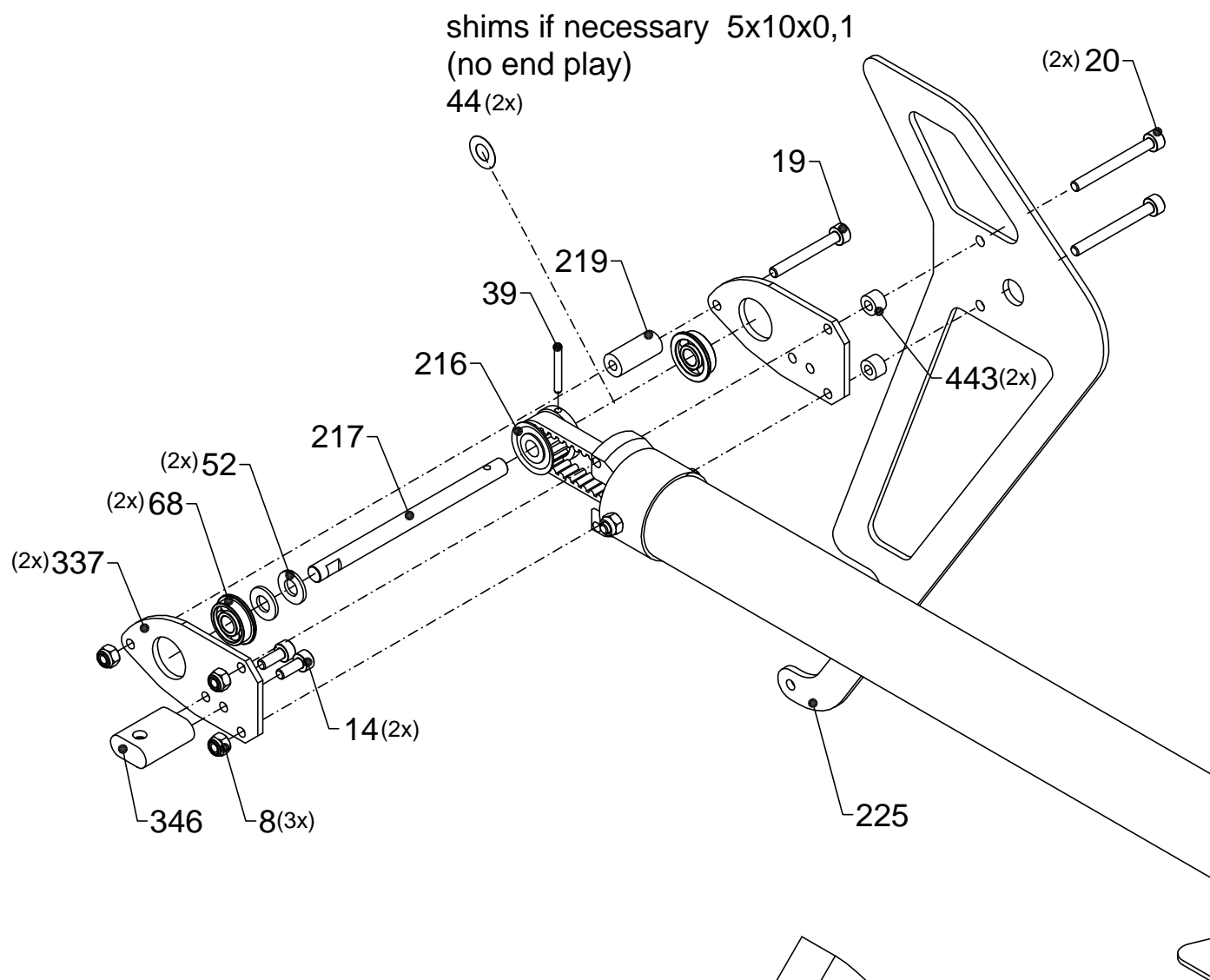
14 = hexagon socket screw M3 x 8

21 = hexagon socket screw M3 x 35

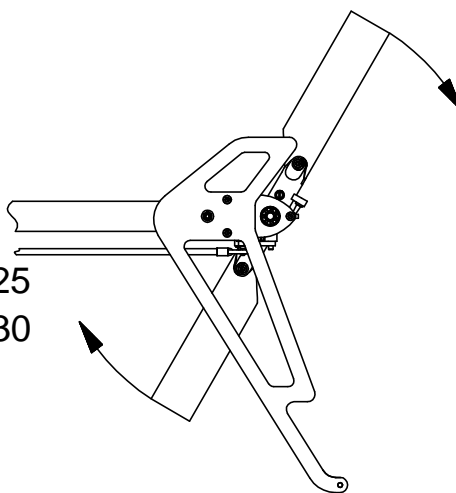


8 = nut with lock ring M3
23 = hexagon socket lense screw M3x6

main rotor cw (right) 17

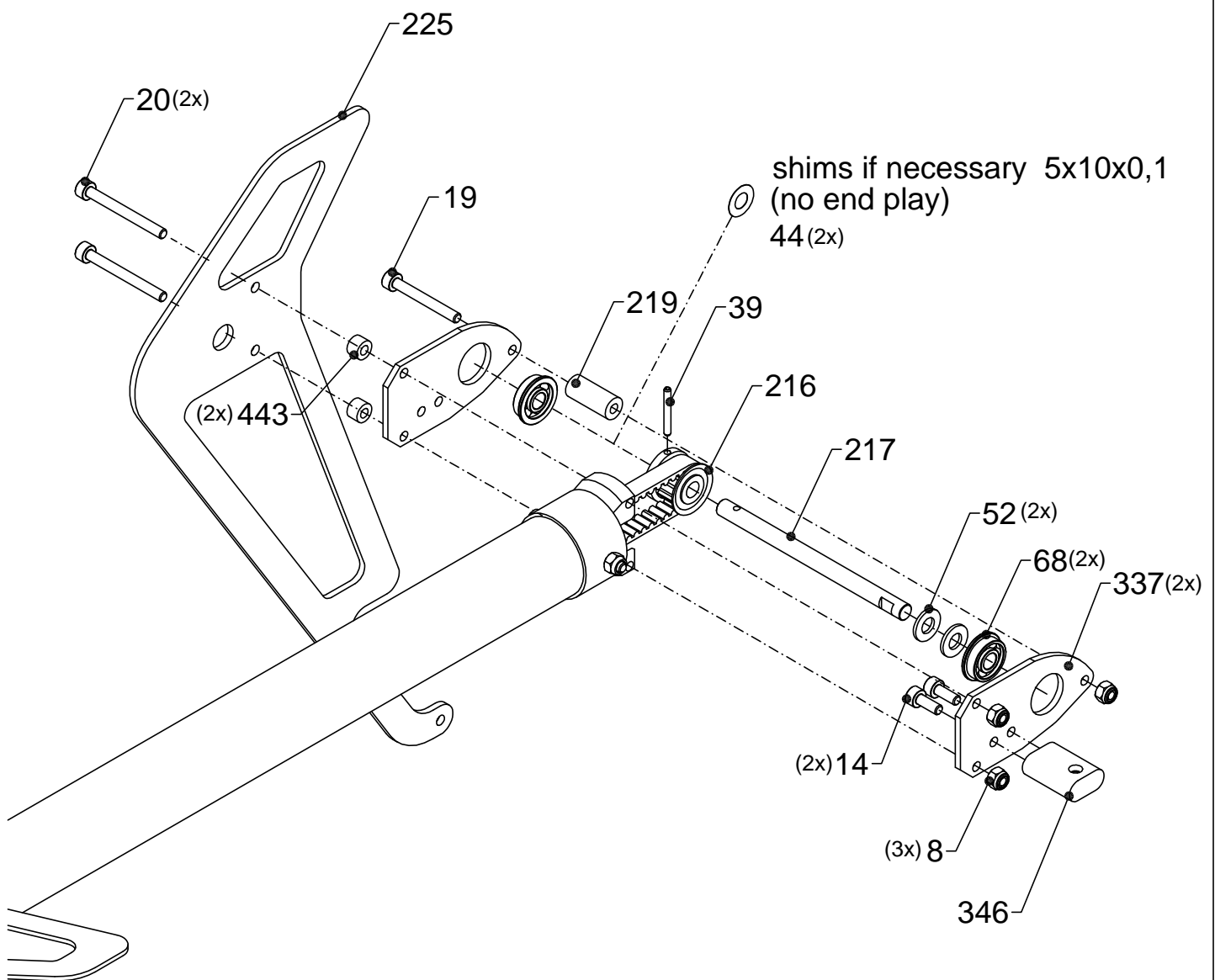


- 8 = nut with lock ring M3
- 14 = hexagon socket screw M3x8
- 19 = hexagon socket screw M3 x 25
- 20 = hexagon socket screw M3 x 30
- 39 = rolled pin 2 x 14
- 51 = shim 3 x 6 x 1
- 52 = shim 5 x 10 x 1
- 68 = ball bearing with flange 5 x 13 x 4

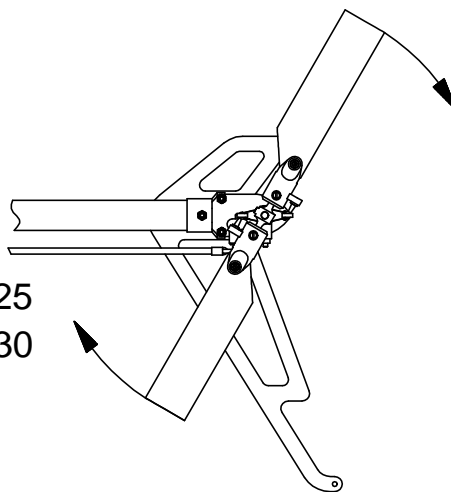


turn belt 90° right!
(view from behind)

main rotor ccw (left) 17



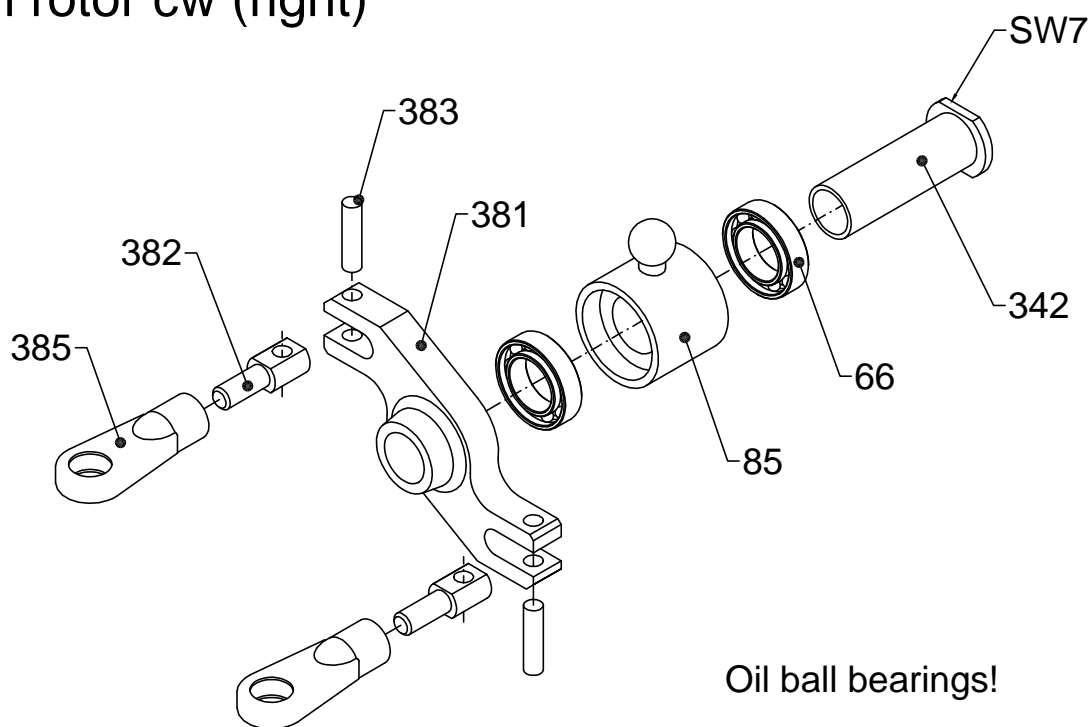
- 8 = nut with lock ring M3
- 14 = hexagon socket screw M3x8
- 19 = hexagon socket screw M3 x 25
- 20 = hexagon socket screw M3 x 30
- 39 = rolled pin 2 x 14
- 51 = shim 3 x 6 x 1
- 52 = shim 5 x 10 x 1
- 68 = ball bearing with flange 5 x 13 x 4



turn belt 90° left!
(view from behind)

main rotor cw (right)

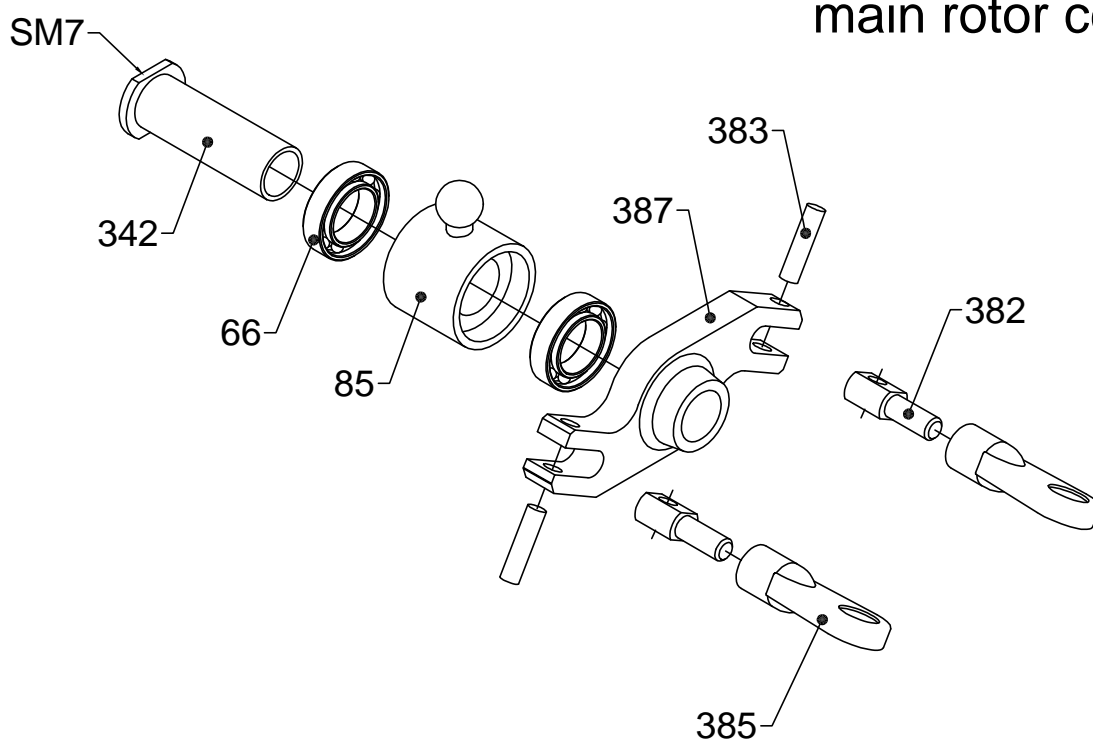
18



Oil ball bearings!

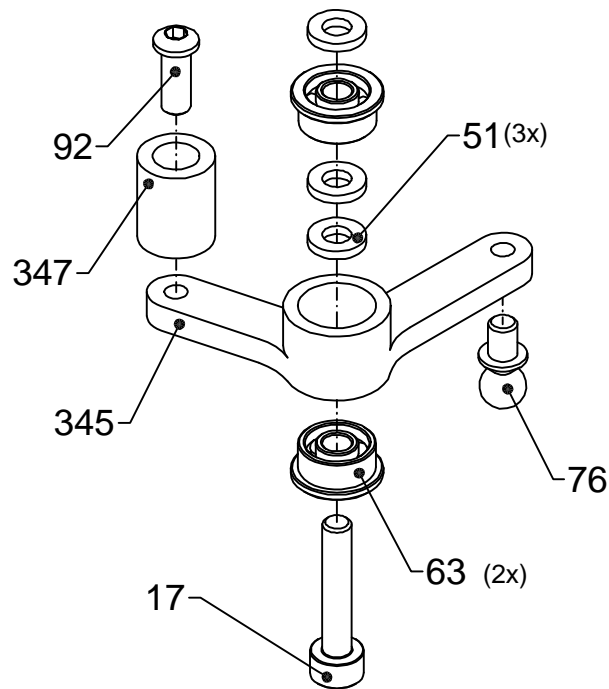
Tip: Press threaded bush in vise vertically, screw only the last thread!

main rotor ccw (left)

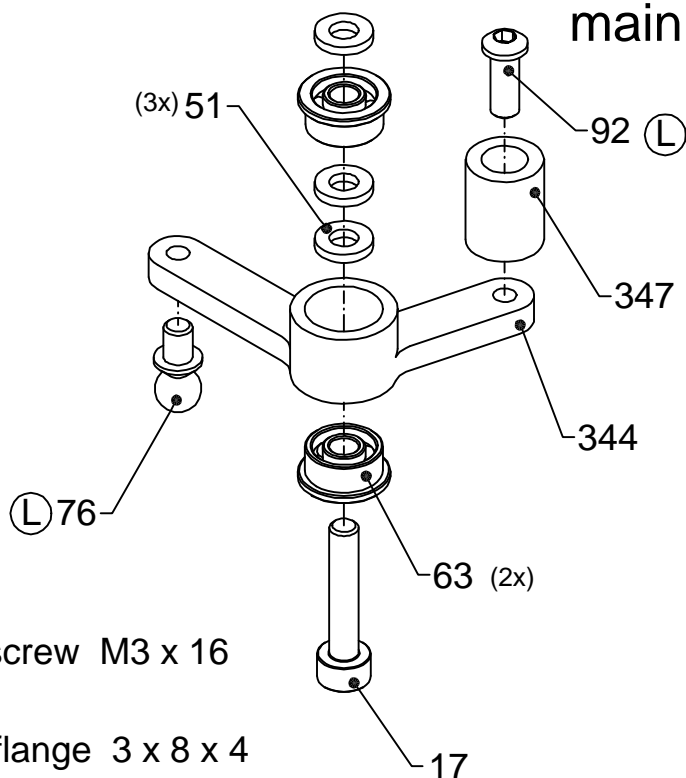


66 = ball bearing 6 x 10 x 2,5

main rotor cw (right) 19



main rotor ccw (left)



17 = hexagon socket screw M3 x 16

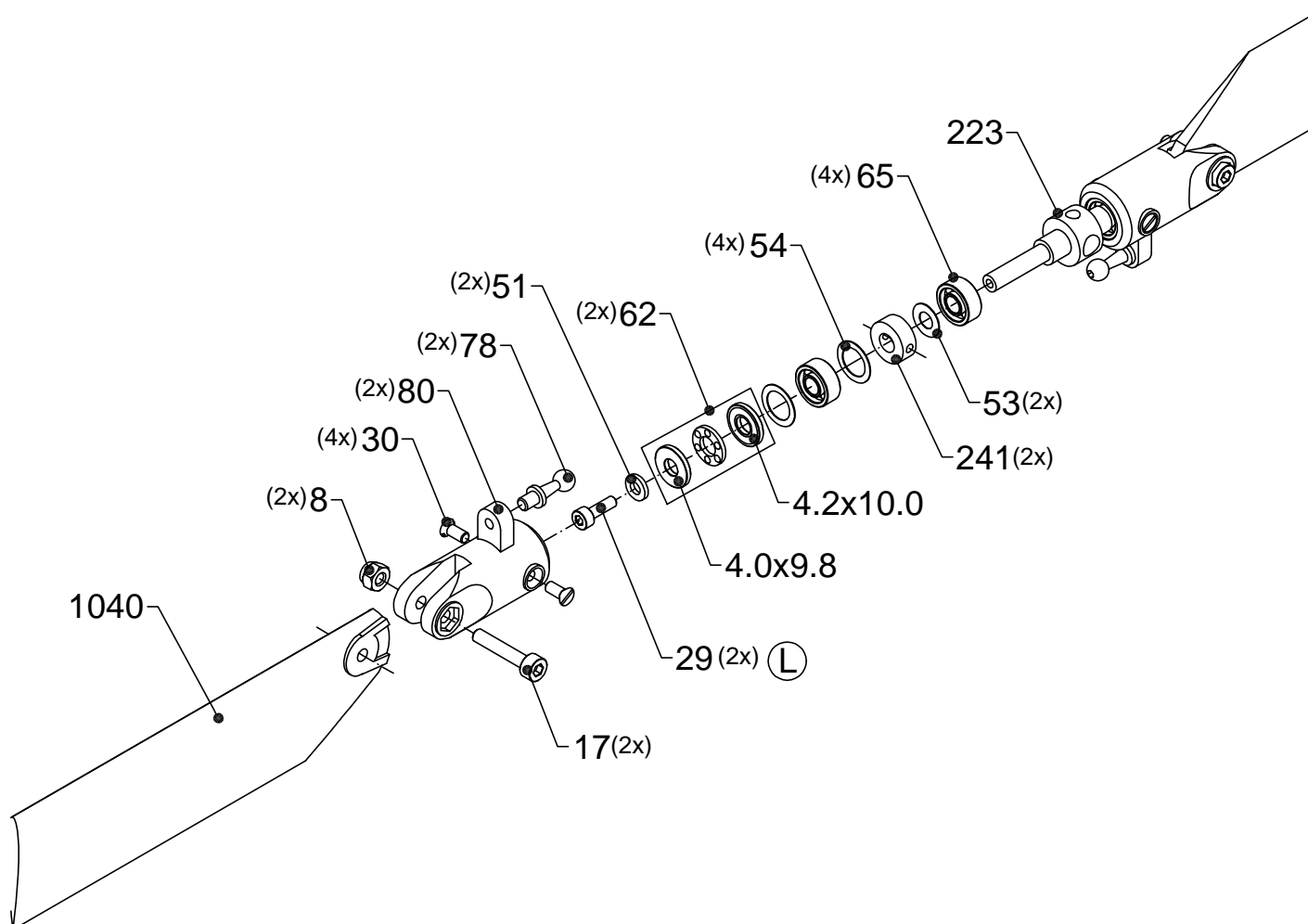
51 = shim 3 x 6 x 1

63 = ball bearing with flange 3 x 8 x 4

76 = joint bolt M3 x 4

92 = hexagon socket lens screw special M3 x 8

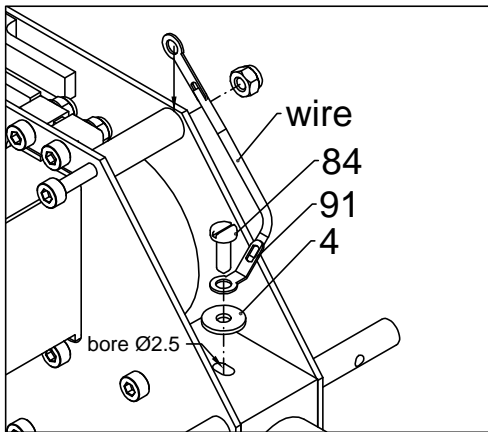
Ⓛ = use Loctite



- 8 = nut with lock ring M3
 17 = hexagon socket screw M3 x 16
 29 = hexagon socket screw M 2,5 x 8
 30 = flat-head-screw M2,5 x 5
 51 = shim 3 x 6 x 1
 54 = shim 7 x 10 x 0,2
 62 = thrust bearing B4
 65 = ball bearing 4 x 10 x 4
 78 = joint bolt M3 x 9

Ⓛ = use Loctite

ground strap

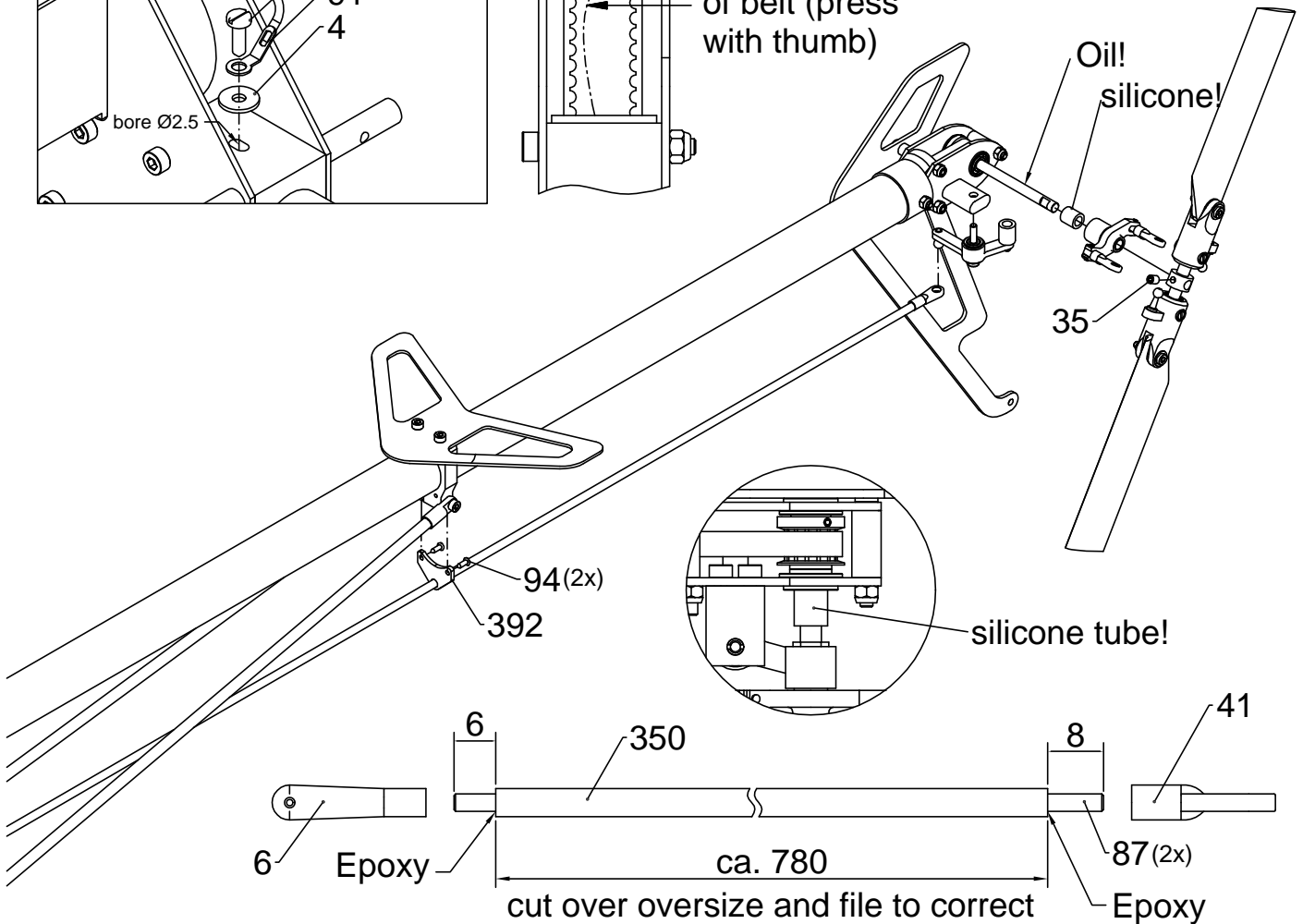


ccw shown (left)!

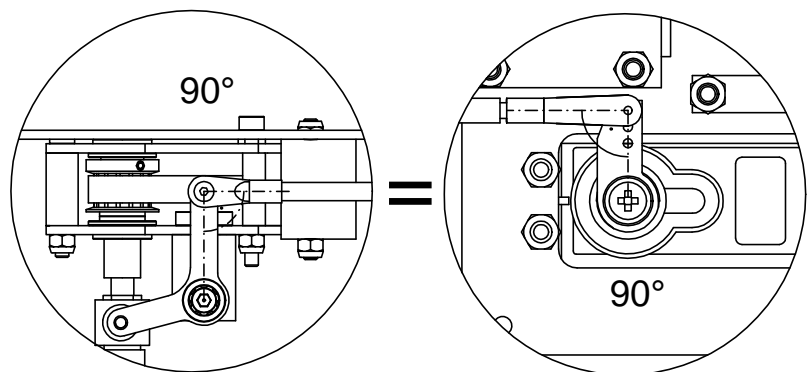
assemble cw (right) symmetrically!

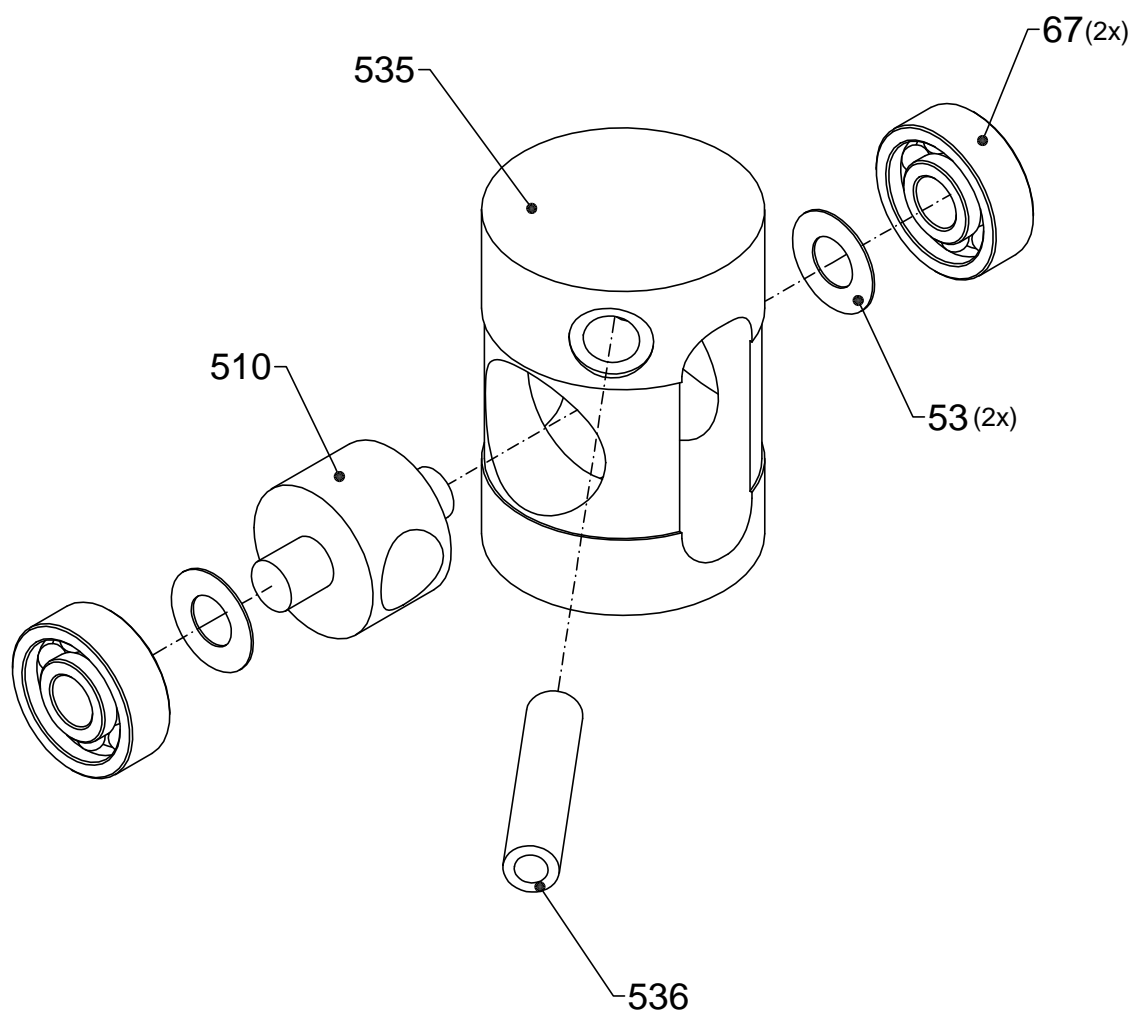
belt should not
touch other side
of belt (press
with thumb)

Oil!
silicone!



- 6 = knuckle joint M2.5
- 7 = nut with lock ring M2
- 35 = headless screw M4 x 5
- 84 = tapping screw 2.9 x 9.5
- 87 = threaded bolt 2.5 x 26
- 94 = tapping screw 2.2 x 6.5

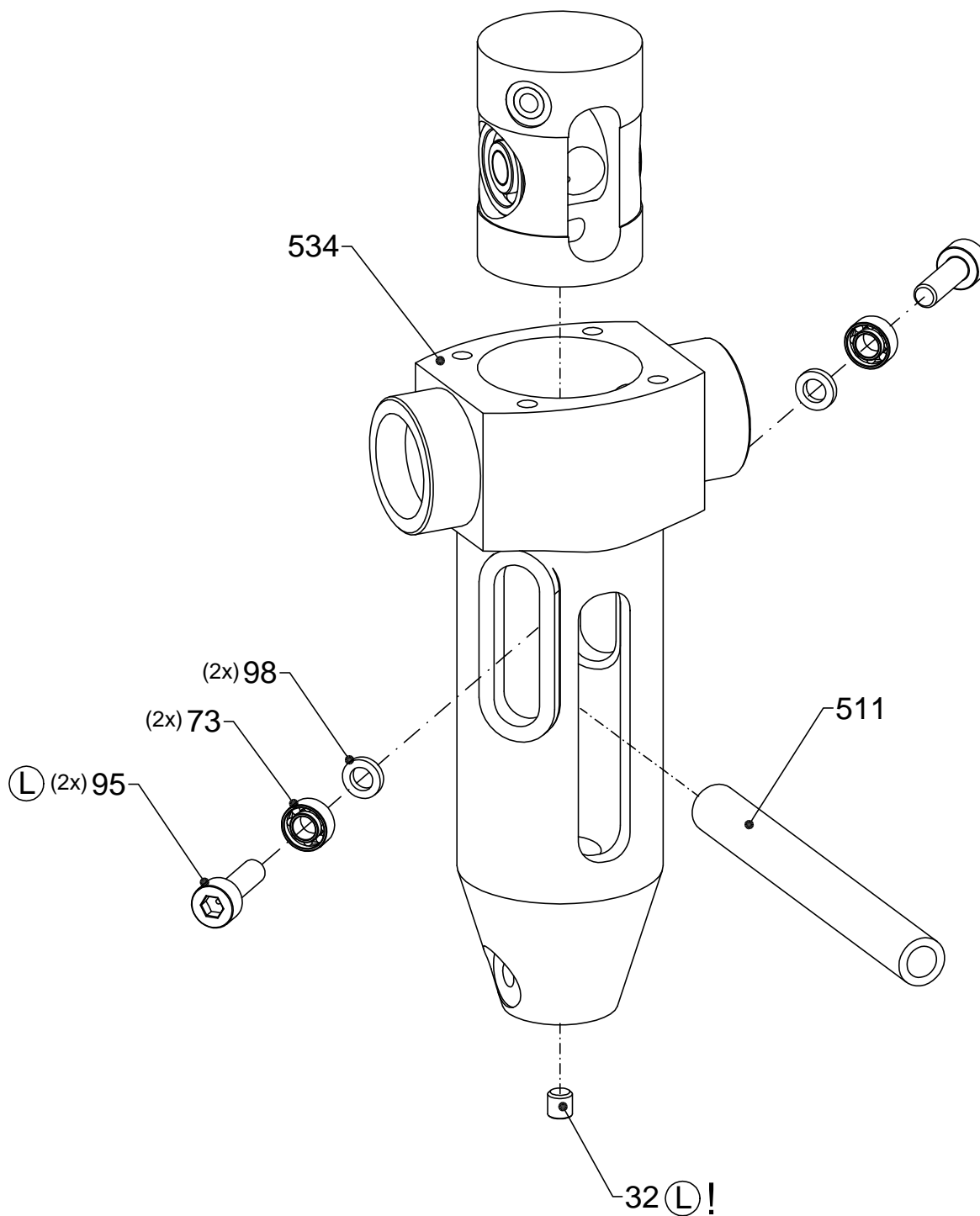




53 = shim 4x8x0.1

67 = ball bearing 4x12x4

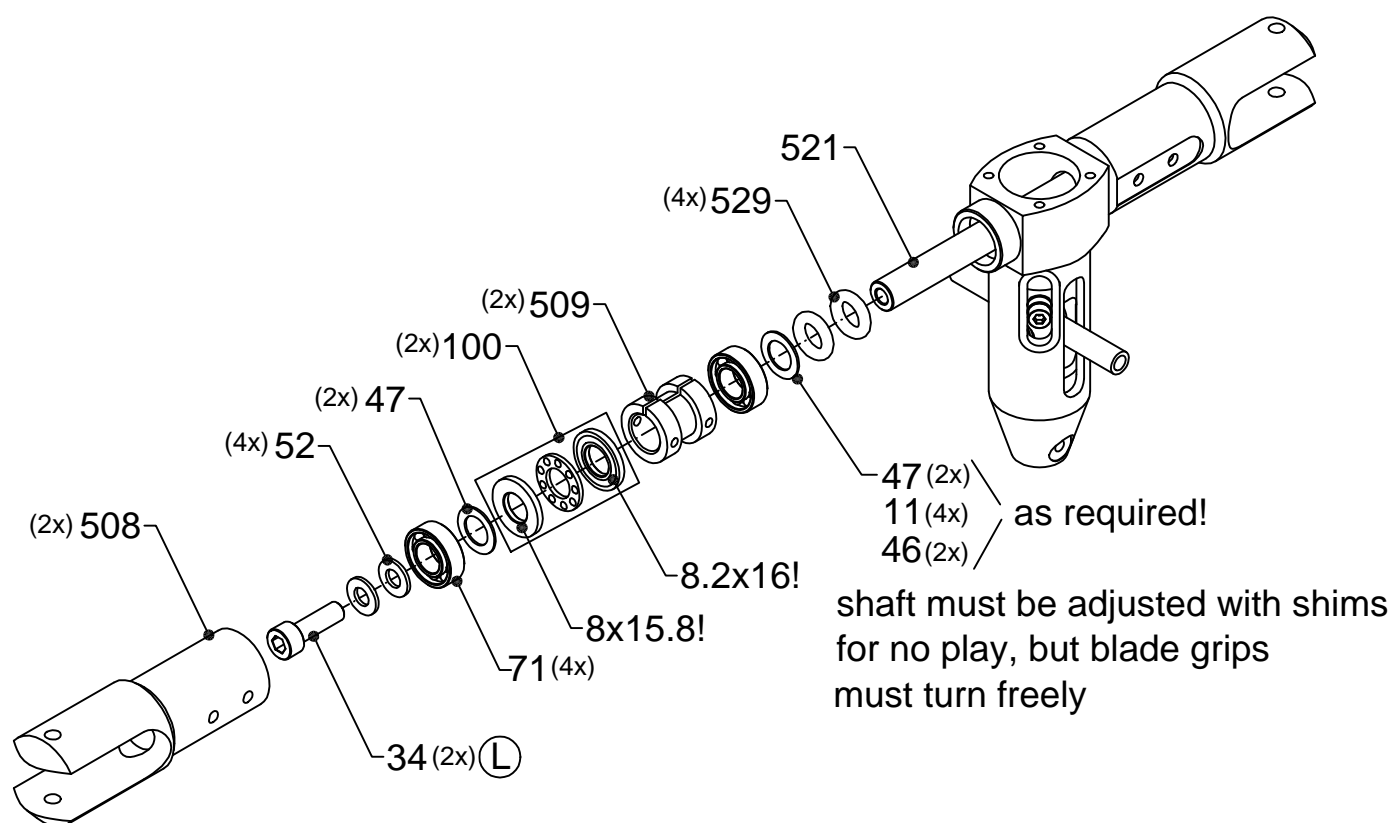
Do not lubricate or oil piston!



(L) = use Loctite

95 = hexagon socket screw M3 x 10 alloy steel

32 = headless hexagon screw with cone point M4 x 5 alloy steel



O-rings must be greased!

For assembly heat blade grips up to 150 °C

11 = shim 8x14x0.2

34 = hexagon socket screw M5x12 12.9

46 = shim 8x14x0.1

47 = shim 8x14x0.5

52 = shim 5x10x1

71 = ball bearing 8 x 16 x 5

100 = thrust bearing B8

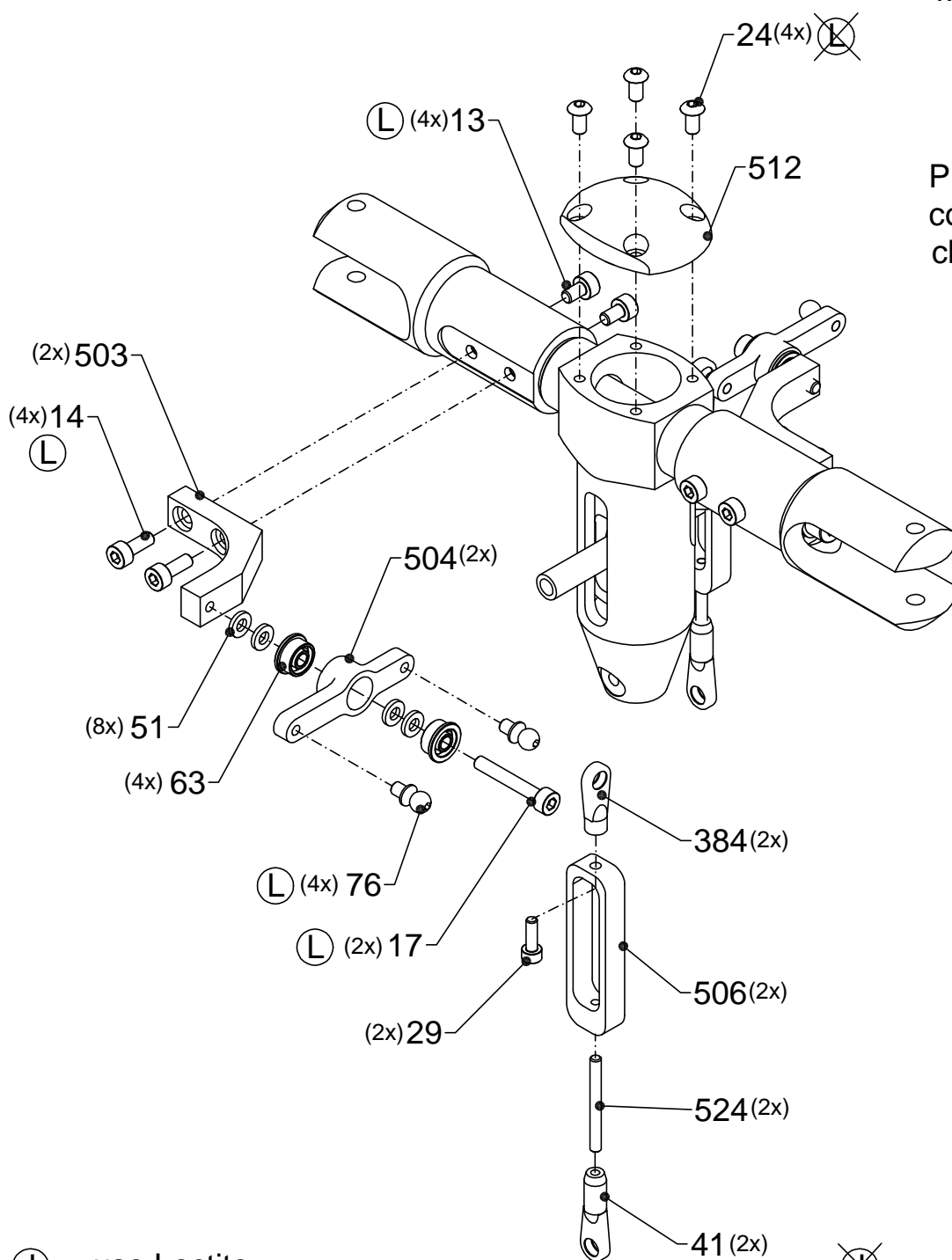
(L) = use Loctite

Note: Steering arm 503 is on the backside of the rotorblade!

25

Mainrotor right (CW)

Protect Pos.51 against corrosion with clear lacquer!



Ⓛ = use Loctite

13 = hexagon socket screw M3 x 5

14 = hexagon socket screw M3 x 8

17 = hexagon socket screw M3 x 16

24 = hexagon socket lense screw M3 x 8

29 = hexagon socket screw M2,5 x 8

ⓧ = no Loctite

41 = ball joint 2.5

51 = shim 3x6x1

63 = ball bearing flange F3x8

76 = joint bolt M3 x 4

78 = joint bolt M3 x 9

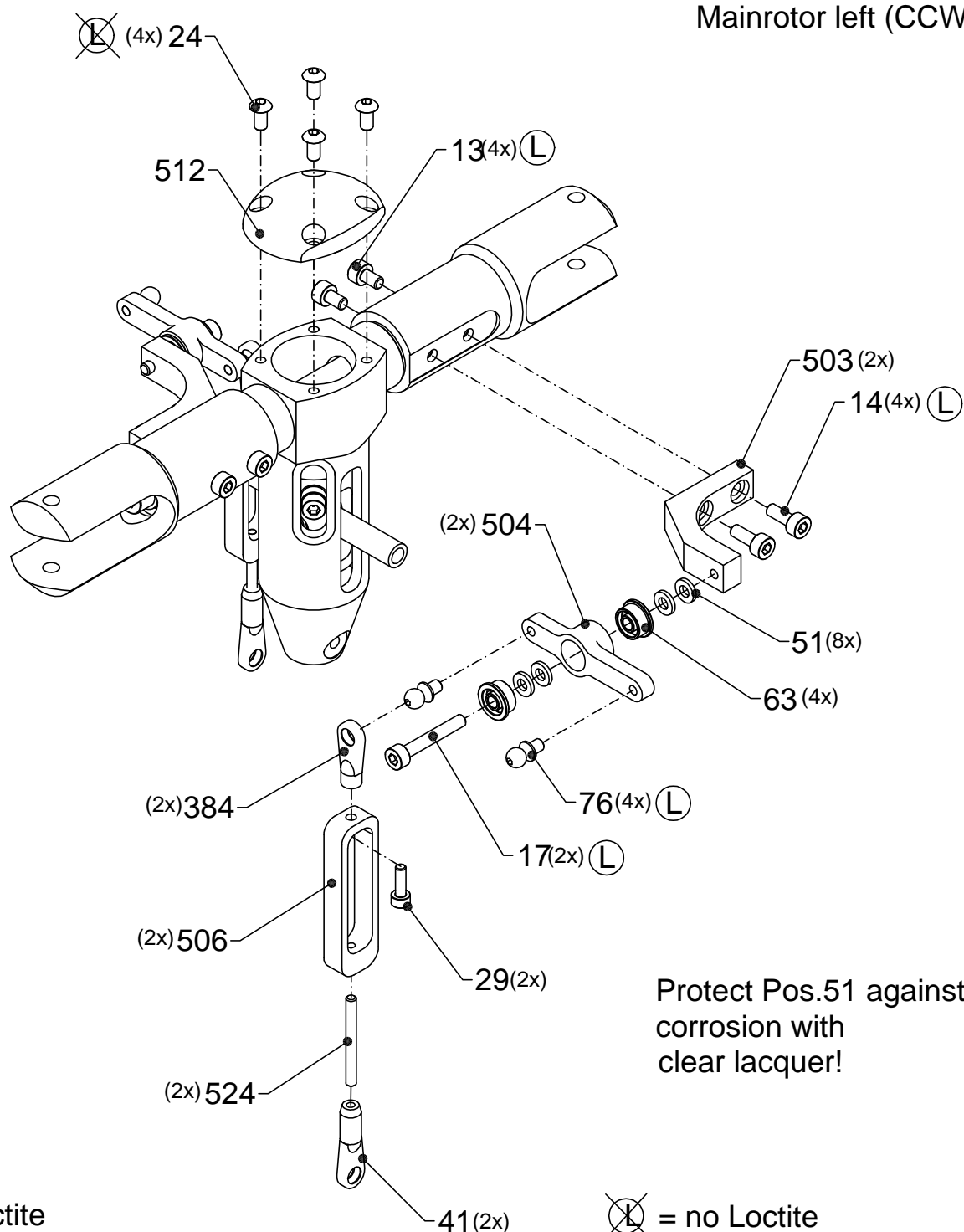
minicopter®

manual

JOKER CX

Note: Steering arm 503 is on the backside of the rotorblade!

Mainrotor left (CCW)



Protect Pos. 51 against corrosion with clear lacquer!

(L) = use Loctite

13 = hexagon socket screw M3 x 5

14 = hexagon socket screw M3 x 8

17 = hexagon socket screw M3 x 16

24 = hexagon socket lense screw M3 x 8

29 = hexagon socket screw M2,5 x 8

(X) = no Loctite

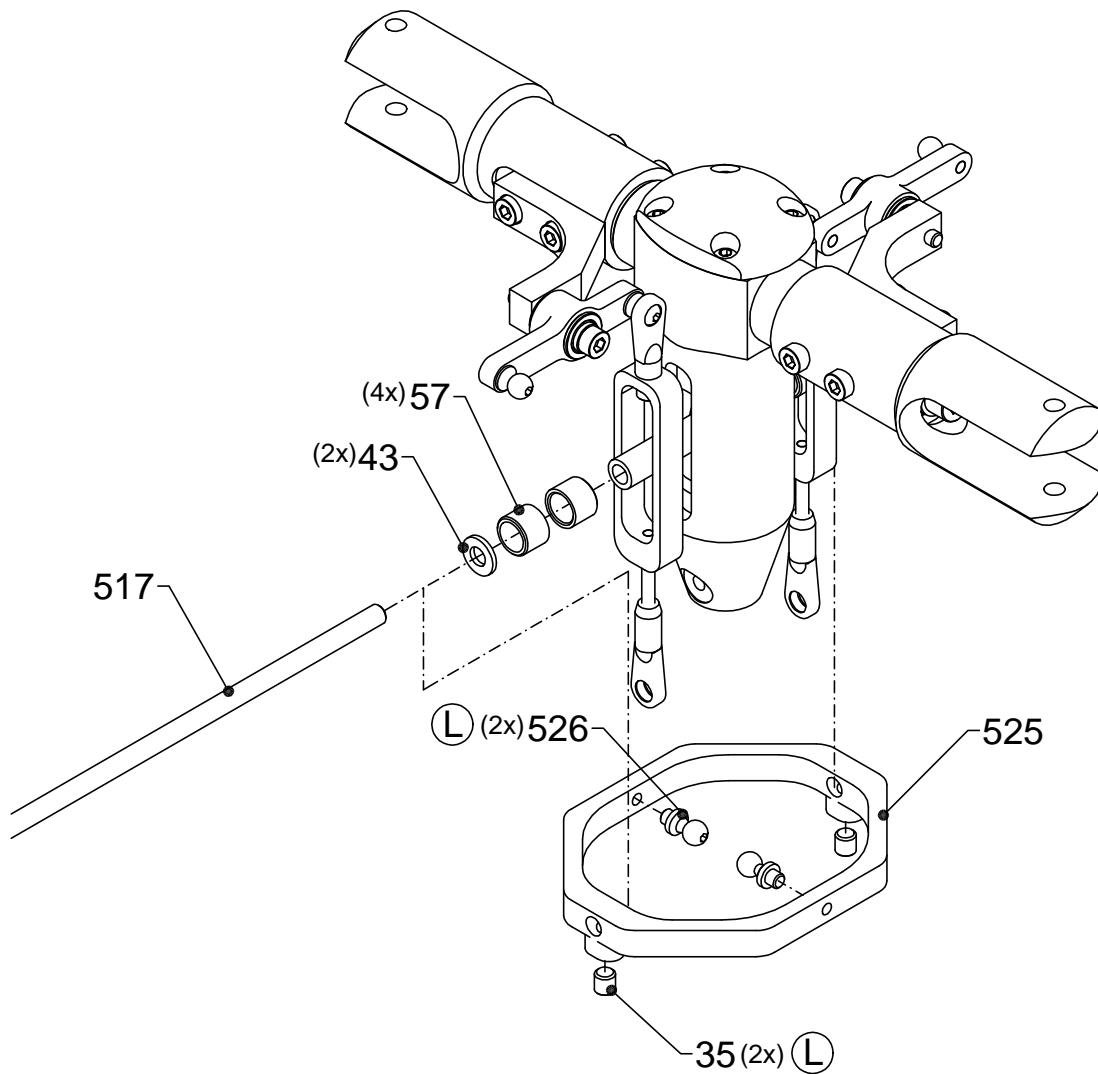
41 = ball joint 2.5

51 = shim 3x6x1

63 = ball bearing flange F3x8

76 = joint bolt M3 x 4

78 = joint bolt M3 x 9

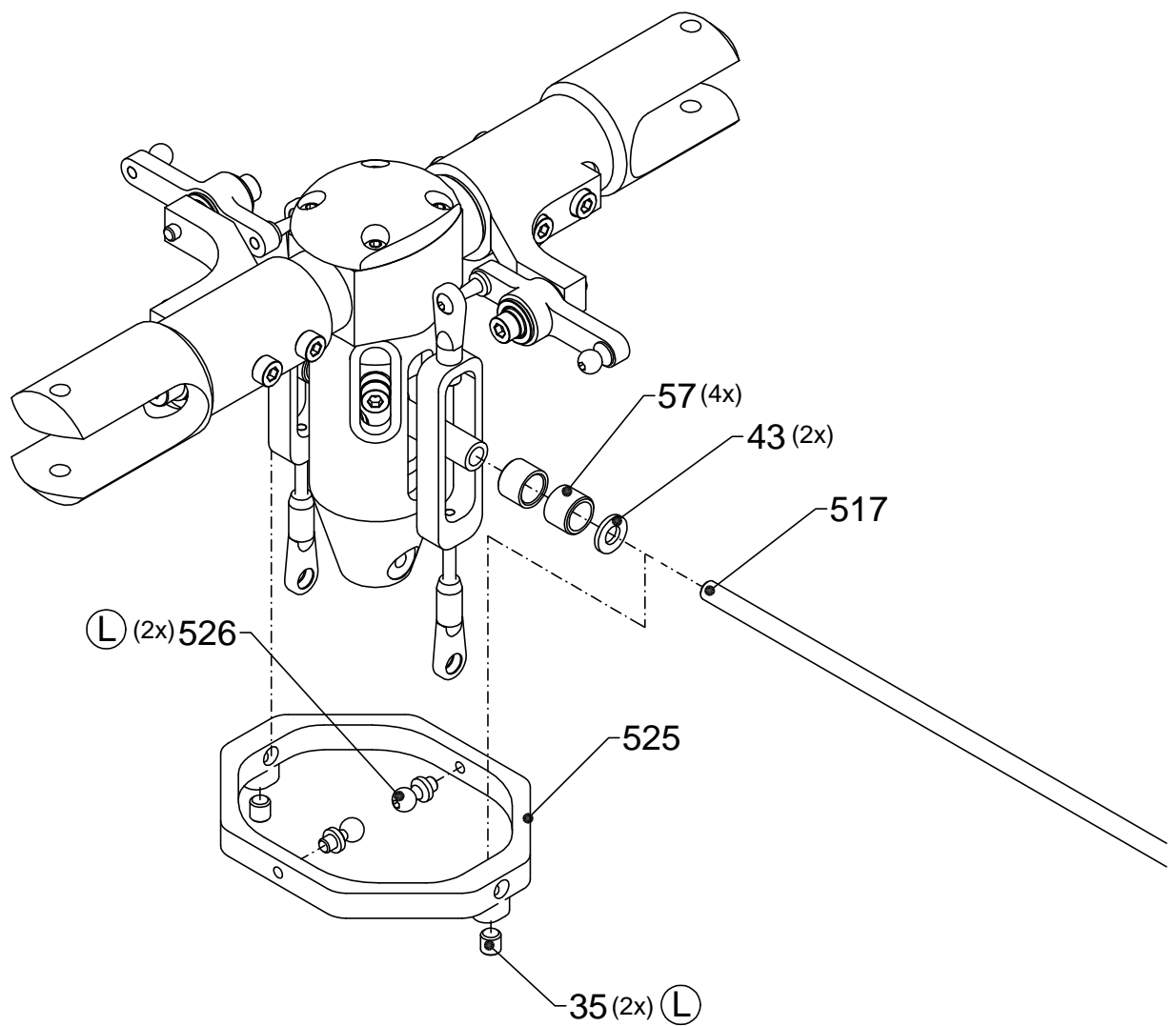


35 = headless hexagon socket screw M4 x 5

43 = shim 4 x 8 x 1

57 = Teflon anti-friction bearing

(L) = use Loctite

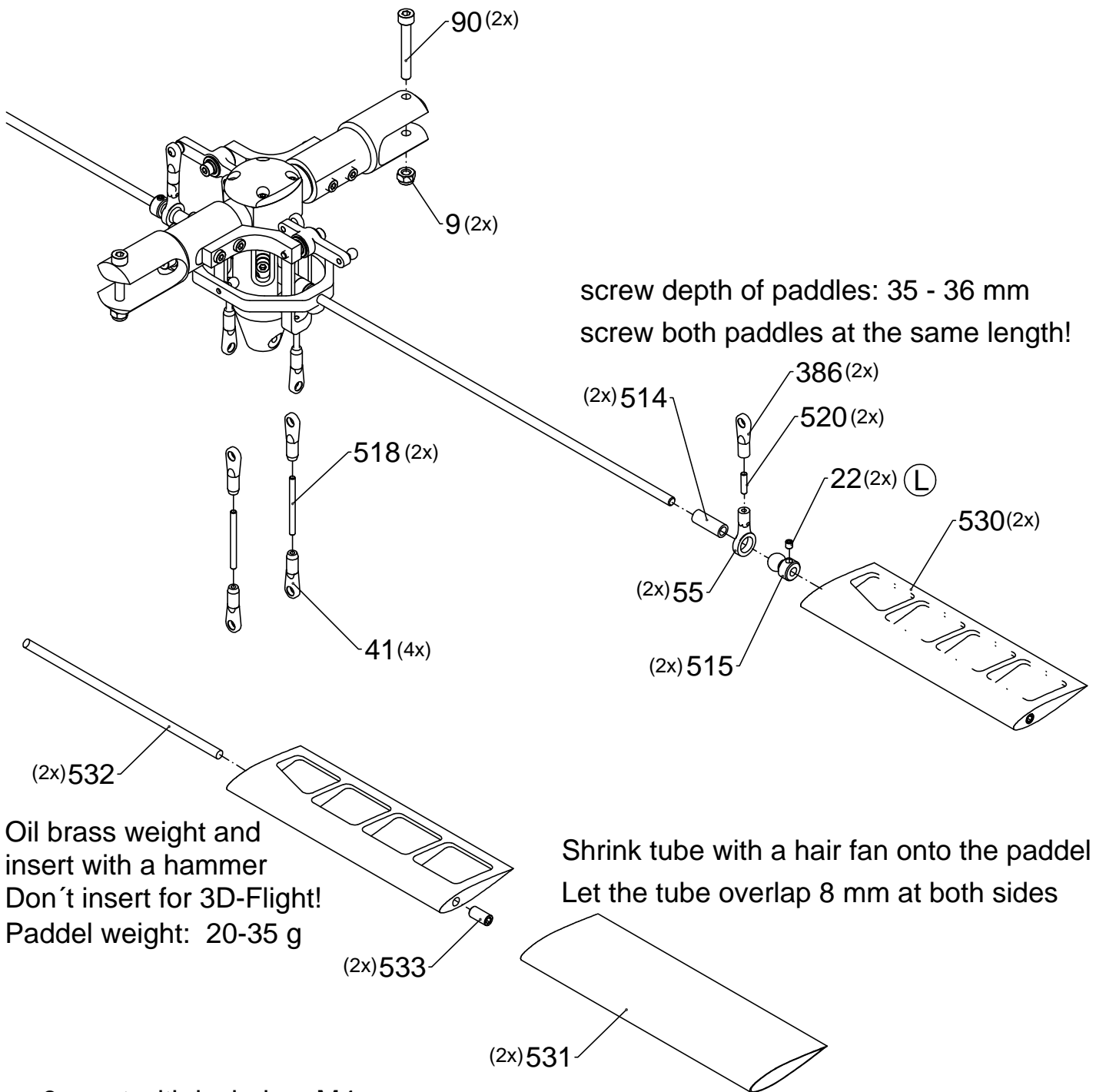


35 = headless hexagon socket screw M4 x 5

43 = shim 4 x 8 x 1

57 = Teflon anti-friction bearing

Ⓛ = use Loctite



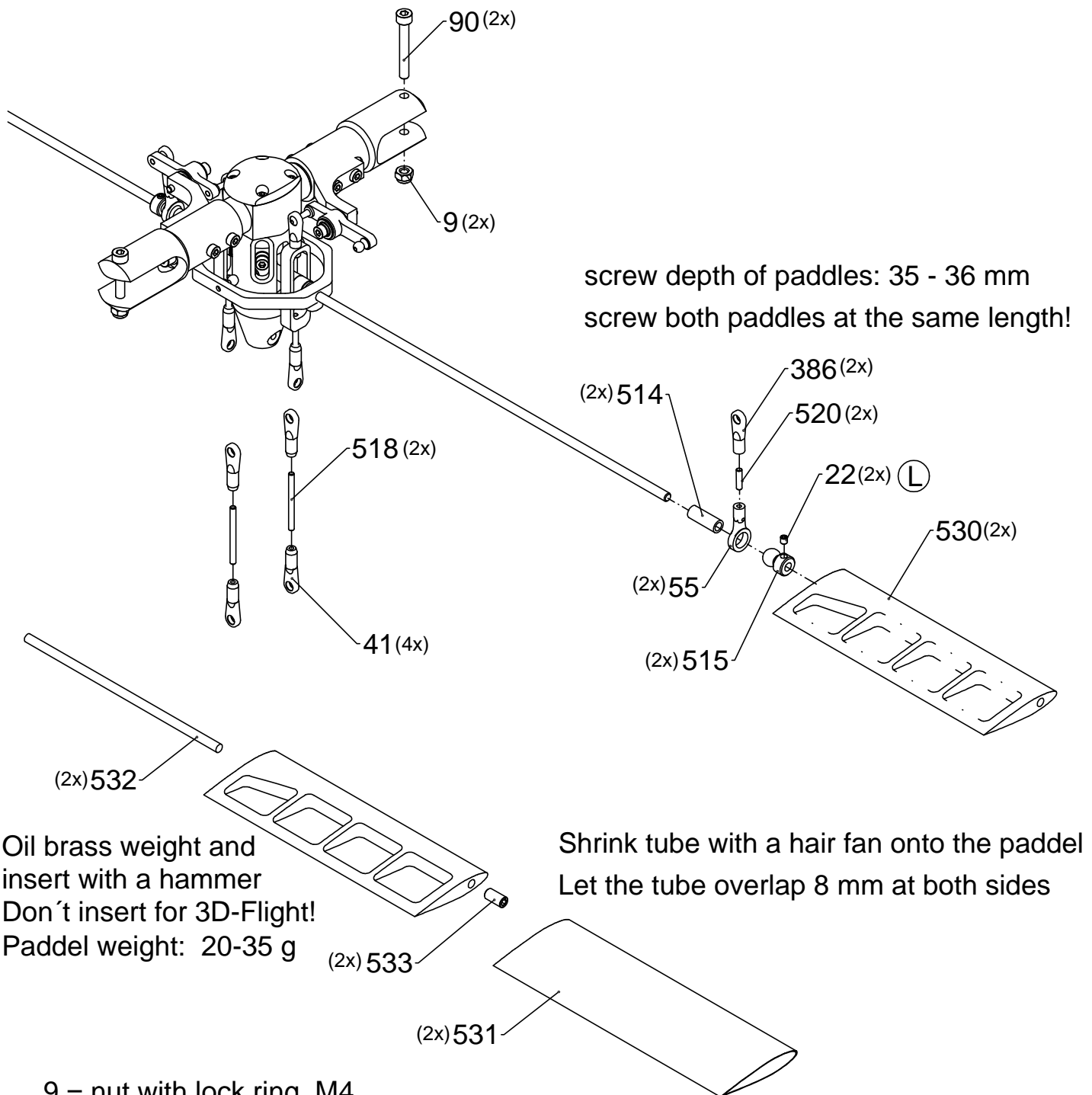
9 = nut with lock ring M4

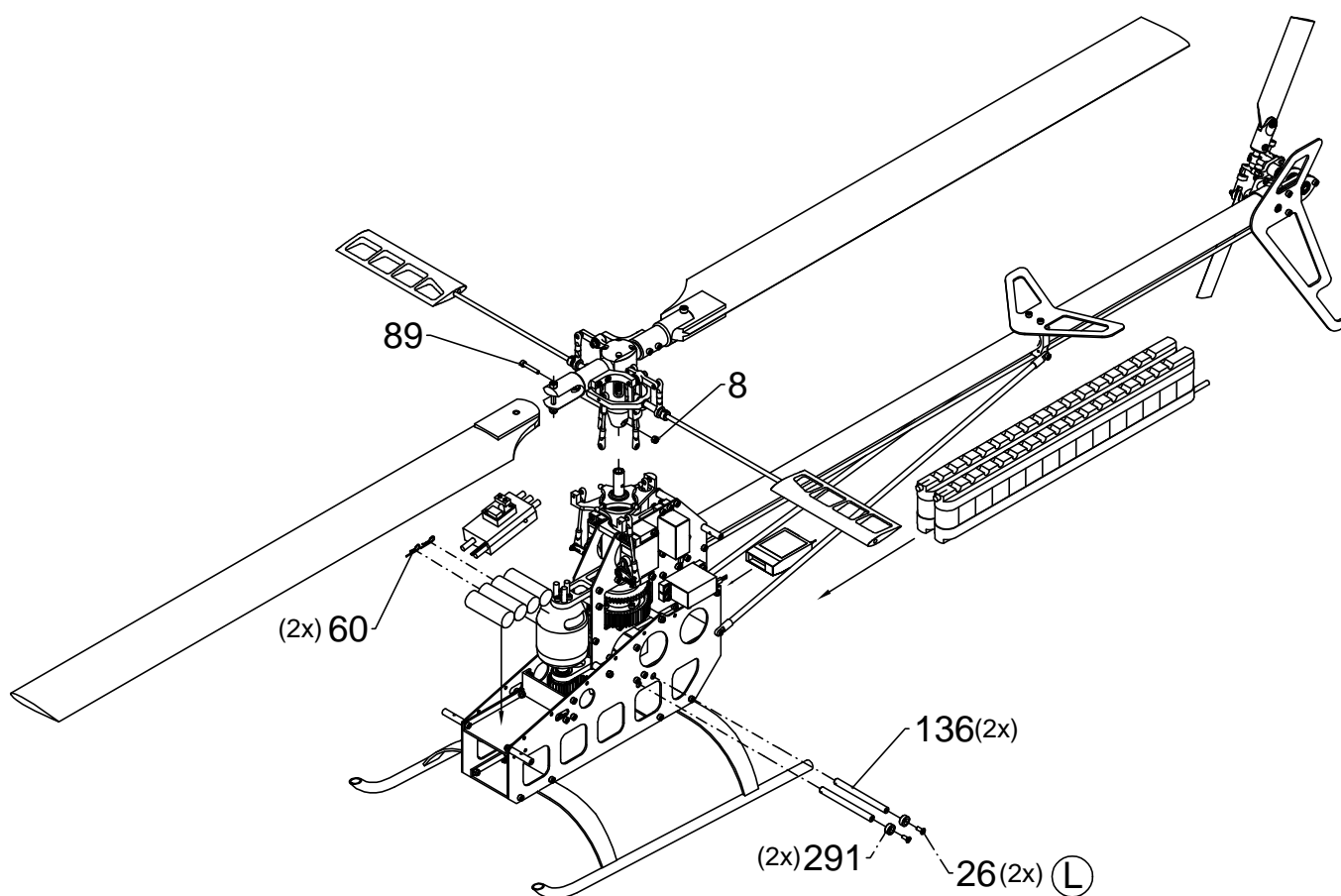
22 = headless hexagon socket screw M3 x 3

41 = ball joint 2.5

55 = ball joint 8

(L) = use Loctite





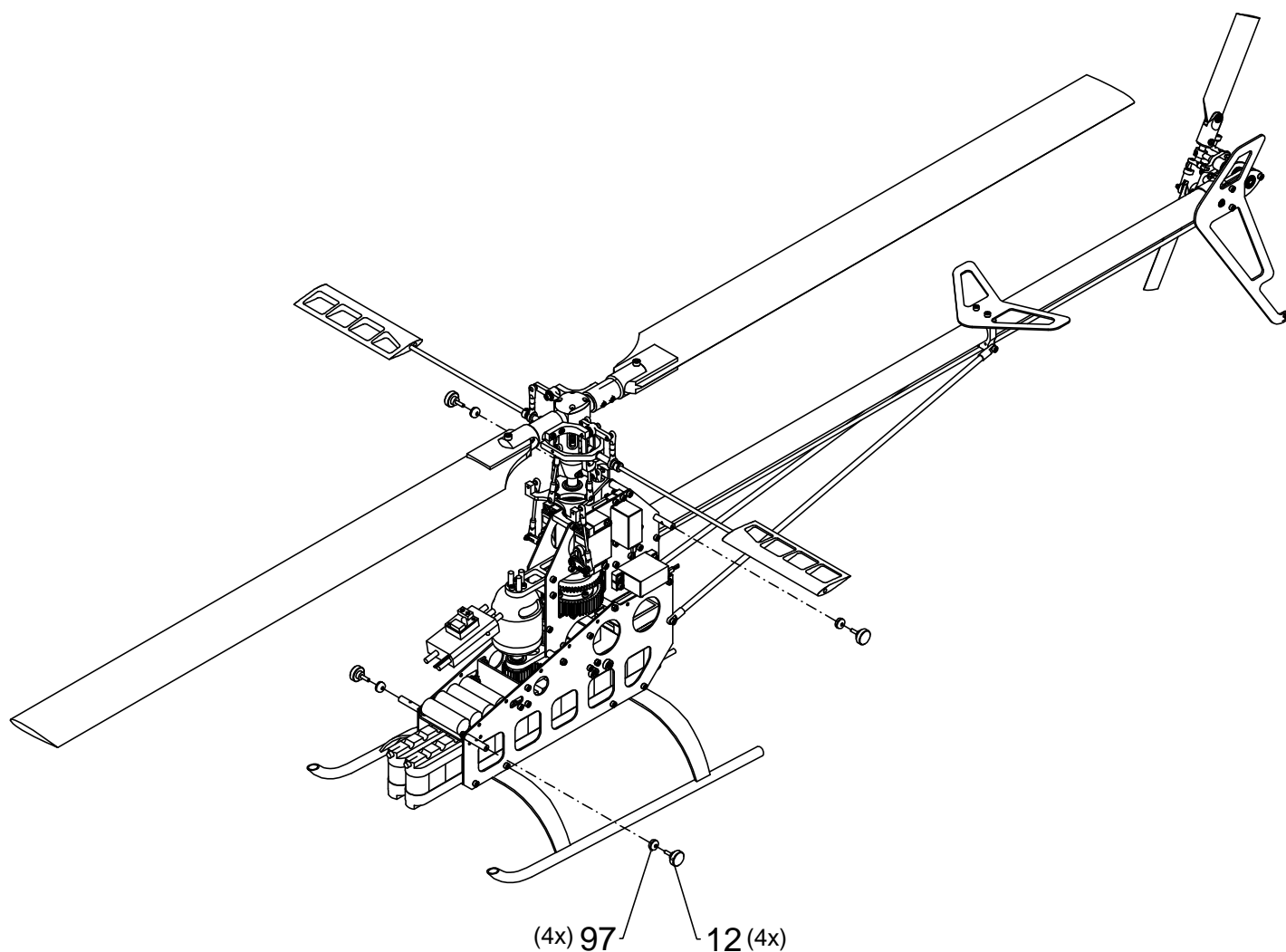
8 = nut with lock ring M3

26 = flat-head-hexagon-socket screw M3 x 10

60 = cotter pin 1.2 x 22

89 = hexagon socket screw M3 x 19 special

Ⓛ = use Loctite



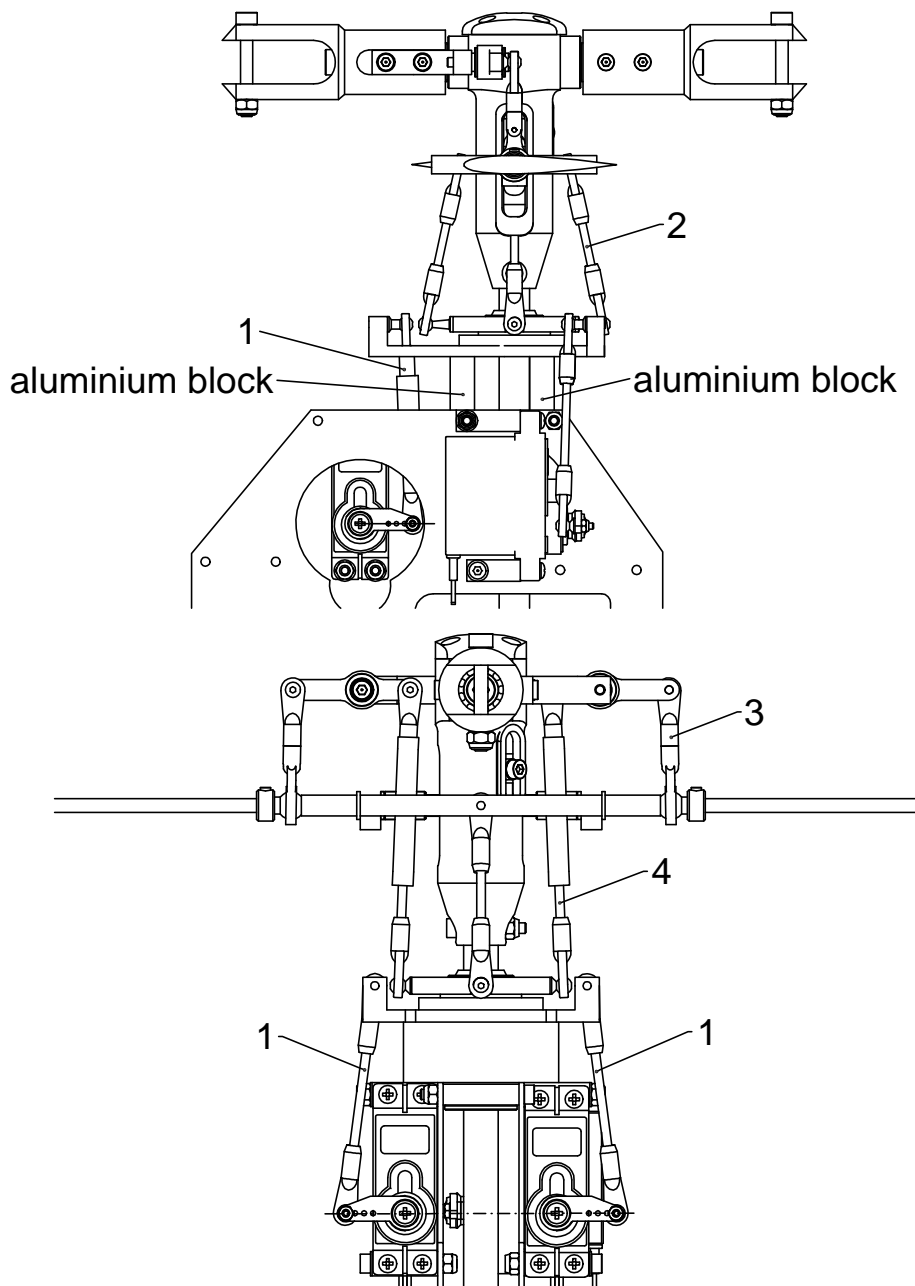
8 = nut with lock ring M3

26 = flat-head-hexagon-socket screw M3 x 10

60 = cotter pin 1.2 x 22

89 = hexagon socket screw M3 x 19 special

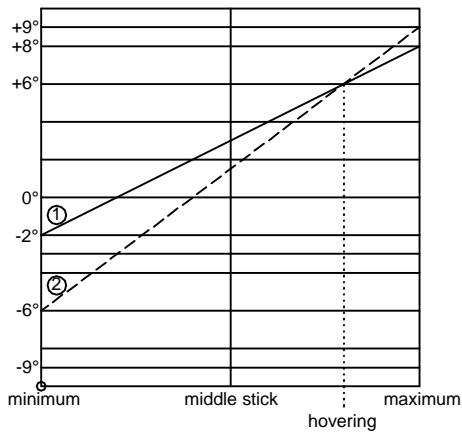
Ⓛ = use Loctite



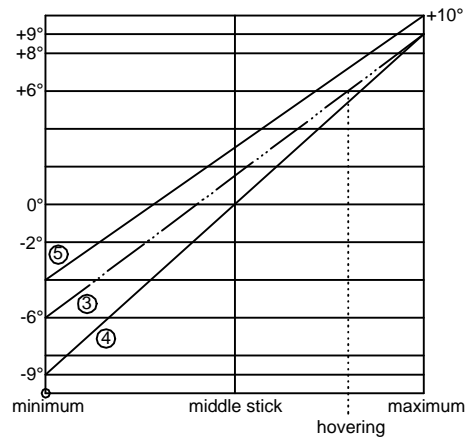
1. Place blocks with 17.5mm height between frame and swash plate.
2. Adjust pushrod 1 between servos and swash plate until all servo arms are horizontally.
3. Adjust pushrod 2 to the hiller bridge until ball bearing is in the middle of the brass control ledge.
4. Double ball link between flybar and mixer arm is 42 mm long.
5. Adjust lower ball link between swash plate and mixer arm until mixer arm is in horizontal position.
6. Check pitch angle of mounted rotorblades with a pitch gauge. Adjust lower ball links of rod 4 until both blades are exactly in neutral position (zero degree pitch).

pitch gauge

1. normal flight, 1200 1/min



2. aerobatic, 1200 and 1600 1/min



recommended main rotor speed: 1200 - 1600 1/min

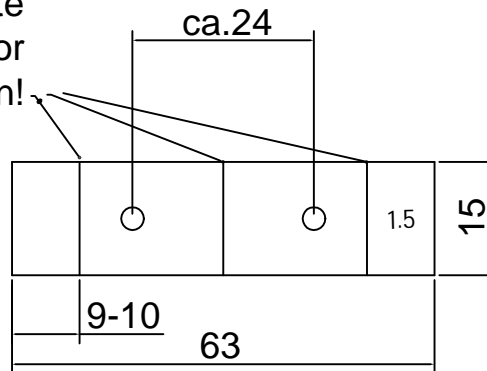
steering deflections:

elevator:	hovering	1200 1/min: 12°	25% Exponential
	forward flight	1200 1/min: 20°	20% Exponential
	aerobatic	1600 1/min: 20°	15% Exponential

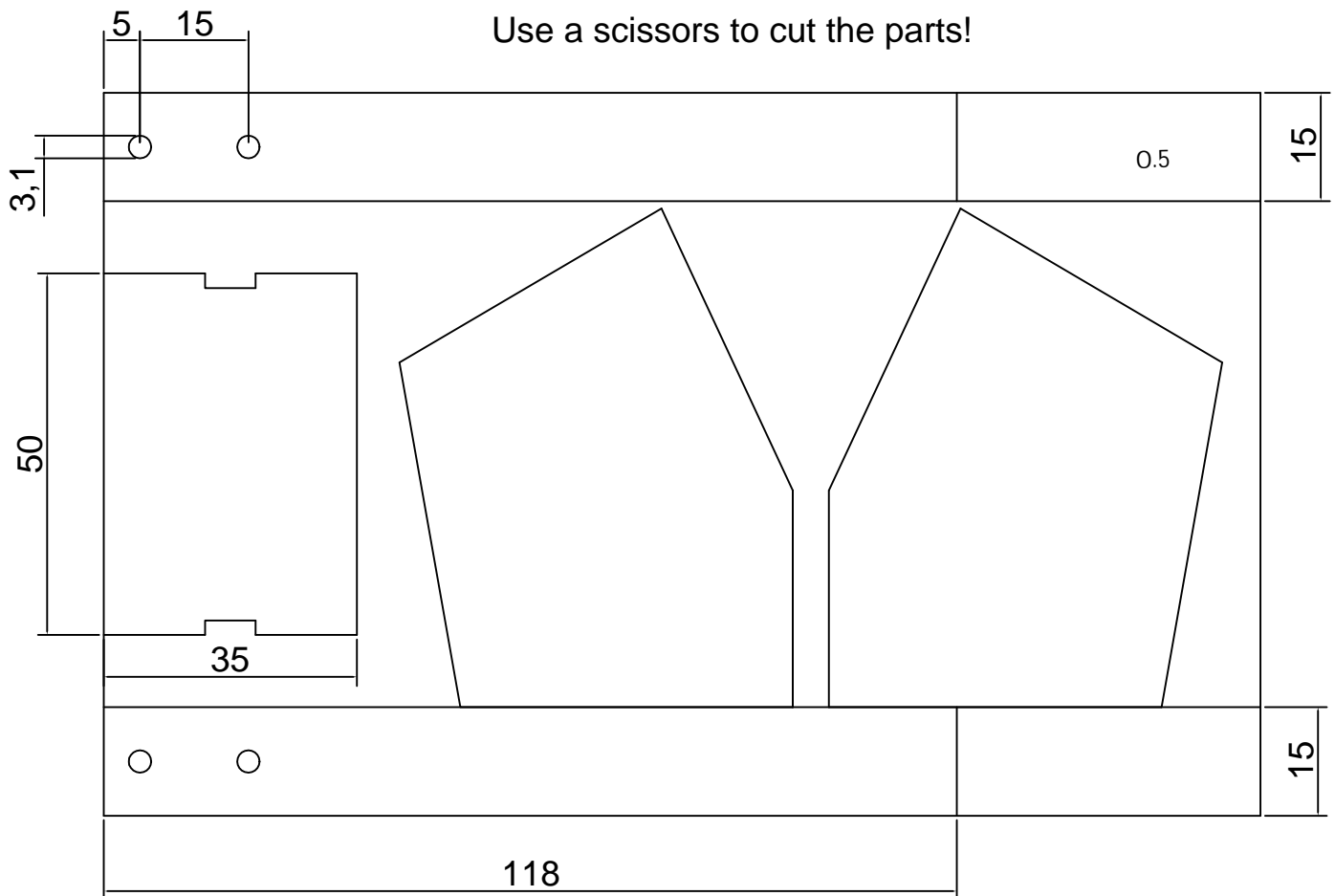
roll:	hovering	1200 1/min: 15°	20% Exponential
	forward flight	1200 1/min: 20°	10% Exponential
	aerobatic	1600 1/min: 20°	10% Exponential

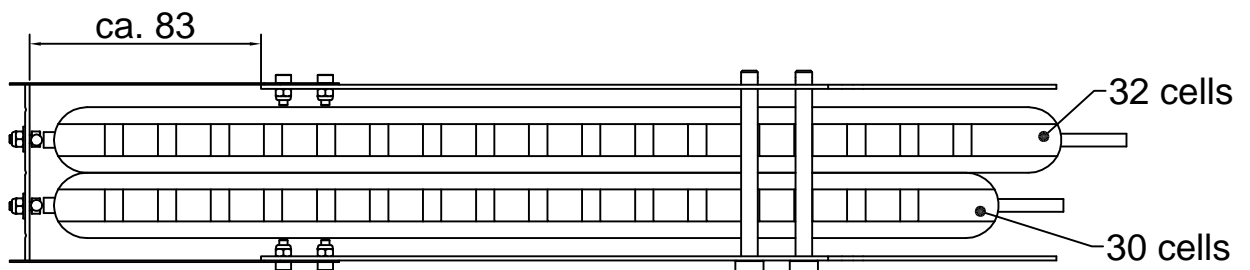
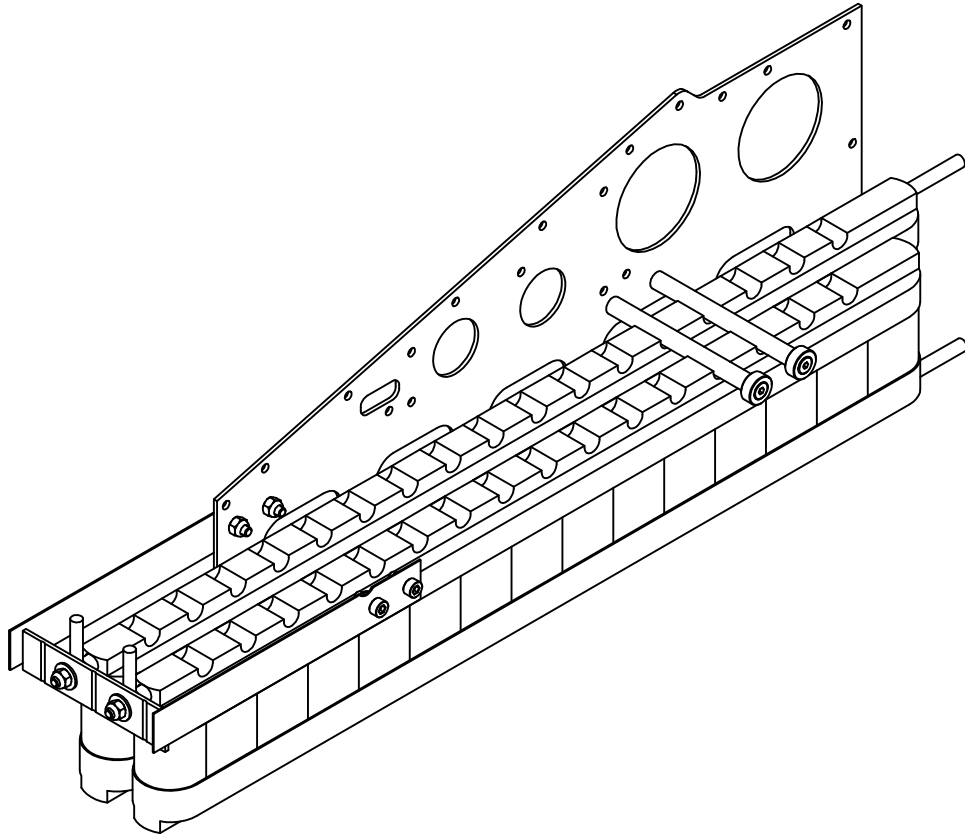
tailrotor:	all phases:	+26°/-10°	30-50% Exponential
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Remove the cooper plate
here with a file for
electric isolation!



Use a scissors to cut the parts!



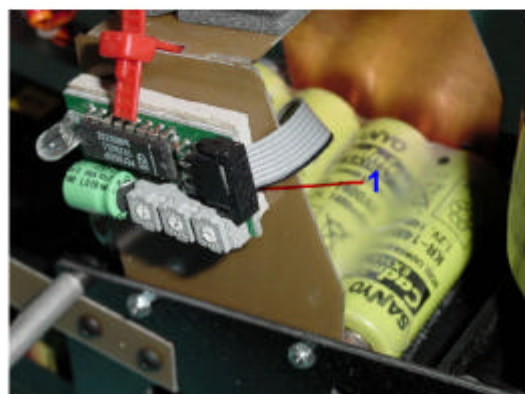
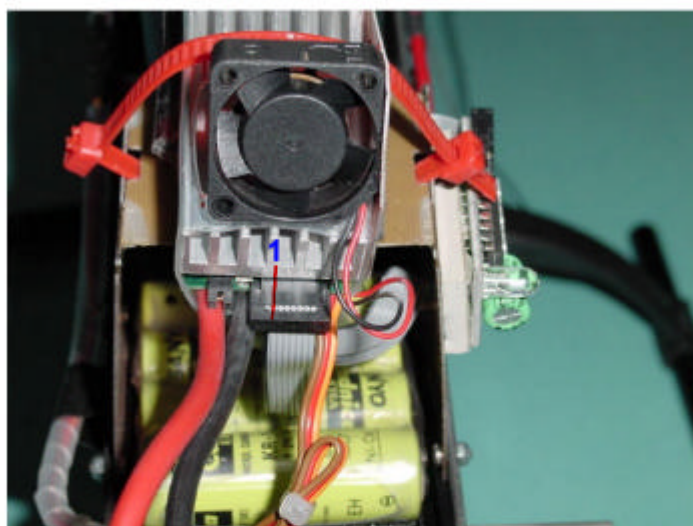
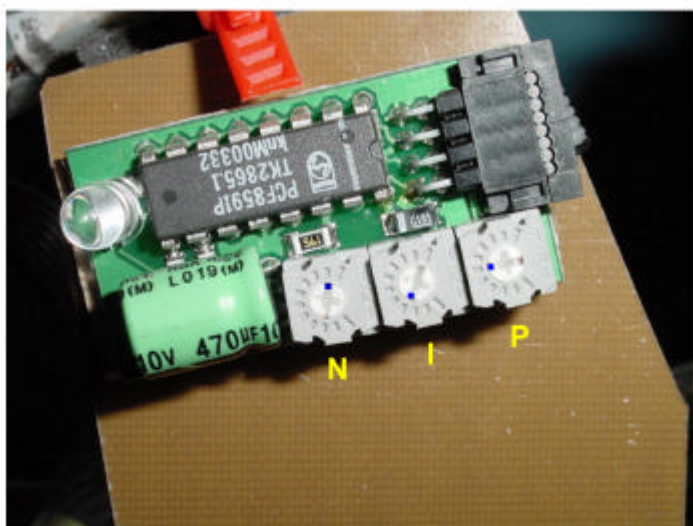
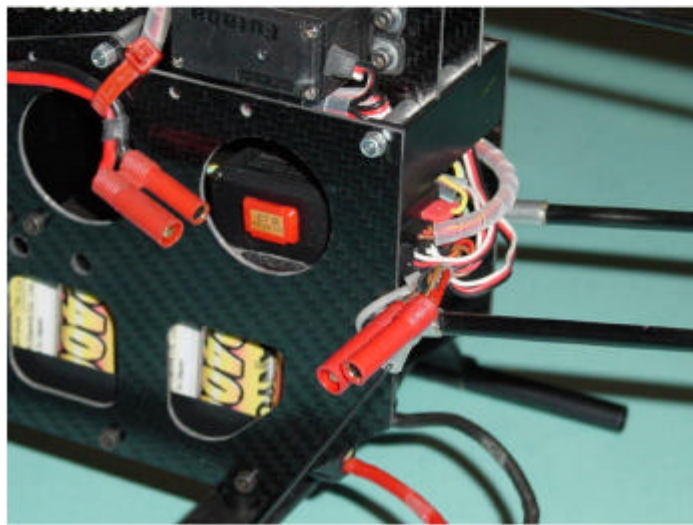
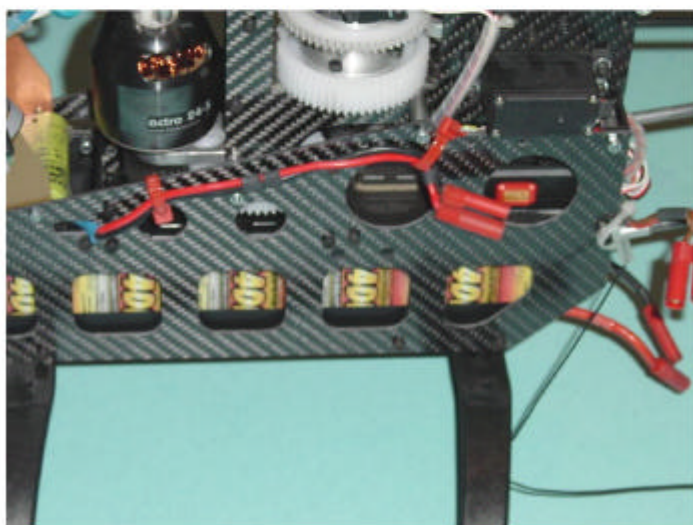
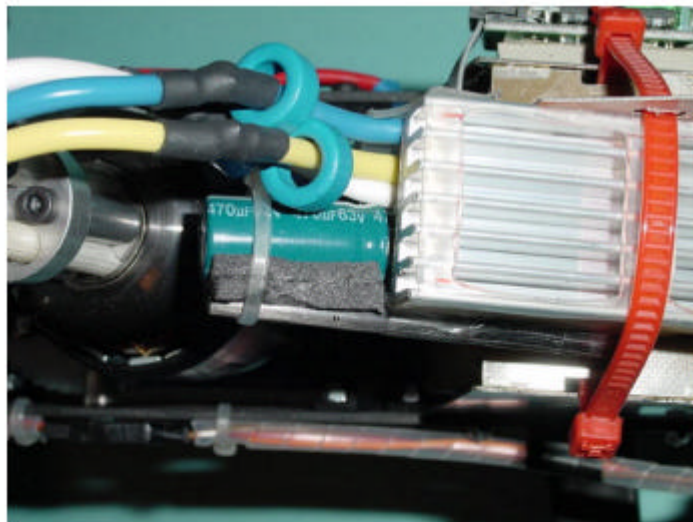
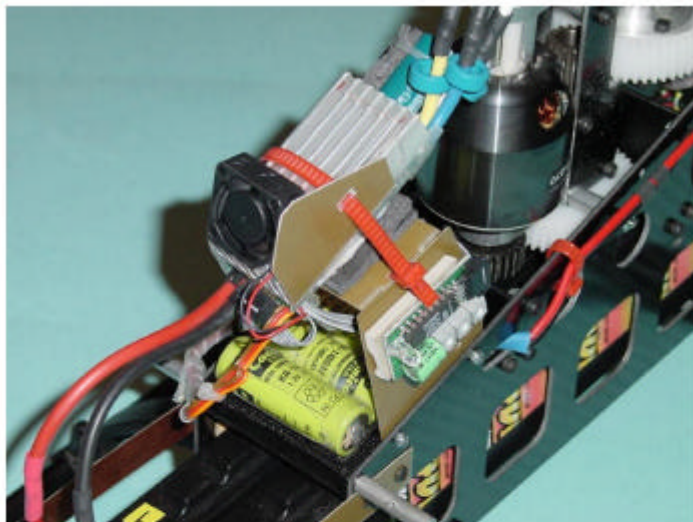


Construction of controler platform: (see pictures)

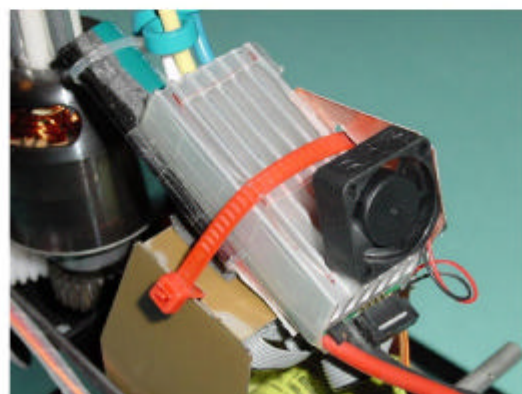
1. Remove the black foil from the fiberglass board and wipe the photosensitive plate off with acetone (nail enamel remover).
2. Cut parts with scissors or a fretsaw, straighten the borders with sand paper and solder them at two points on each side (copper inner side).
3. Mount platform with 4 screws M2 and locking nuts (drill-Ø2.2mm).
4. Fix controller with adhesive tape and cable fittings.

Contruction of battery connector socket: (see pictures)

1. Cut the parts for the fiberglass frame (2 strips 0.5 mm and one cross strip 1,5 mm) from the rest of the board.
2. Solder on the first cell of every battery pack a 4mm gold connector (female). For best results you should build a small wooden frame. Keep a small distance of 0.5 mm from connector to the cell to avoid short circuits.
3. Screw side strips to the frame with 4x M3x8 screws and lock nuts.
4. Solder two brass screws into the gold connectors (male). Remove the heads of the screws with a saw. Screw these units into the 1.5mm cross strip after drilling two holes 24 mm apart in the middle of the strip. File 3 break lines across the copper on the inside of the end plate to avoid short. Fix the connectors to the cross strip and fix battery pack in the chassis frame. Now plug in the connectors and solder the end cross plate at 2 points on each side.
5. Solder cables between connectors and controler.



minicopter



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