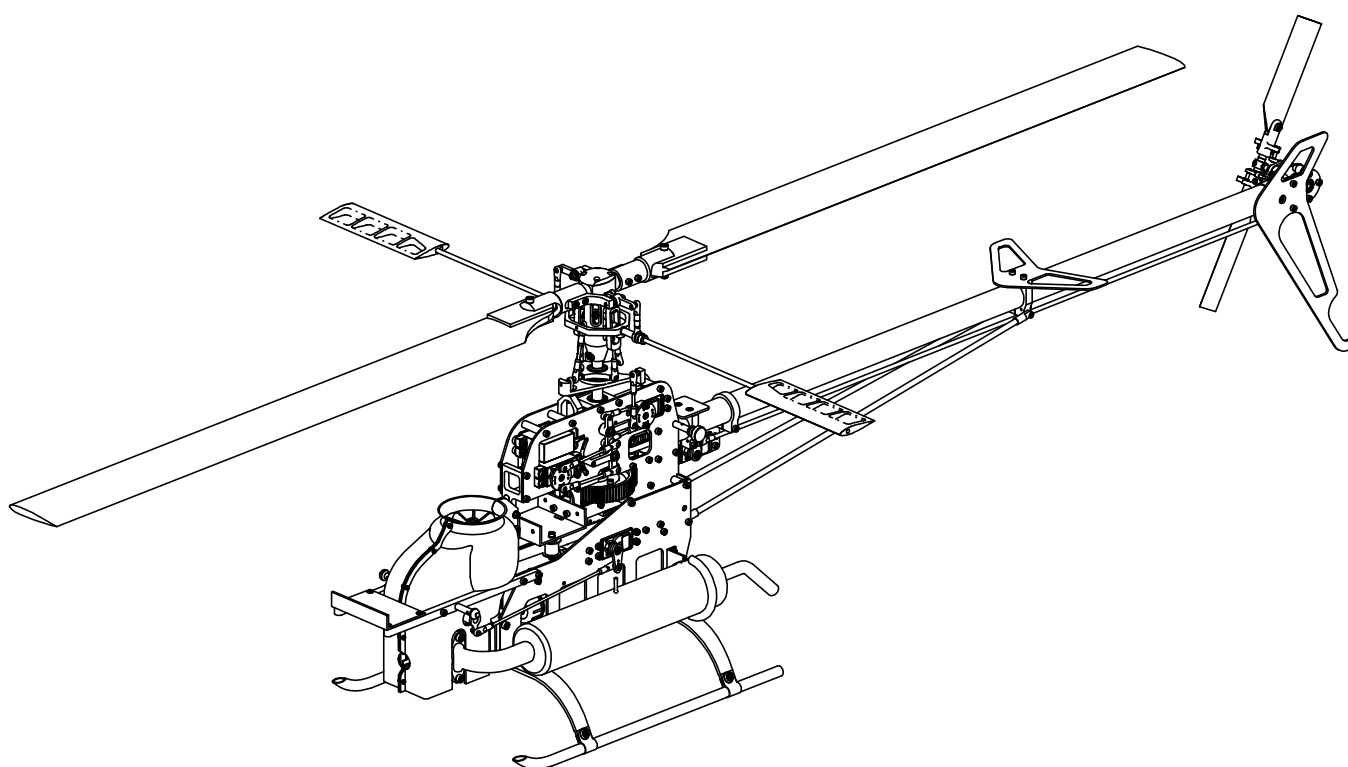


Acrobat

Ord.-No. 3000

Manual



minicopter

Rheinstahlring 47
34246 Vellmar
Germany

Fon: +49 561 9882800 Fax: +49 561 9882801
www.minicopter.de
info@minicopter.de

Version 4
Date: 02/22/05

minicopter

Rheinstahling 47
34246 Vellmar
Fon.: +49 5619882800
Fax.: +49 5619882801
e-mail: info@minicopter.de
www.minicopter.de

Congratulations on the purchase of your *Acrobat* - helicopter.

With this model you have a high power helicopter in your hands, which not only has a very good power to weight ratio for extreme aerobatics but also has a relatively low centre of gravity for good hovering. The Acrobat is manufactured to the highest quality standards which means that you have purchased a helicopter with a long life expectancy. 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:

Thin walled socket wrenches to fit 5,5 and 7 mm nuts.
Open wrench 4,5/5,5 mm
Hexagon wrenches for 2/2,5/3 mm bolts
Hexagon wrench 4 mm a.f. (2 required for the feathering spindle)
Sharp tongs with 45° cranked head
Phillips screwdriver small
Screwdriver flat
Screw lock Loctite 243 blue

Special Tools:

Special open wrench 5,5mm for restricted access to the nuts Ord.-No. 707
Ball joint tongs e.g. Robbe S 1360
Pitch gauge e.g. Robbe S1366
Paddle gauge e.g. Robbe S1368

Lubricants:

Axial bearings: normal machine lubricant (from tool suppliers)
Autorotation coupling: grease or synthetic motor oil
The gear wheels and the belt drives don't use lubricant.

Recommended RC-equipment:

Receiver: Dual conversion PCM-system
RC-battery: 4 cells Sanyo KR 1700AU or cells with similar capacity
Swash-plate servos: Futaba S9252, S9206, S9202 or similar
Throttle-Servo: Futaba S 9202 or similar
Governor (if needed): Futaba GV-1
Gyro: Futaba GY 401 with servo S9253/4 or GY 601 with servo S9251

If you have problems when building your model please contact us. We will help you!

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

Safety rules:

Radio controlled helicopters are **not toys**. Incorrect use of such models can cause accidents with severe injuries.

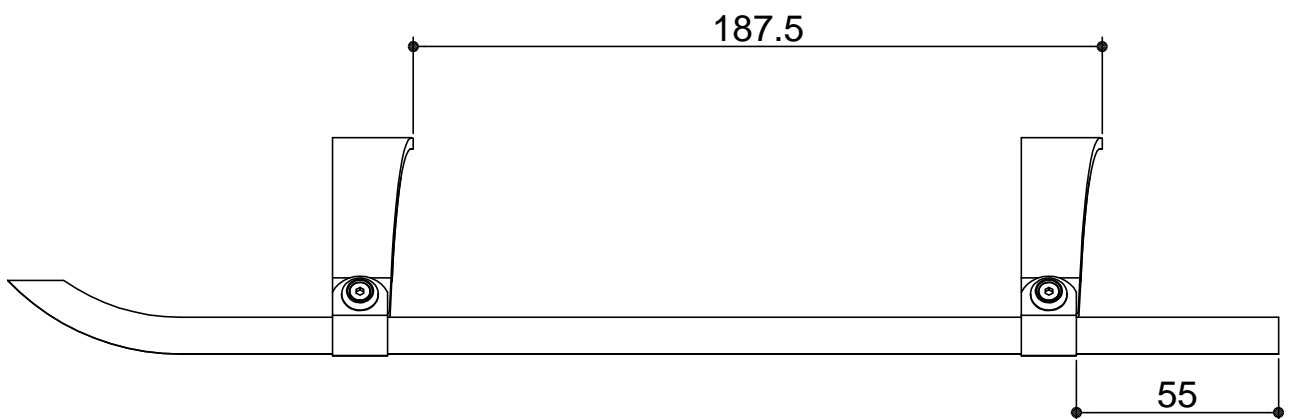
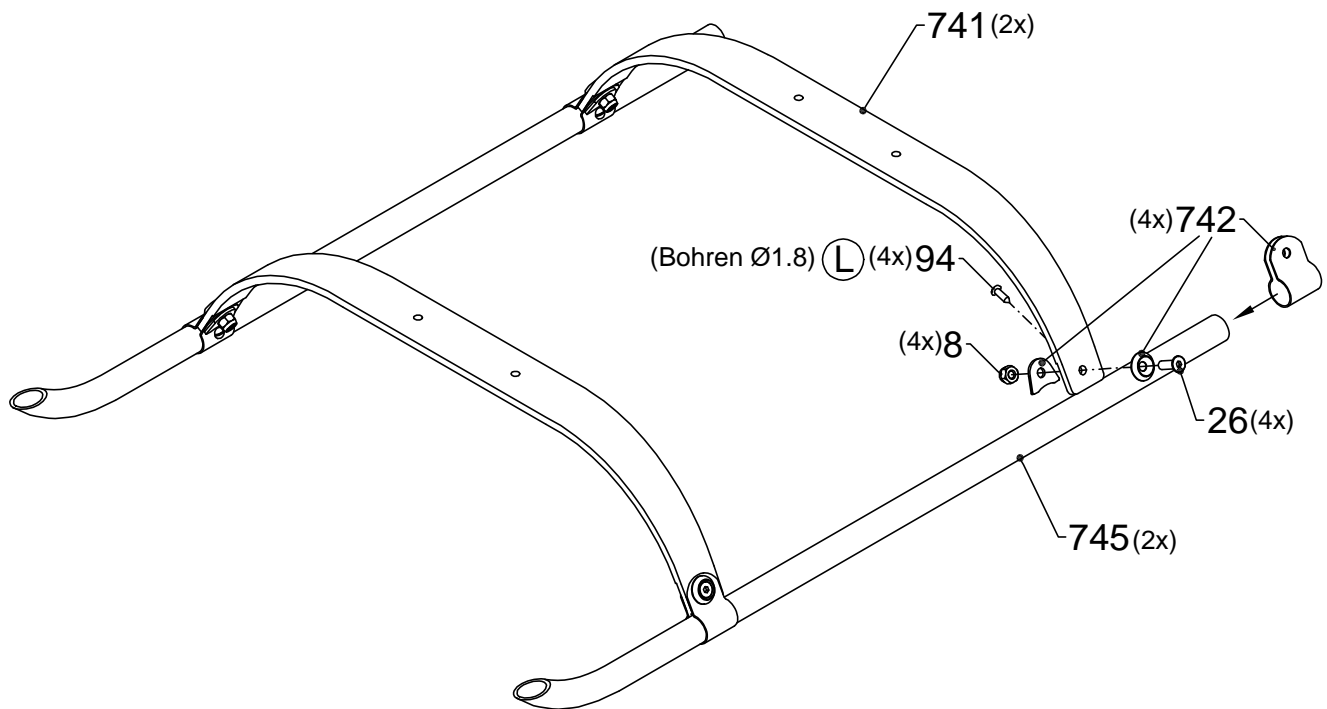
Therefore please bear the following rules in mind:

- Do not make running tests on your workbench or in your hobby room! High risk of injury and of poisoning from exhaust fumes!
- For the first motor run remove the complete main rotor-head including all rods and the tail-rotor blades. Make sure that nothing can come into contact with the tail-rotor. Only when you are sure that the clutch is engaging correctly should you re-fit these components.
- After starting the motor leave the danger areas of main- and tail-rotor as soon as possible.
- If you don't have experience with the handling of glow engines please contact a modeller who does.
- In hovering flight please keep a distance of at least 5 metres from the helicopter.
- Don't fly near other people or animals and keep a security distance of at least 20 metres.
- Don't leave the secure area for autorotations if you tend to fly the tank to empty, if you can't autorotate set a timer on your transmitter.
- Always keep a check on the tank contents while flying. A 90 size engine has a large fuel consumption and in extreme cases the tank can be empty in less than 10 minutes.
- The Acrobat has an extreme power to weight ratio. This means an experienced pilot can fly extreme manoeuvres with ease. But please always maintain sufficient safety distance especially if you are in training. Remember that even a small control error can very quickly lead to a very big deviation from the intended (safe) flight line.
- Do not overstretch yourself in training and avoid too much pressure to perform. Do your exercises with a systematic aim. A few well prepared flights bring more progress than monotonous figure training.

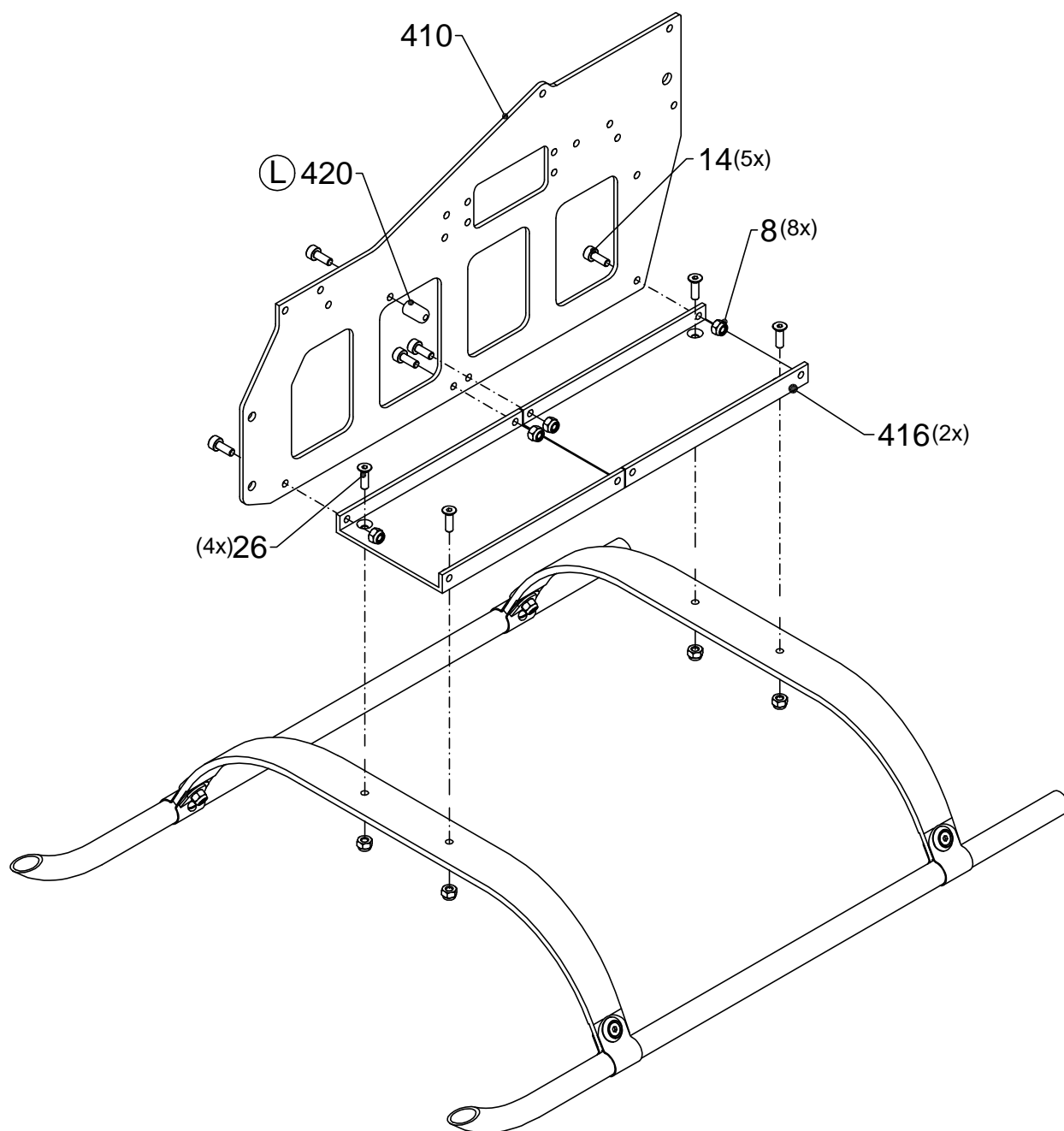
Liability exclusion:

We can't control correct assembly, adjustment, maintenance and usage.
So **no safety guarantee is possible**.

Vellmar, in november 2003



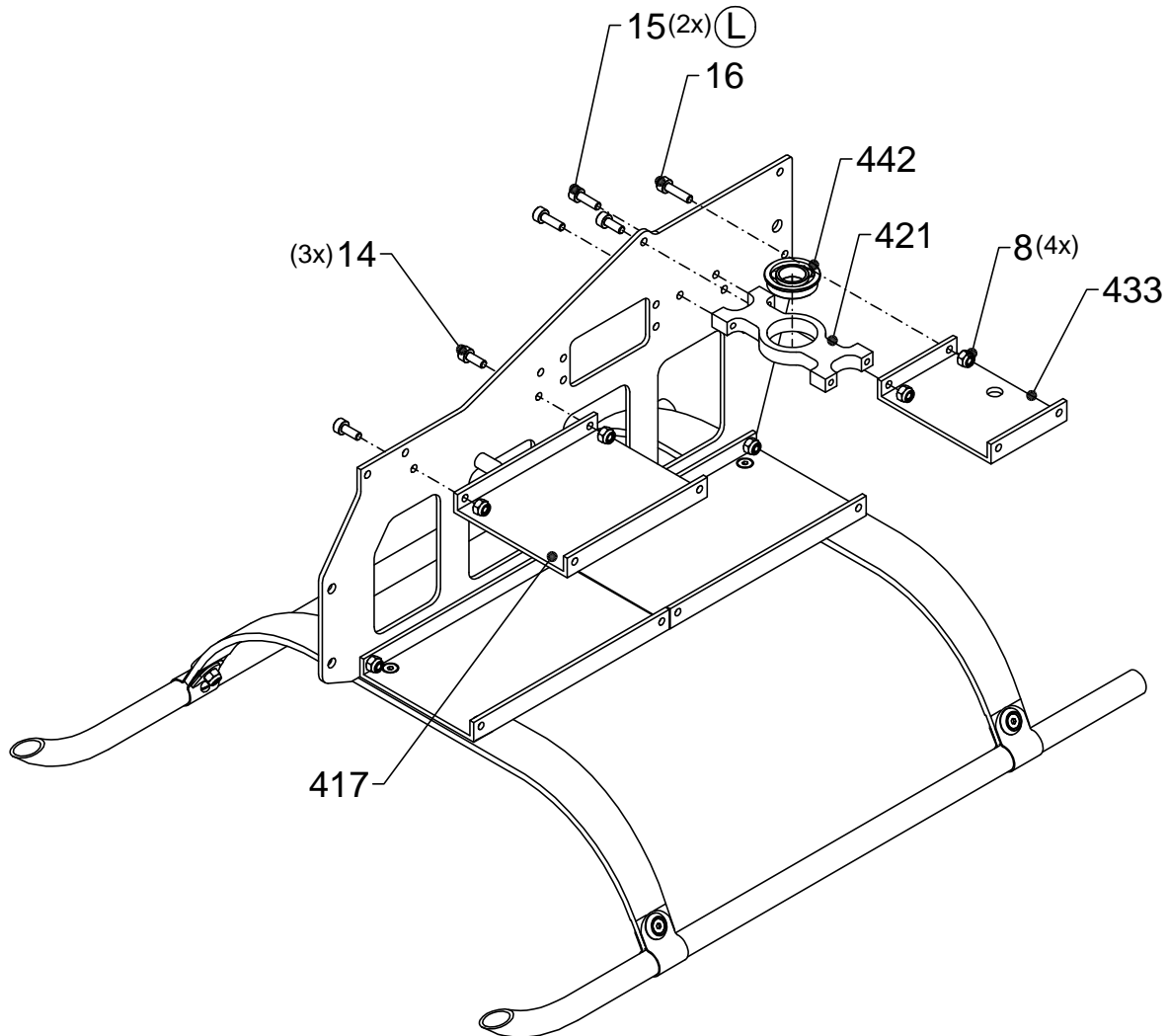
(L) = use Loctite



8 = locknut M3
14 = hexagon socket screw M3 x 8
26 = hexagon flat head screw M3 x 10

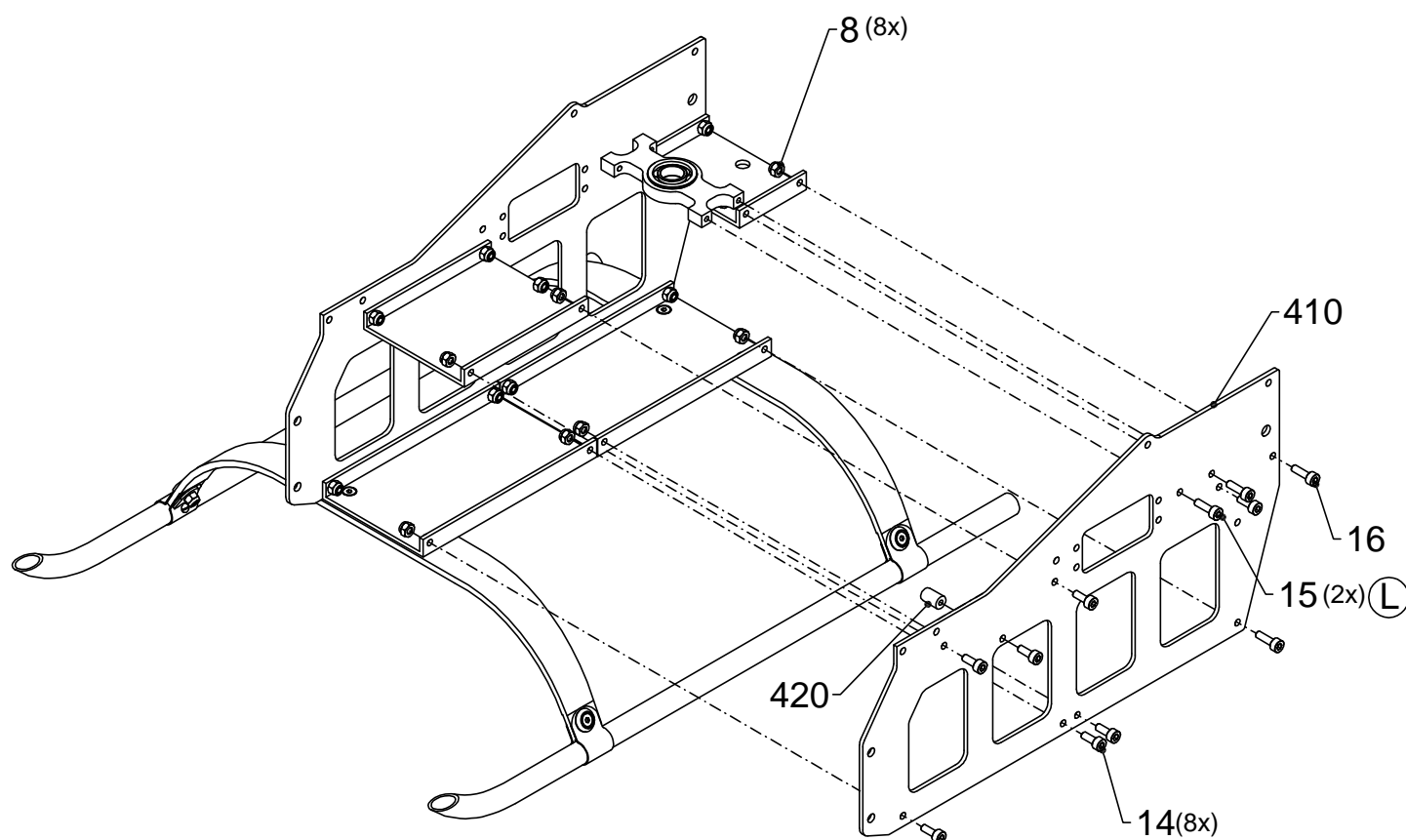
Ⓛ = use Loctite

Do not tighten Part.-No. 15 and 16 yet!



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

Ⓛ = use Loctite



Do not tighten Part.No. 15 and 16 yet!

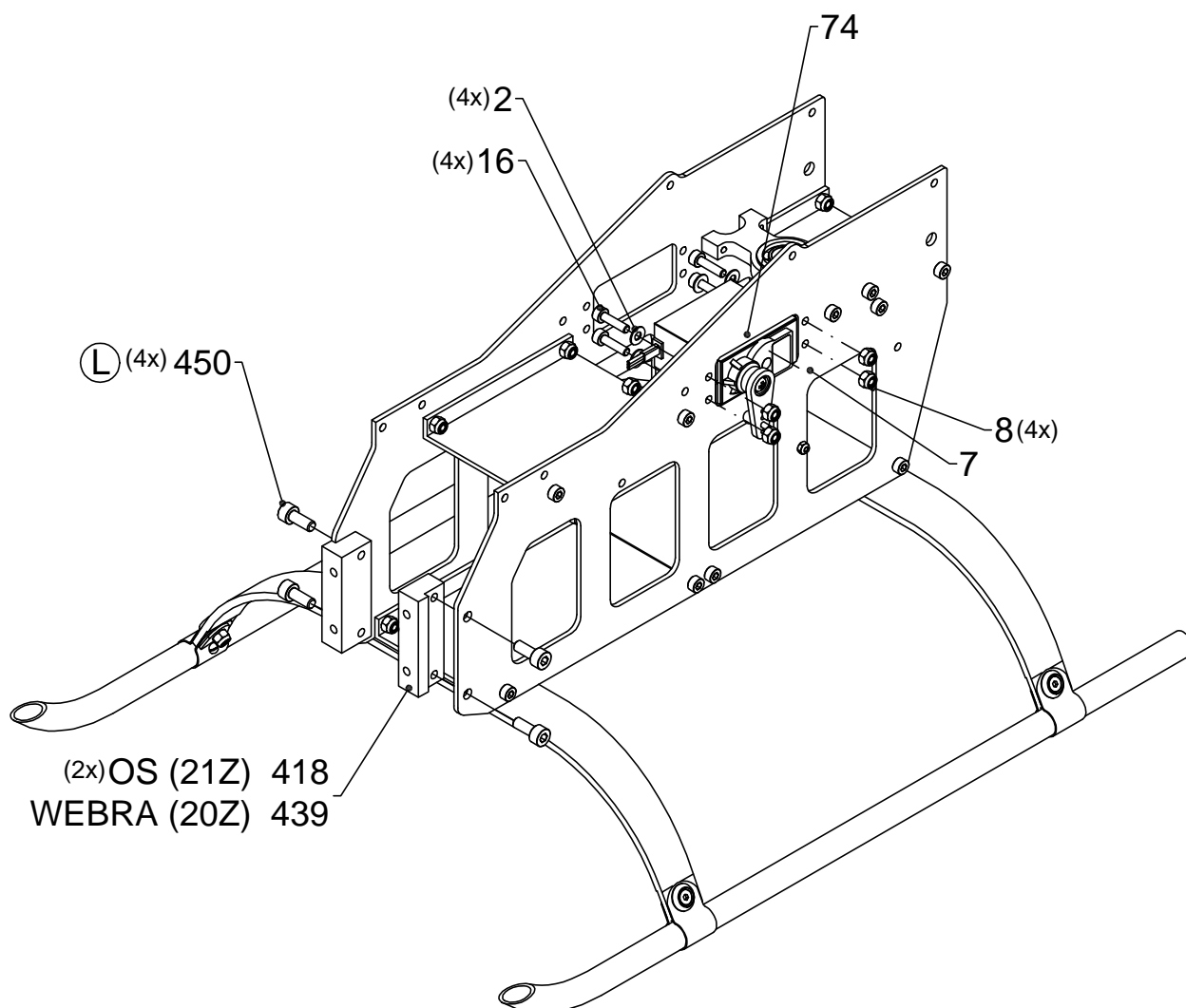
8 = lock nut M3

14 = hexagon socket screw M3 x 8

15 = hexagon socket screw M3 x 10

16 = hexagon socket screw M3 x 12

Ⓛ = use Loctite



2 = washer M3

7 = lock nut M2

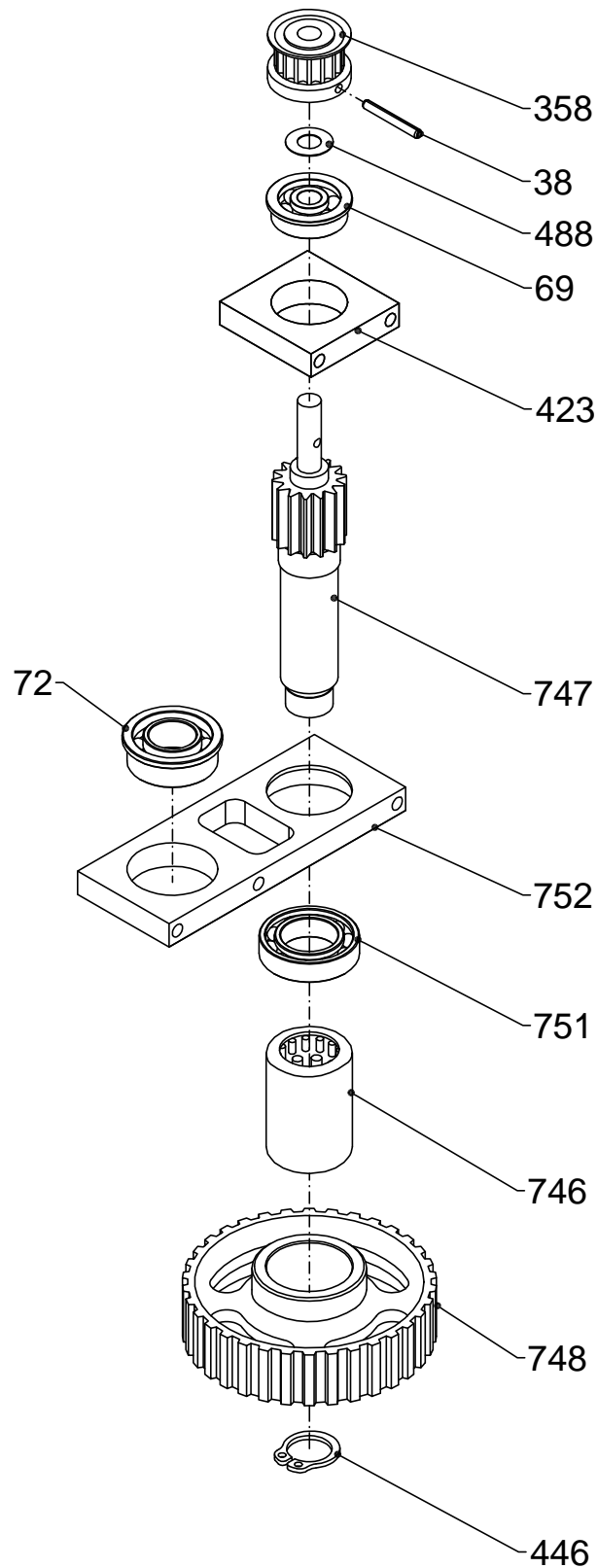
8 = lock nut M3

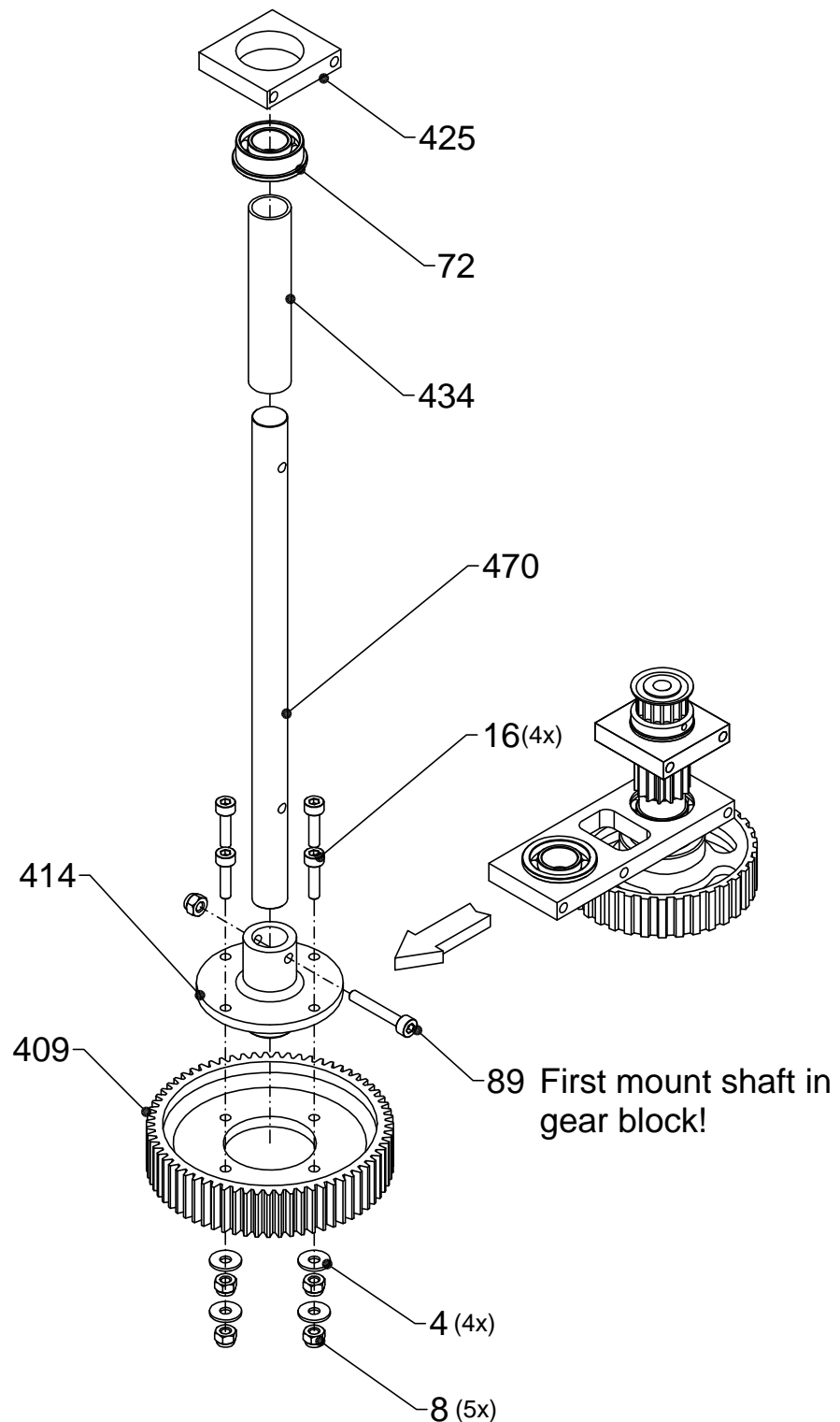
16 = hexagon socket screw M3 x 12

74 = joint bolt M2 x 4

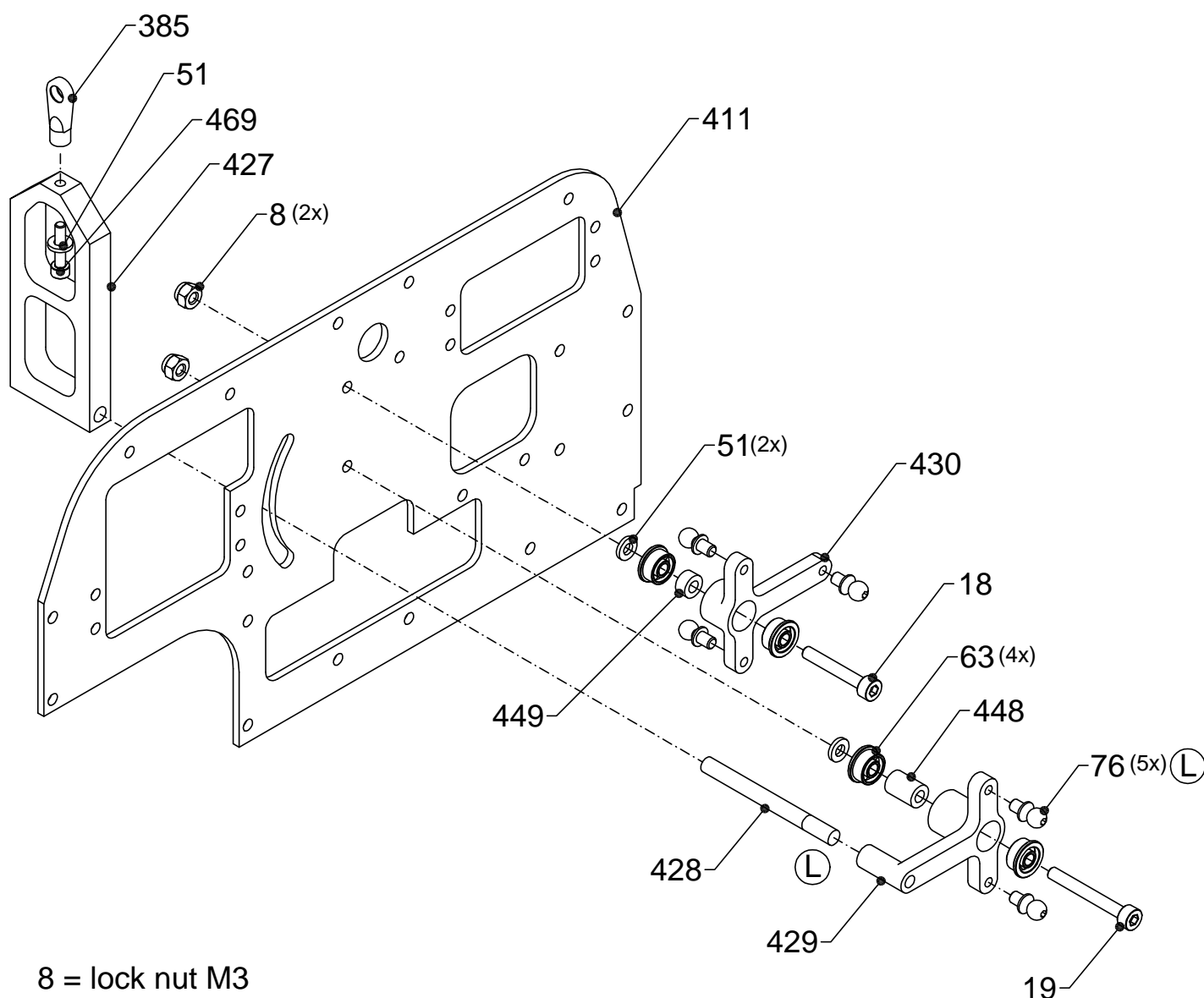
450 = hexagon socket screw M4 x 10

(L) = use Loctite



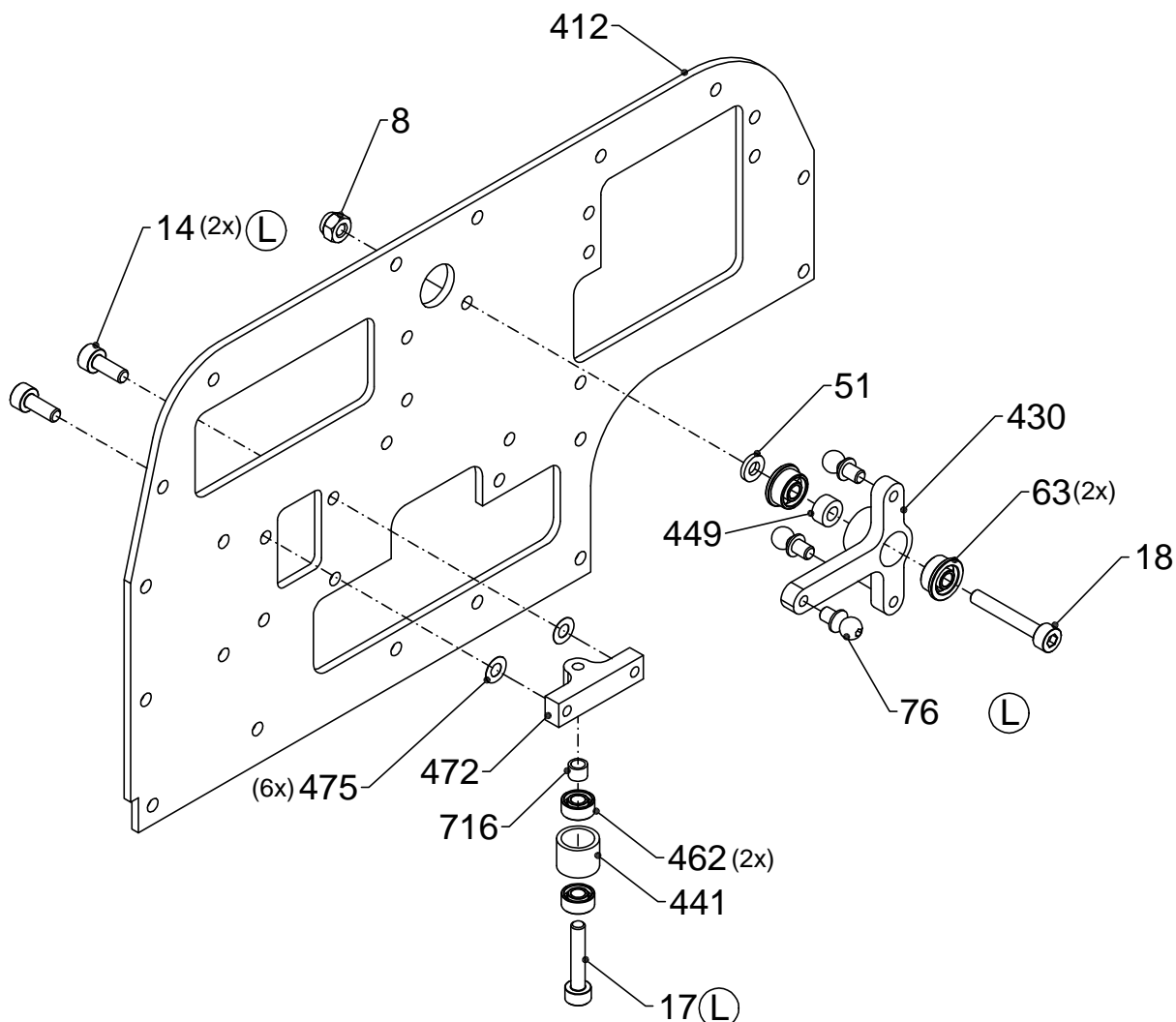


4 = washer M3 large
 8 = lock nut M3
 16 = hexagon socket screw M3 x 12
 72 = ball bearing with flange F10x19x7



- 8 = lock nut M3
 18 = hexagon socket screw M3 x 20
 19 = hexagon socket screw M3 x 25
 41 = ball joint 2.5
 51 = shim 3 x 6 x 1
 63 = ball bearing with flange F3 x 8 x 4
 76 = joint bolt M3 x 4
 469 = hexagon socket screw M2.5 x 12

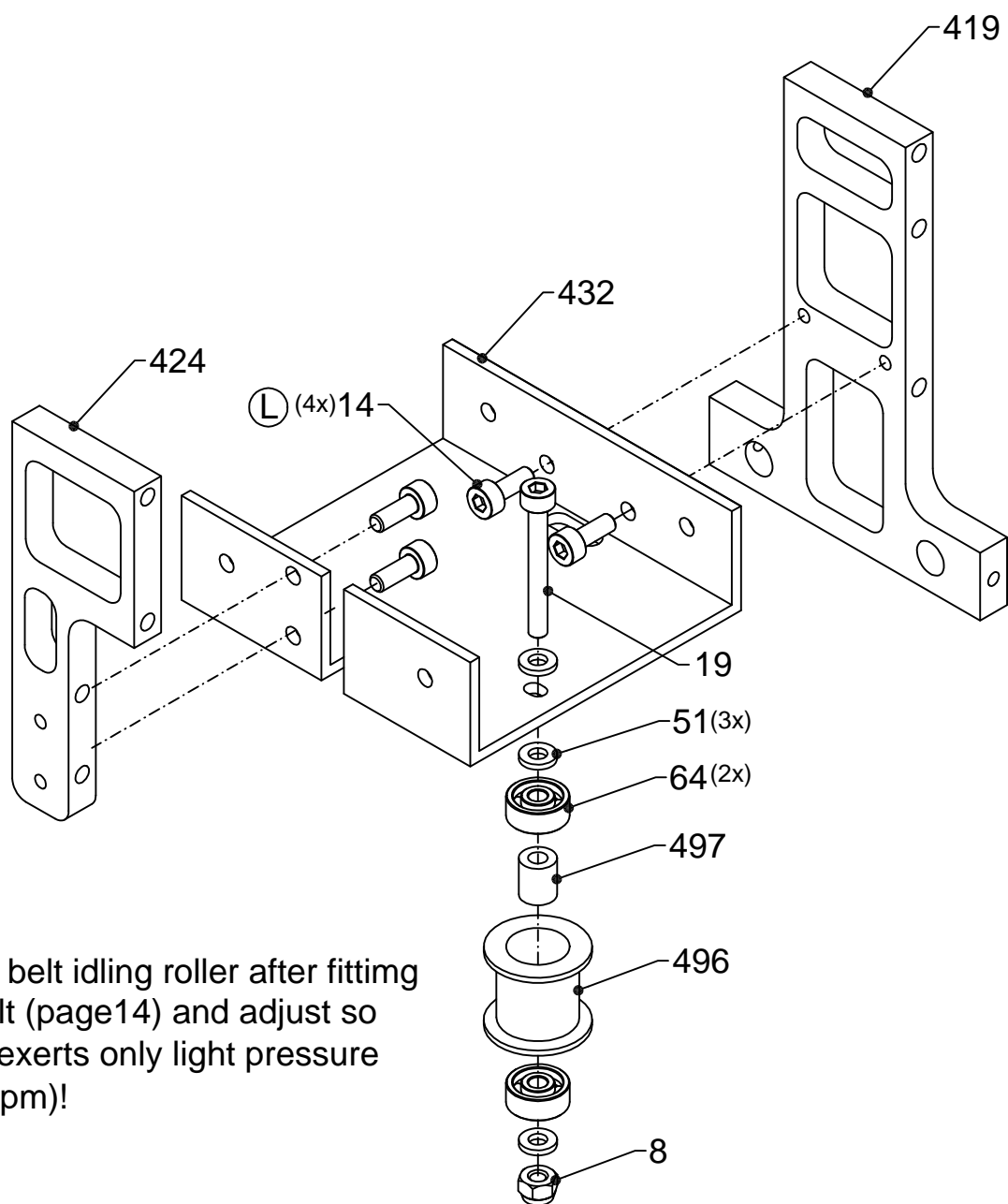
Ⓛ = use Loctite



Bearing carrier should be tightened up after the belt is fitted! Use shims 3x6x0.1 for the right distance to the belt! Distance between bearing and belt about 0.2-0.3mm! Bearing may NOT run with the belt during normal usage!!

- 8 = lock nut M3
- 14 = hexagon socket screw M3 x 8
- 17 = hexagon socket screw M3 x 16
- 18 = hexagon socket screw M3 x 20
- 51 = shim 3 x 6 x 1
- 63 = ball bearing F3 x 8 x 4
- 76 = joint bolt M3 x 4

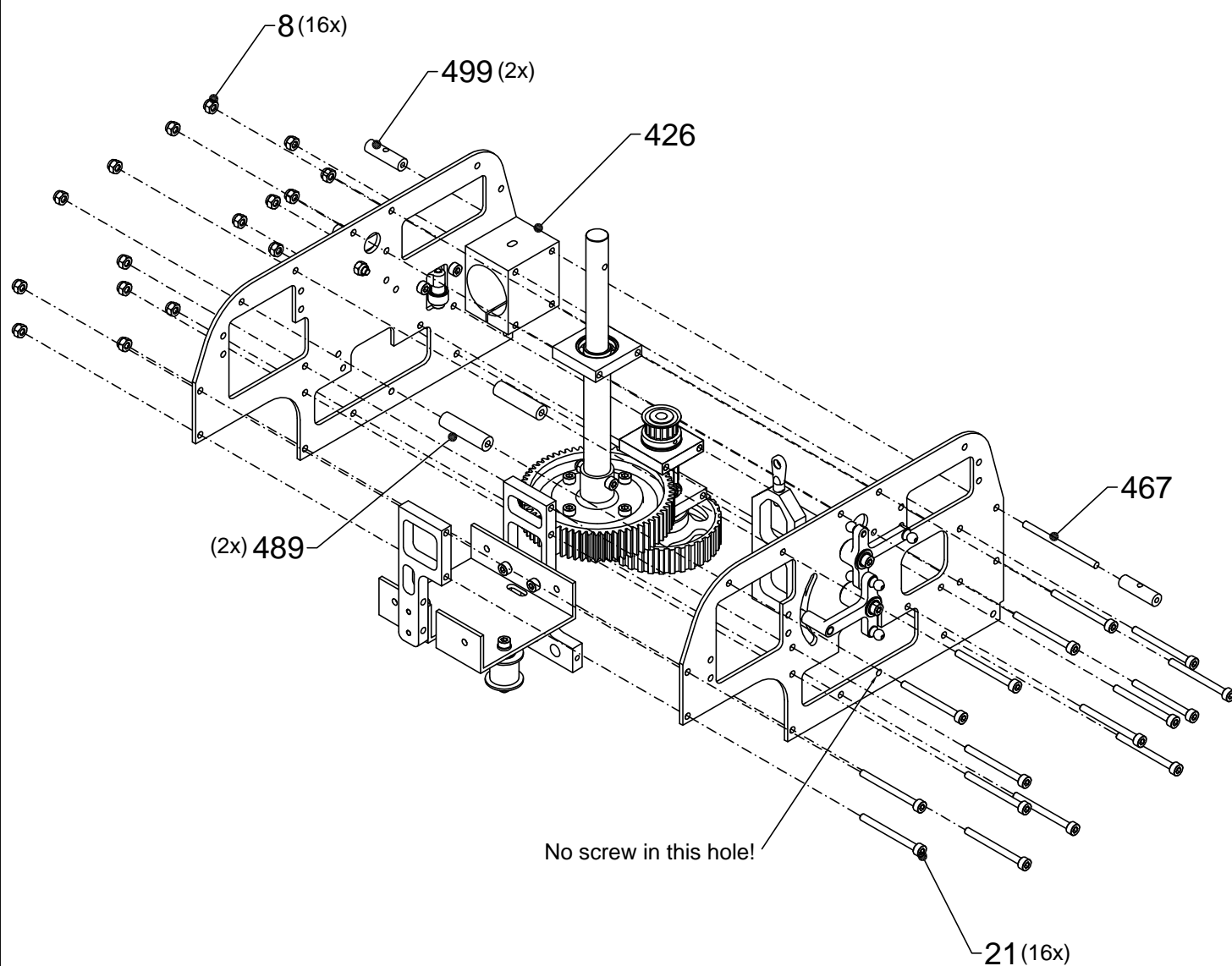
(L) = use Loctite



Fit the belt idling roller after fitting the belt (page 14) and adjust so that it exerts only light pressure (high rpm)!

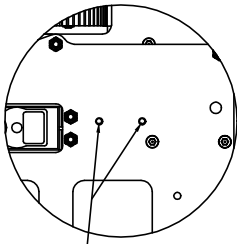
- 8 = lock nut M3
- 14 = hexagon socket screw M3 x 8
- 19 = hexagon socket screw M3 x 8
- 51 = shim 3 x 6 x 1
- 64 = ball bearing 3 x 10 x 4

Ⓛ = use Loctite

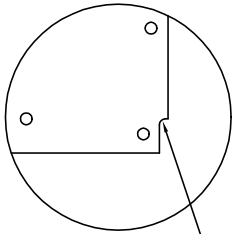


8 = lock nut M3

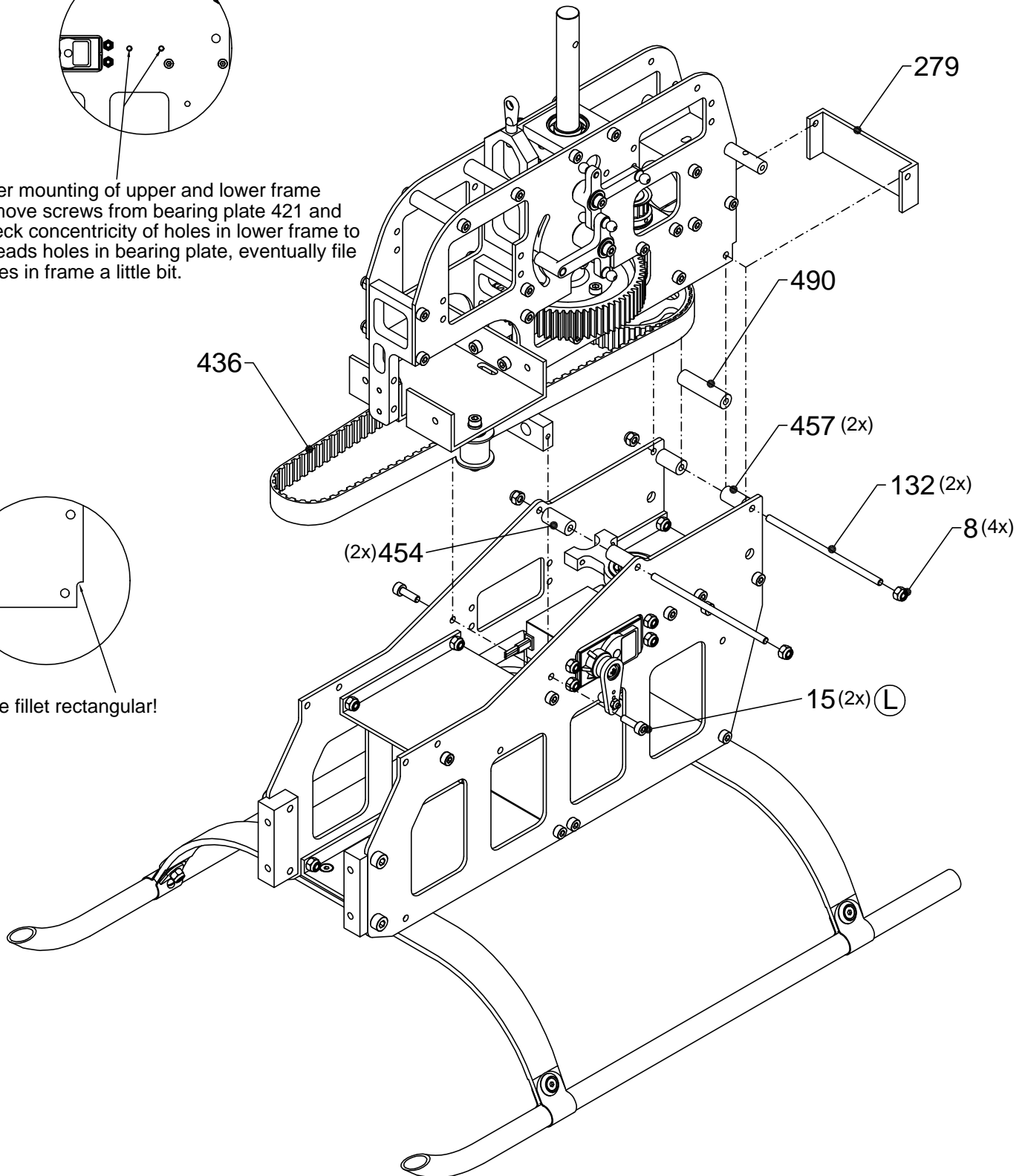
21 = hexagon socket screw M3 x 35



After mounting of upper and lower frame remove screws from bearing plate 421 and check concentricity of holes in lower frame to threads holes in bearing plate, eventually file holes in frame a little bit.



file fillet rectangular!

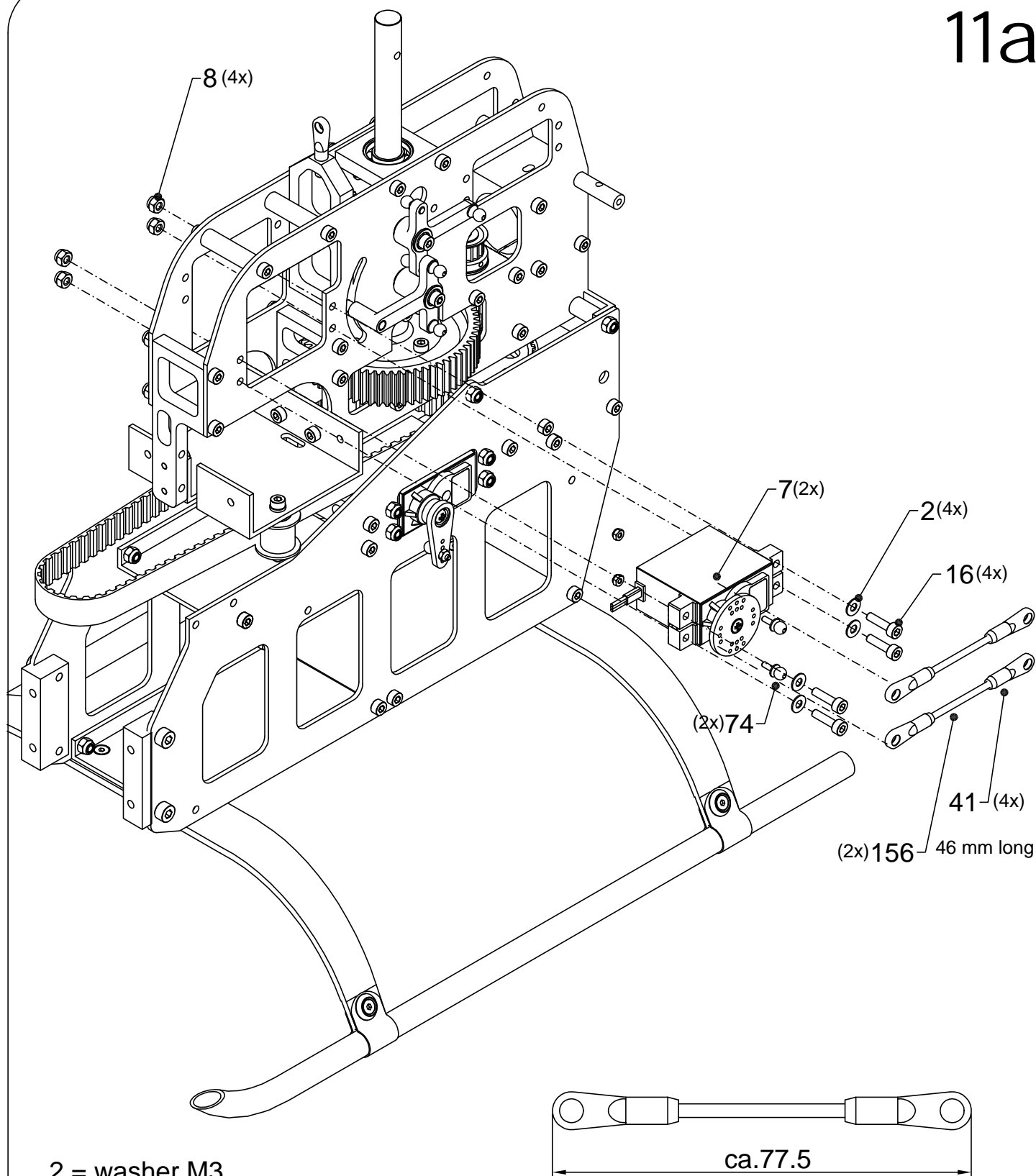


8 = lock nut M3

15 = hexagon socket screw M3 x 10

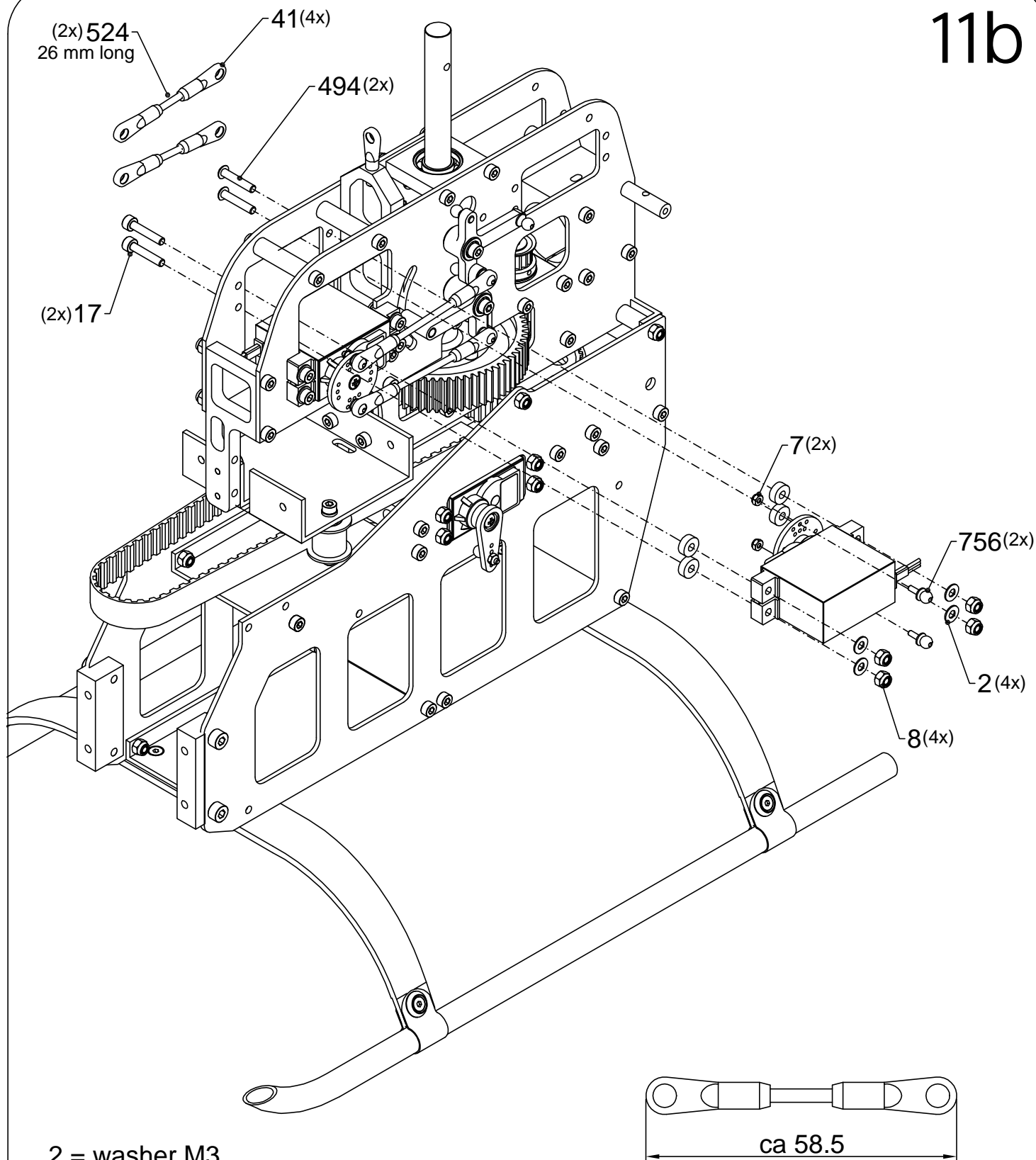
(L) = use Loctite

11a



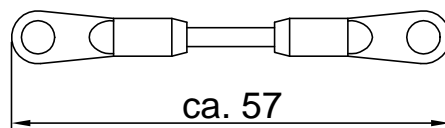
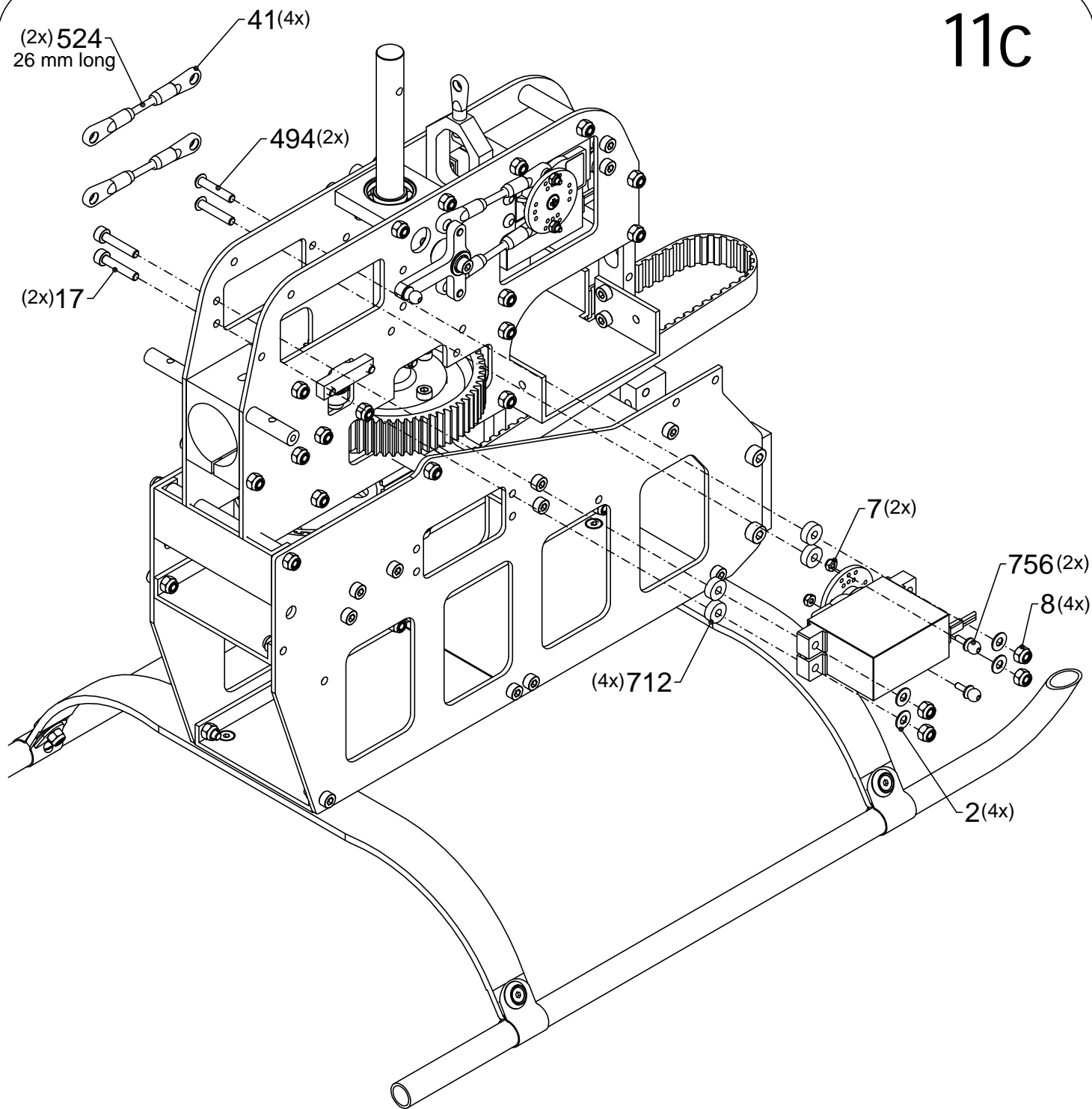
- 2 = washer M3
- 7 = lock nut M2
- 8 = lock nut M3
- 16 = hexagon socket screw M3 x 12
- 41 = ball joint 2.5

11b

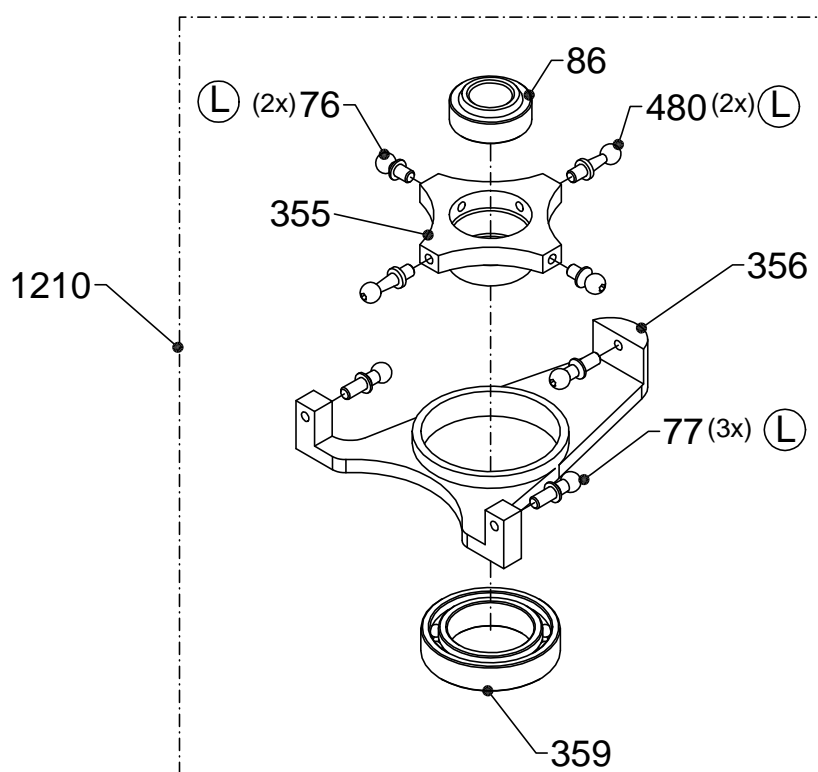


- 2 = washer M3
- 7 = lock nut M2
- 8 = lock nut M3
- 16 = hexagon socket screw M3 x 12
- 41 = ball joint 2.5

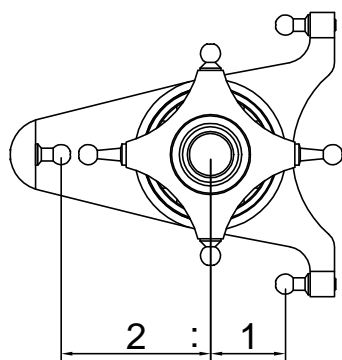
11c



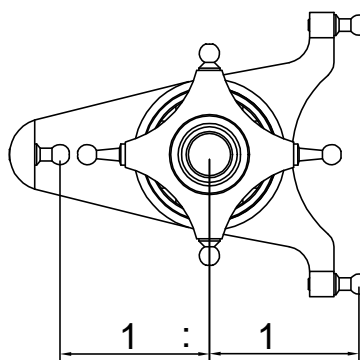
- 2 = washer M3
- 7 = lock nut M2
- 8 = lock nut M3
- 16 = hexagon socket screw M3 x 12
- 41 = ball joint 2.5



120°-mode (recommended)

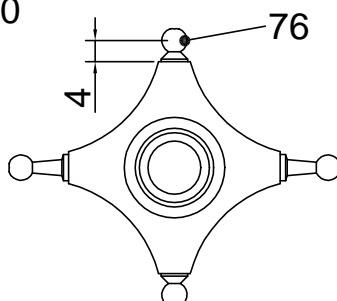


140°-mode

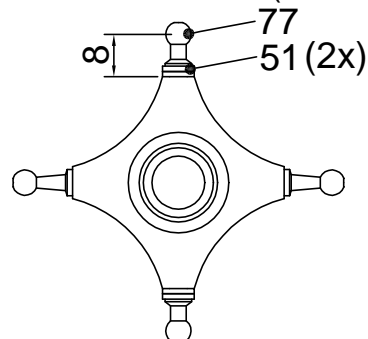


Screw the joint balls 480
with care!

FAI/3D-soft



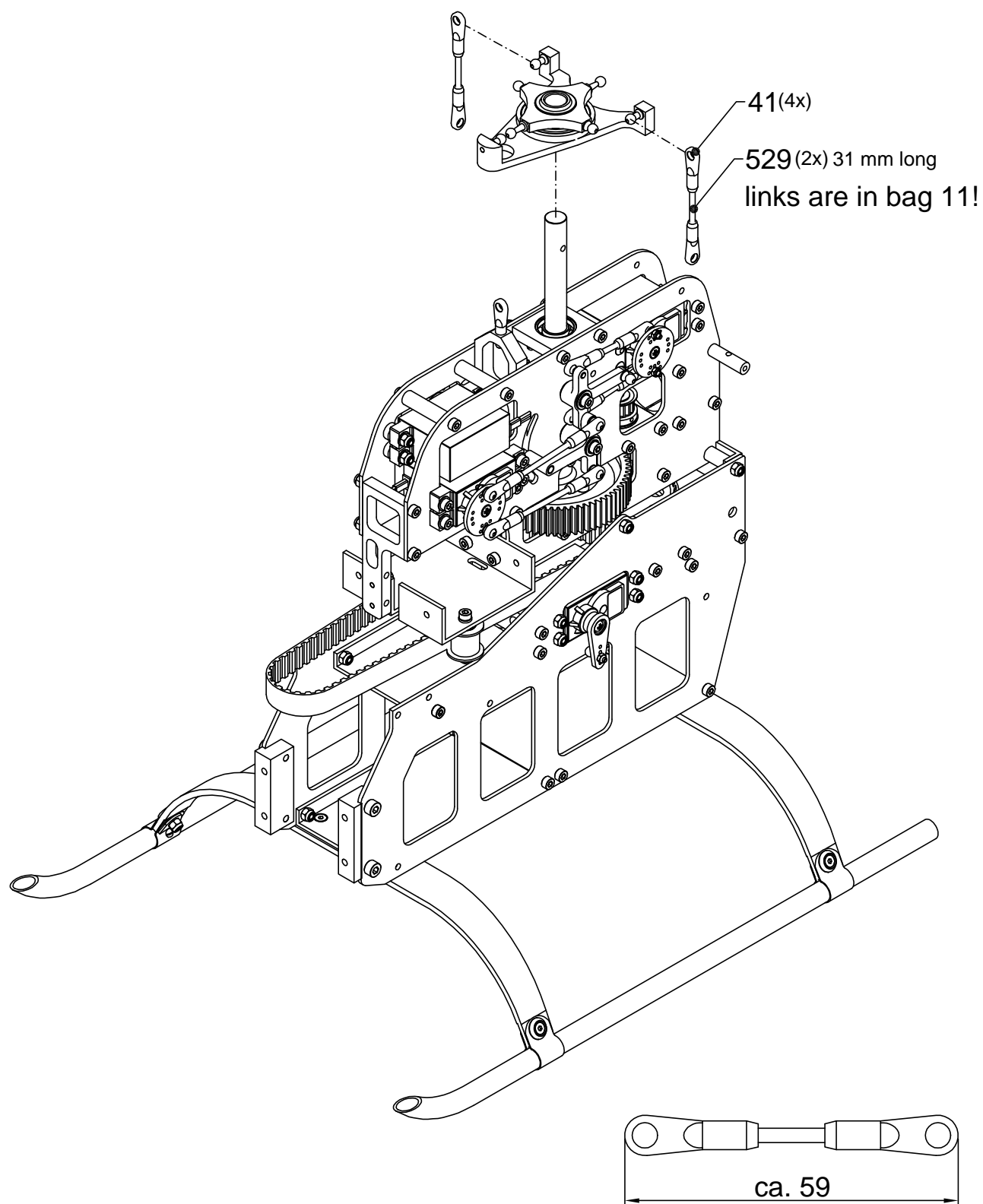
3D-hard (US-style)



51 = washer 3 x 6 x 1
76 = joint bolt M 3 x 4
77 = joint bolt M 3 x 6
78 = joint bolt M 3 x 9

(L) = use Loctite

12b



41 = ball joint 2.5

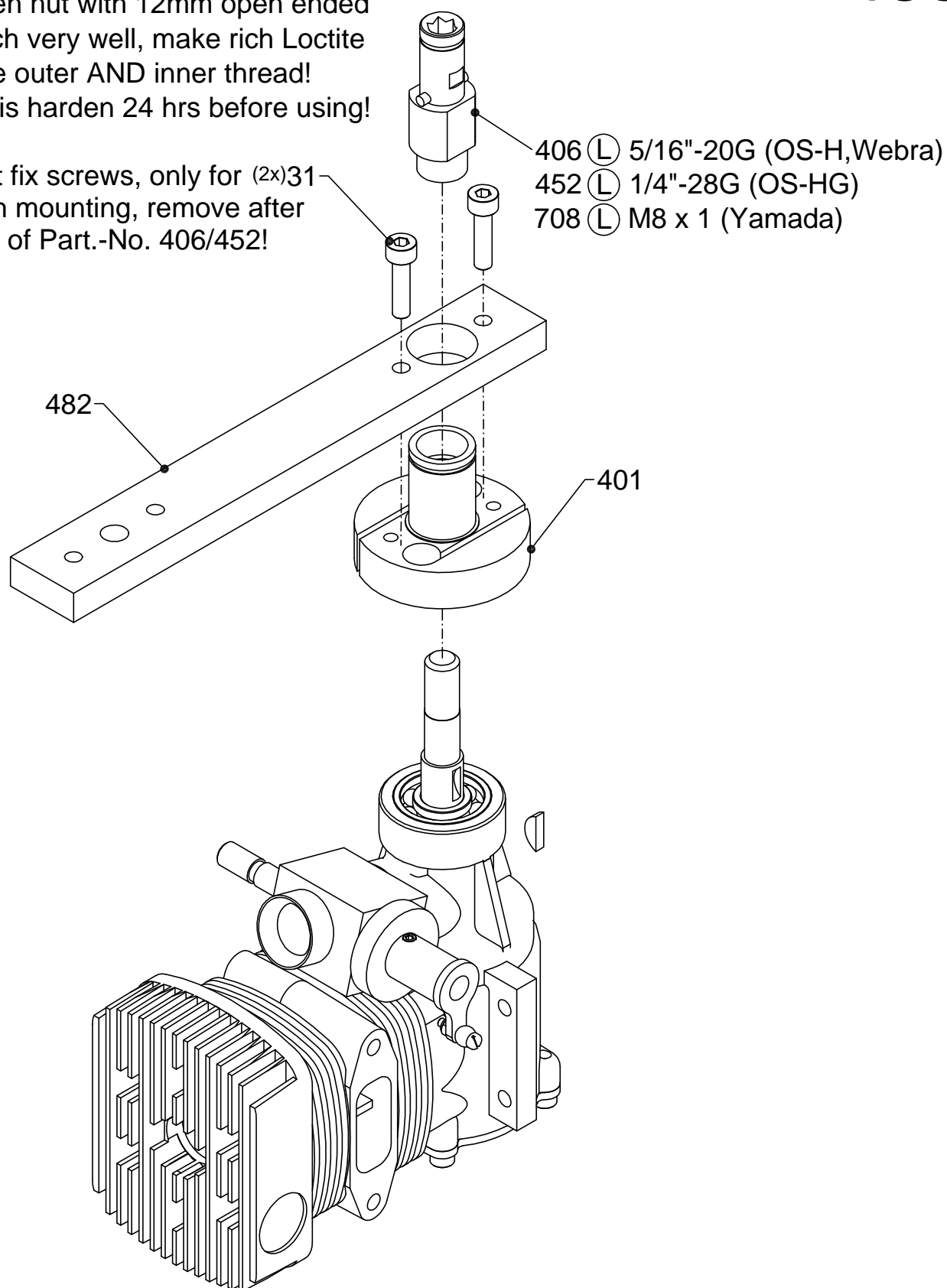
minicopter®

manual

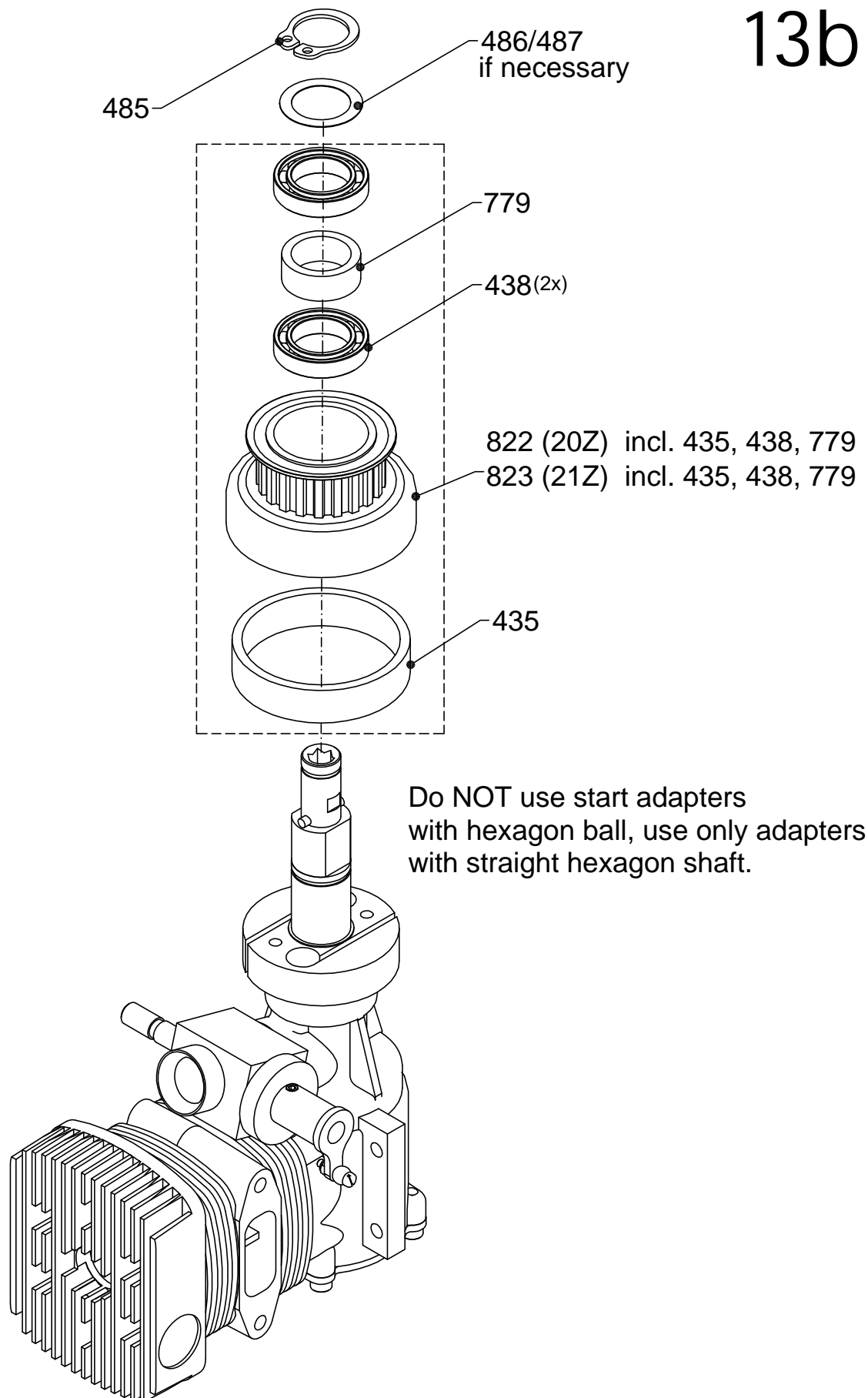
ACROBAT

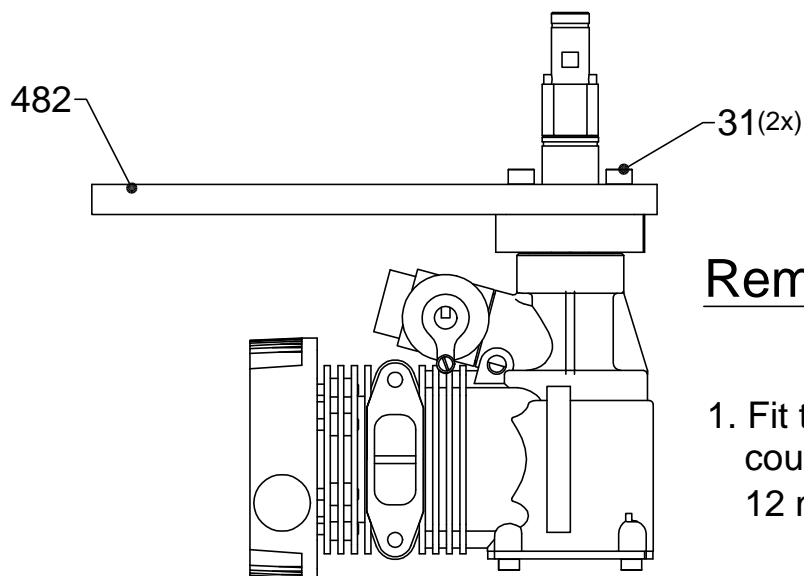
Tighten nut with 12mm open ended wrench very well, make rich Loctite on the outer AND inner thread!
Let this harden 24 hrs before using!

Don't fix screws, only for (2x)31 clutch mounting, remove after fixing of Part.-No. 406/452!



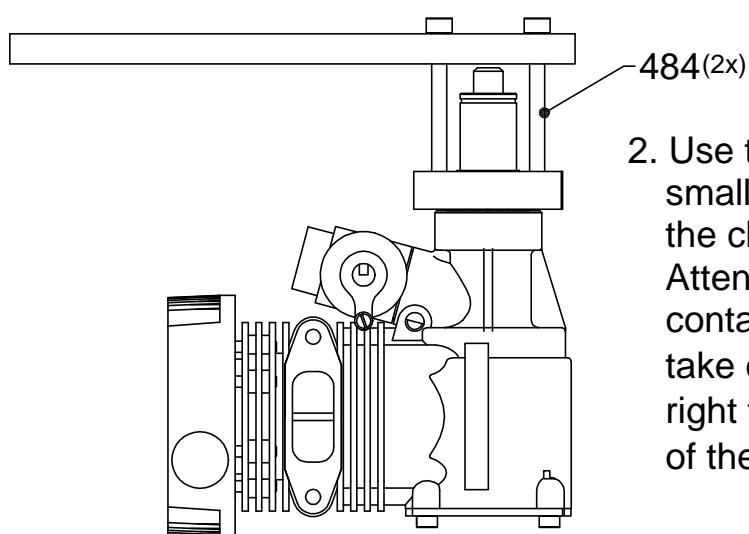
(L) = use Loctite



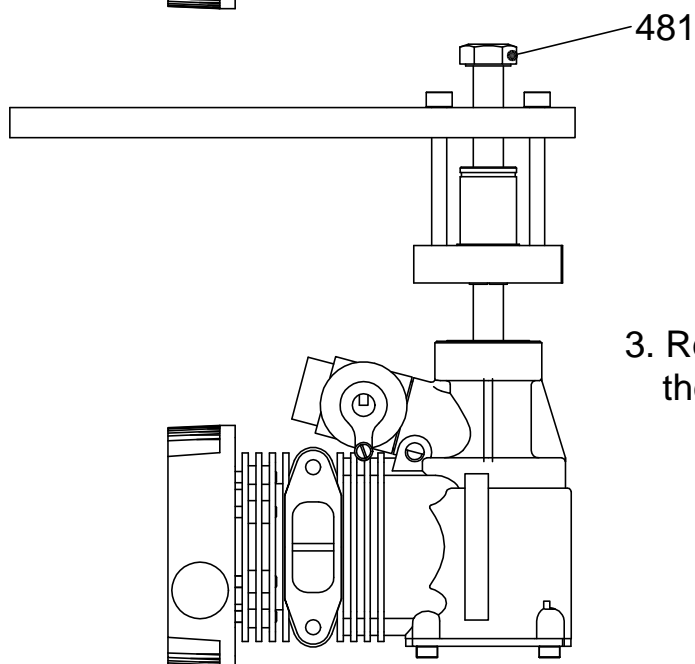


Removing of clutch:

1. Fit tool and remove coupling nut 406 with a 12 mm open ended wrench



2. Use the other end of the tool (with the small M8 threaded hole) and attach the clutch with long M4-bolts. Attention! The Tool must not come into contact with the top of the clutch and take care not to screw the long M4-bolts right through the clutch into the front of the engine!

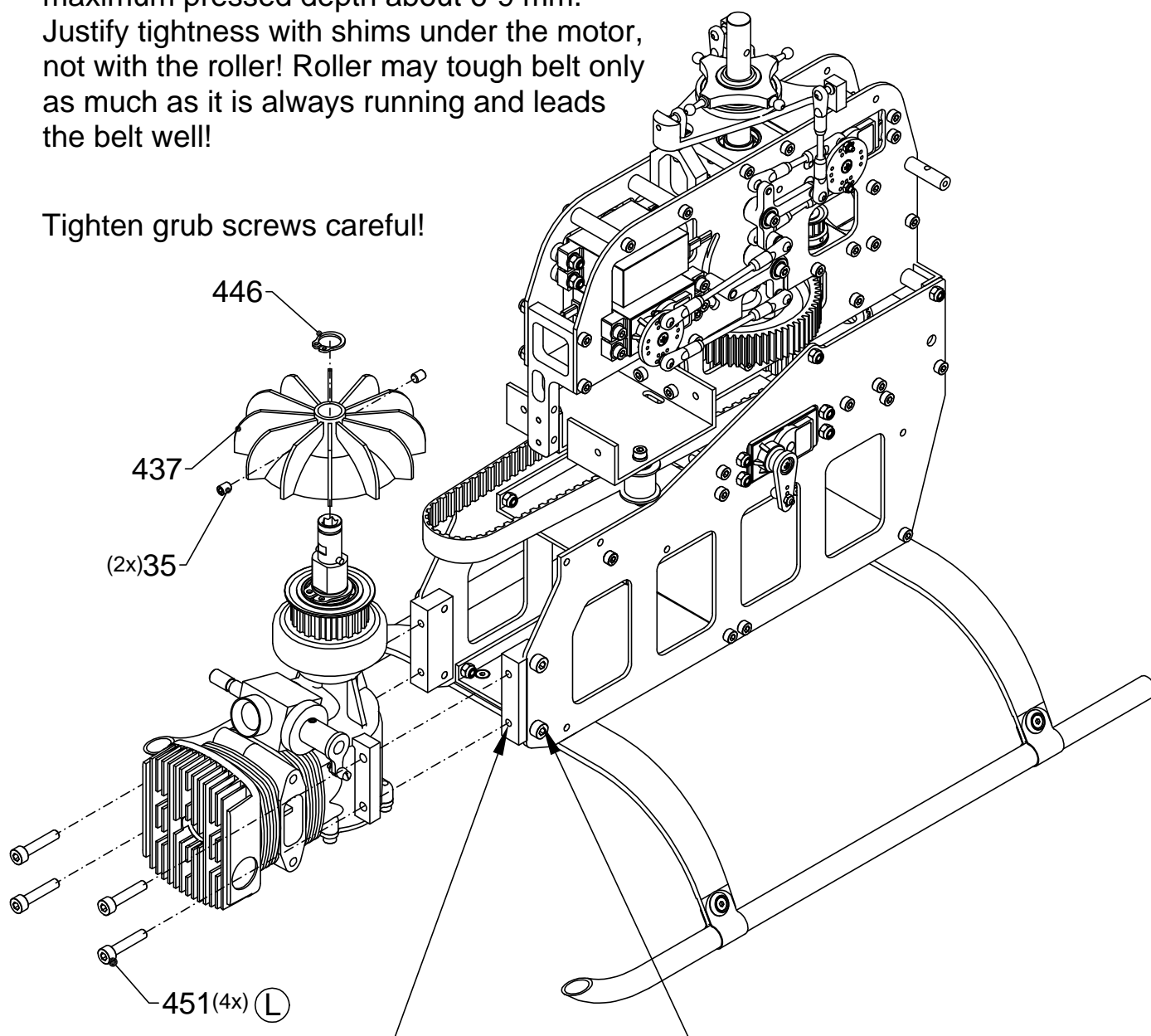


3. Remove clutch by screwing IN the M8x35 hex bolt!

Measure distance to belt with a ruler from front edge of radio tray 432. Difference length from tough to maximum pressed depth about 6-9 mm.

Justify tightness with shims under the motor, not with the roller! Roller may tough belt only as much as it is always running and leads the belt well!

Tighten grub screws careful!



Adjust belt tension with shims between motor and motor mount!

53 = shim 4 x 8 x 0,2 (4x)

96 = shim 4 x 8 x 0,1 (4x)

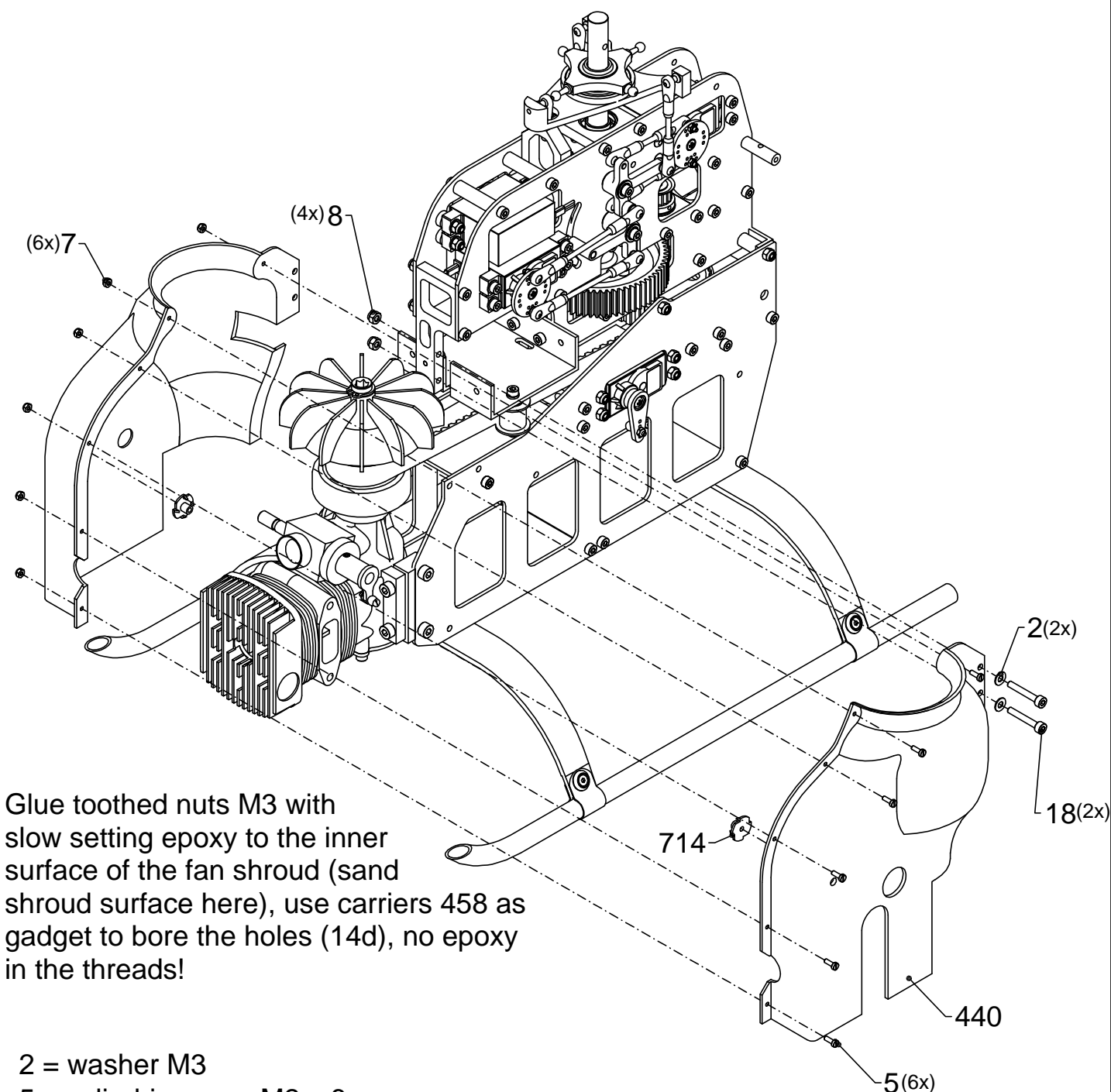
In order to make sure the belt runs "level" you may need to elongate the motor mounting holes in the carbon frames with a small round file!

35 = grub screw M4 x 5

451 = hexagon socket screw M4 x 20

(L) = use Loctite

Cut/file/bore all holes as small as possible to avoid lost of cooling air!
 Center starter hex with a caliper in the middle of the shroud intake!
 Upper distance between fan and housing about 1-2mm!



Glue toothed nuts M3 with slow setting epoxy to the inner surface of the fan shroud (sand shroud surface here), use carriers 458 as gadget to bore the holes (14d), no epoxy in the threads!

- 2 = washer M3
- 5 = cylindric screw M2 x 6
- 7 = lock nut M2
- 8 = lock nut M3
- 18 = hexagon socket screw M3 x 20

Mounting of fan shroud

Attention: Fibreglass dust can damage your health!

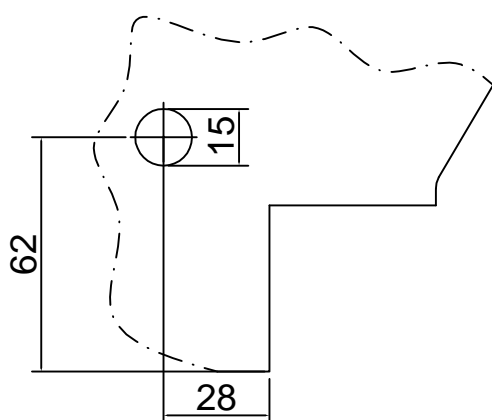
While boring or cutting use always a mask with fine dust filter.

Wash dusty parts always with water, water bonds the dust and makes it harmless!

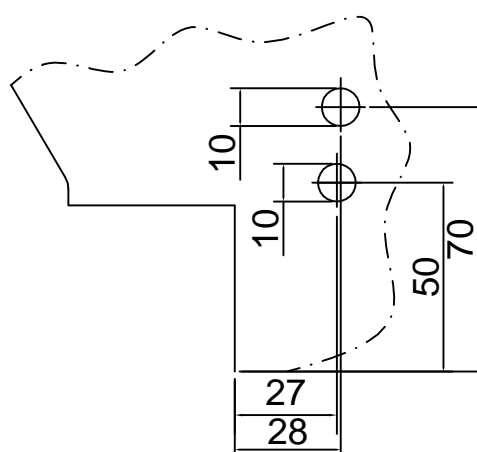
Follow the steps decribber below:

1. Cut the holes for the lower crankshaft housing and the belt.
NOTE: THESE HOLES, DIFFERENT TO THE MARKS IN THE SHROUD, MUST BE MOVED 2 MM TO THE UPPER SIDE (INTAKE SIDE)!
2. Bore 5-6 holes of 2 mm on the outer contour of the shroud, a little bit outside of the fillet stiffening.
3. If using the OS 91 SX Spec with Hyper Head you must eventually cut a hole in the front of the shroud, top about 50 mm over the bottom edge.
4. Mount shroud, connect with 2 or 3 screws and justate height. It must be 1-2 mm above contact with fan. If correct then bore the rear two 3 mm holes.
5. Mount shroud at the back end with two screws and apply the exhaust hole.
6. Apply carburetor holes, use drawings below, eventually make additional holes for fuel line and damper screws. Enlarge the two neddle holes to one big hole. Work accurately to avoid any air lost.
7. Mount complete shroud with all screws, add the battery carrier, justate it horizontally and bore 3mm thru the carriers in the shroud.
8. Glue toothed nuts in the shroud with Epoxy, sand and clean the surface before!
9. Mount complete shroud with carier!

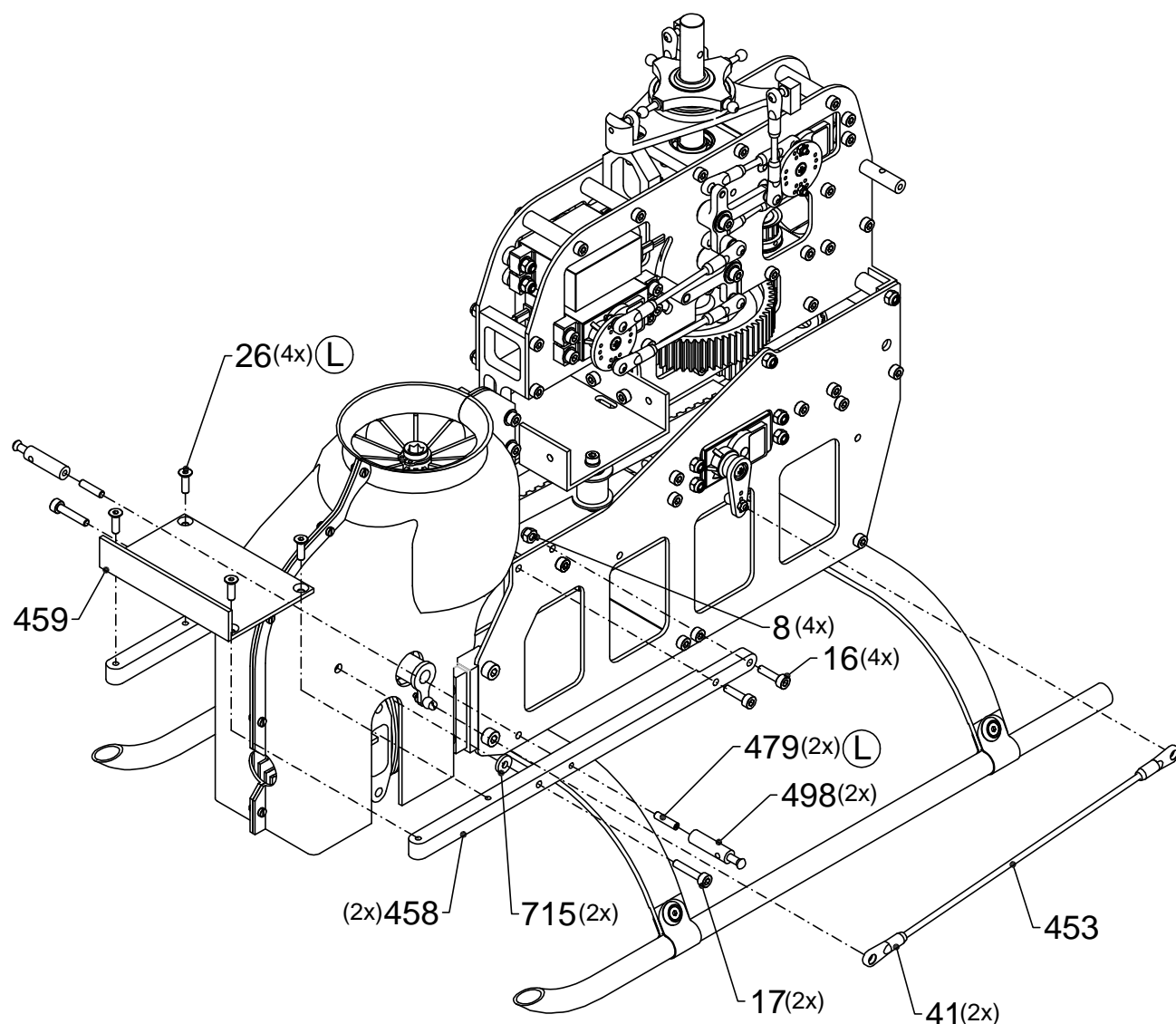
bellcrank side:



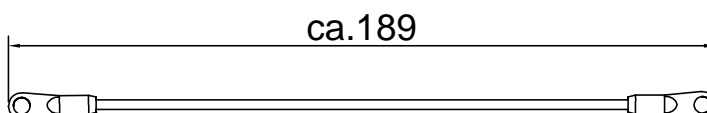
needles side:



index for OS91 SX-C-Spec. with 60K-carburetor



- 8 = lock nut M3
- 16 = hexagon socket screw M3 x 12
- 17 = hexagon socket screw M3 x 16
- 26 = hexagon flat head screw M3 x 10
- 41 = ball joint 2.5
- 479 = grub screw M3 x 12
- 715 = delrin shim 3 x 8 x 1.5



(L) = use Loctite

478

447

(3x) 733

477

(3x) 52

silicone tubing 4x2

478

722

721

offset 10

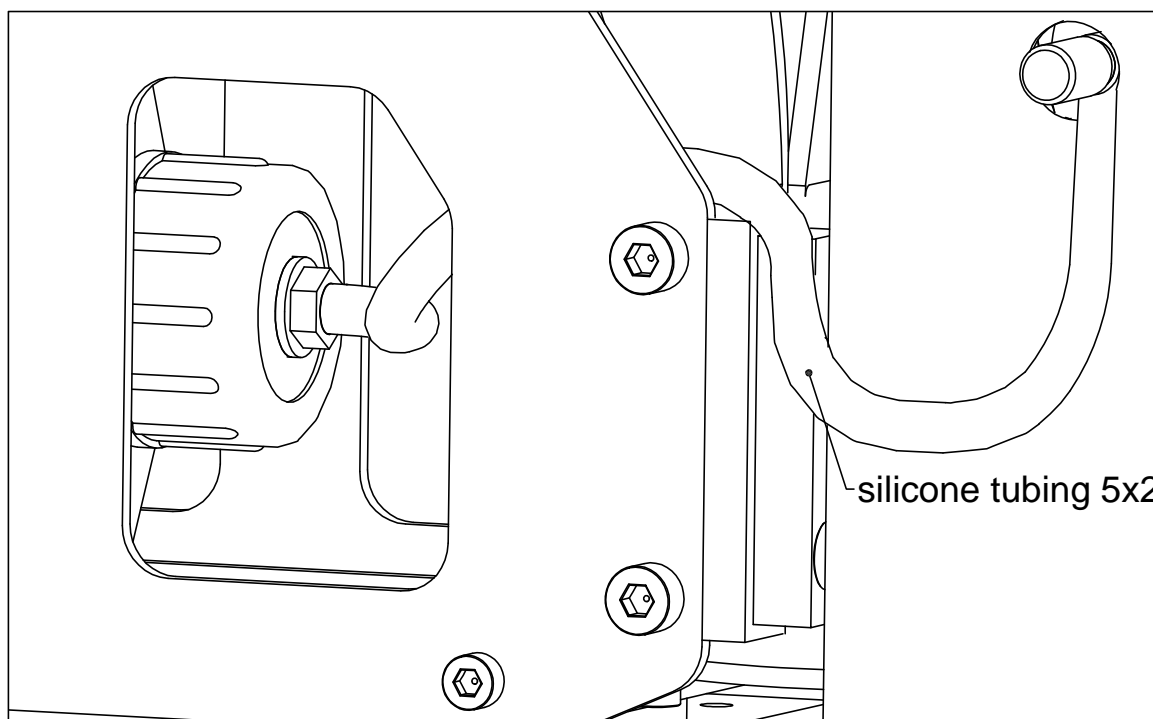
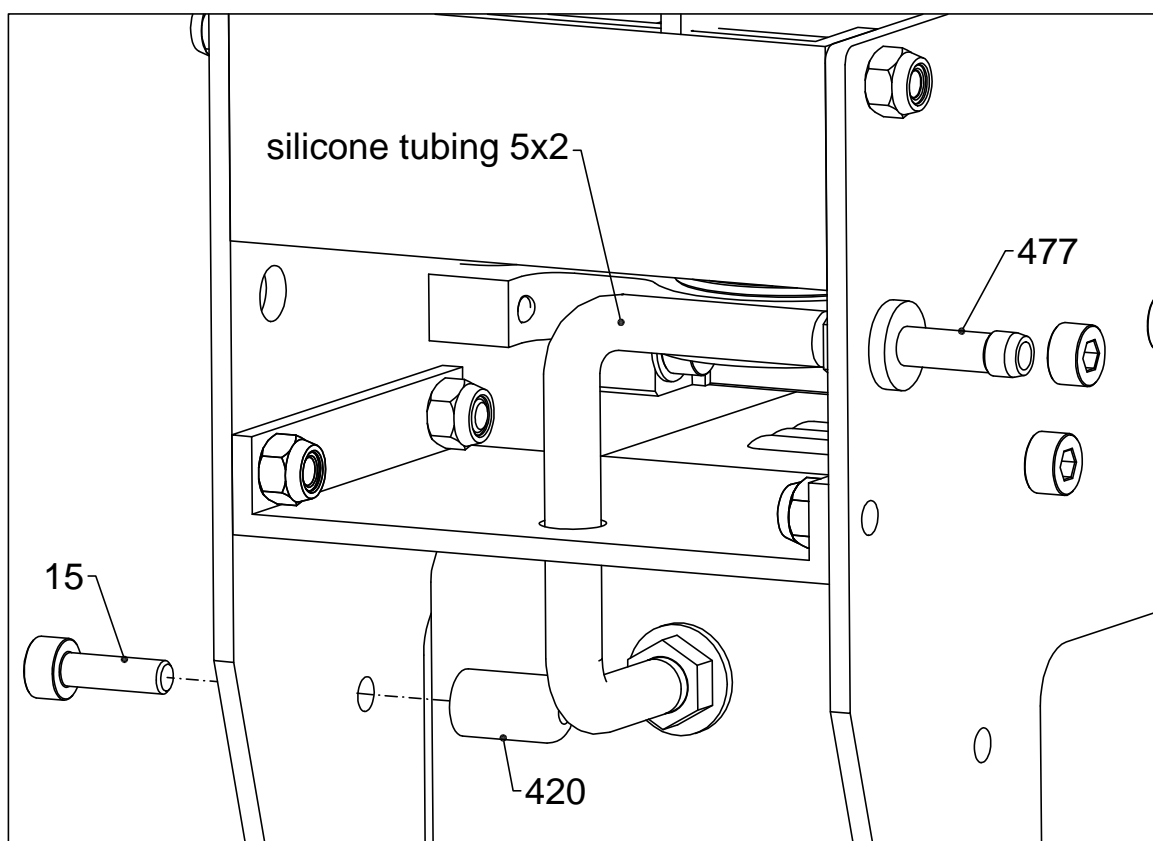
52 (steel)

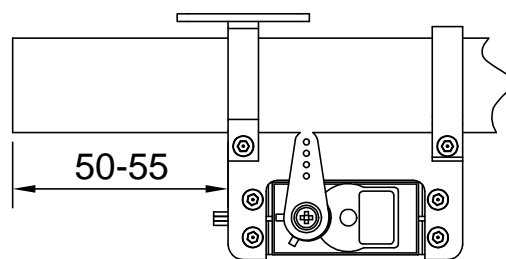
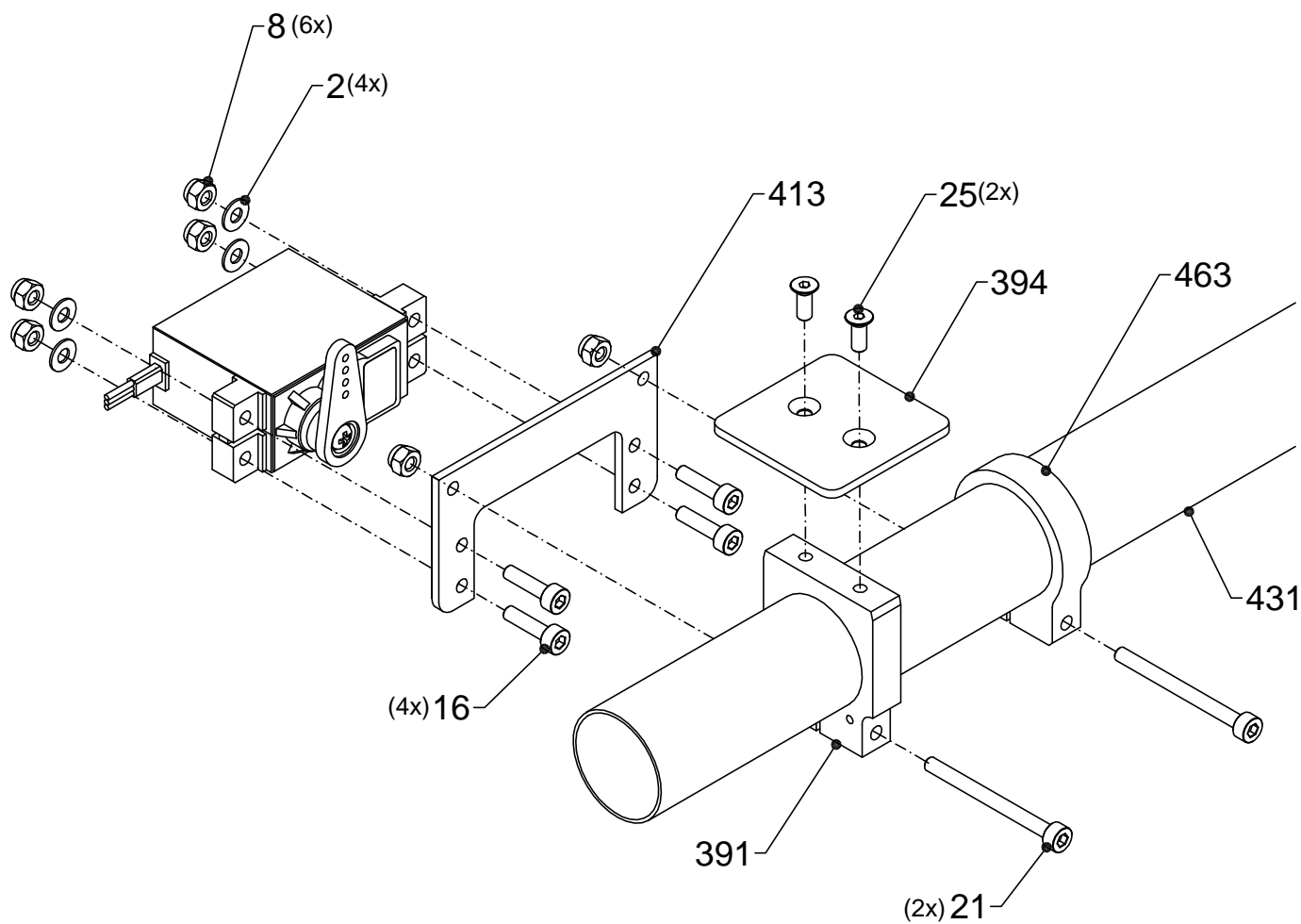
nut (Ms)

733 (rubber seal)

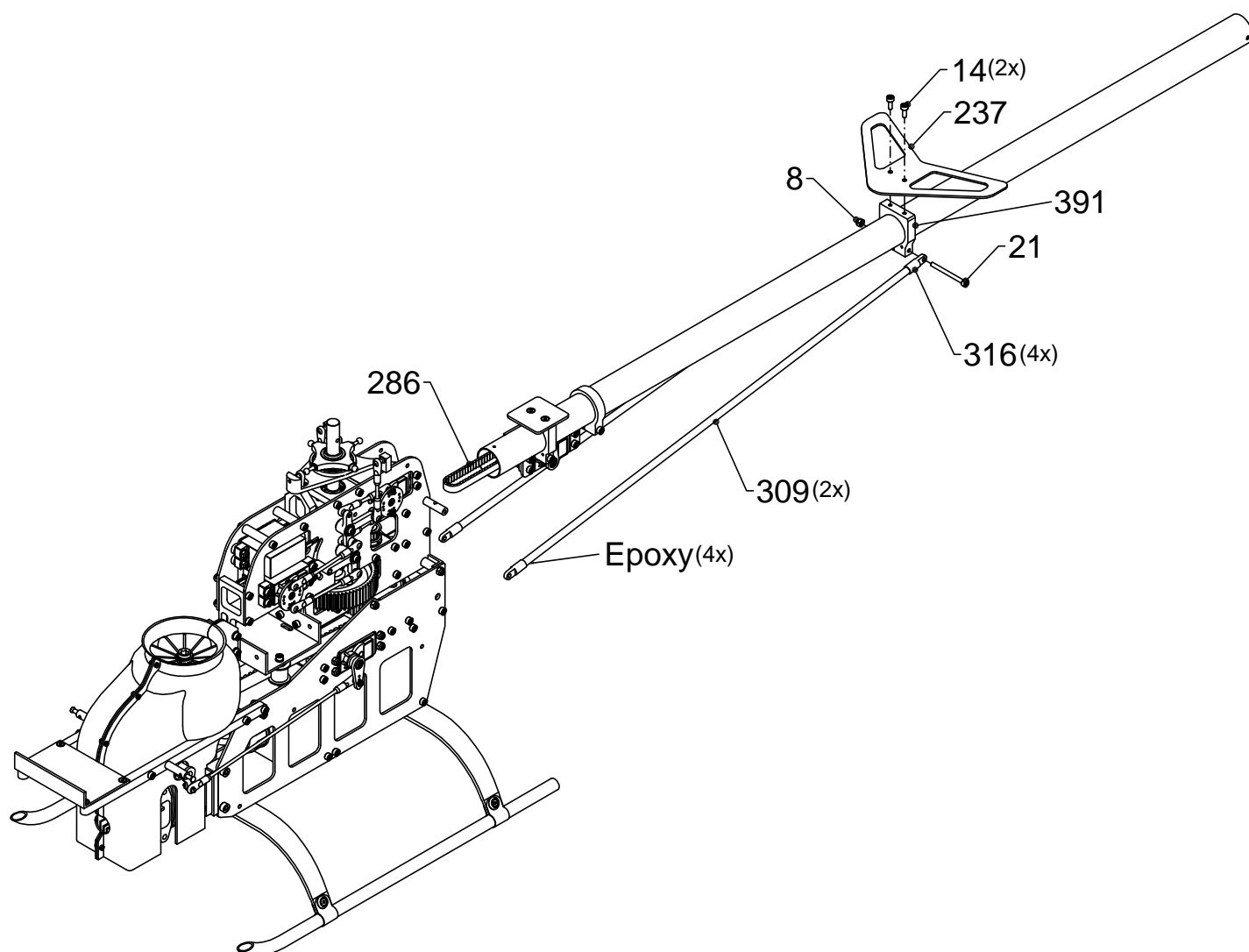
minicopter®

ACROBAT



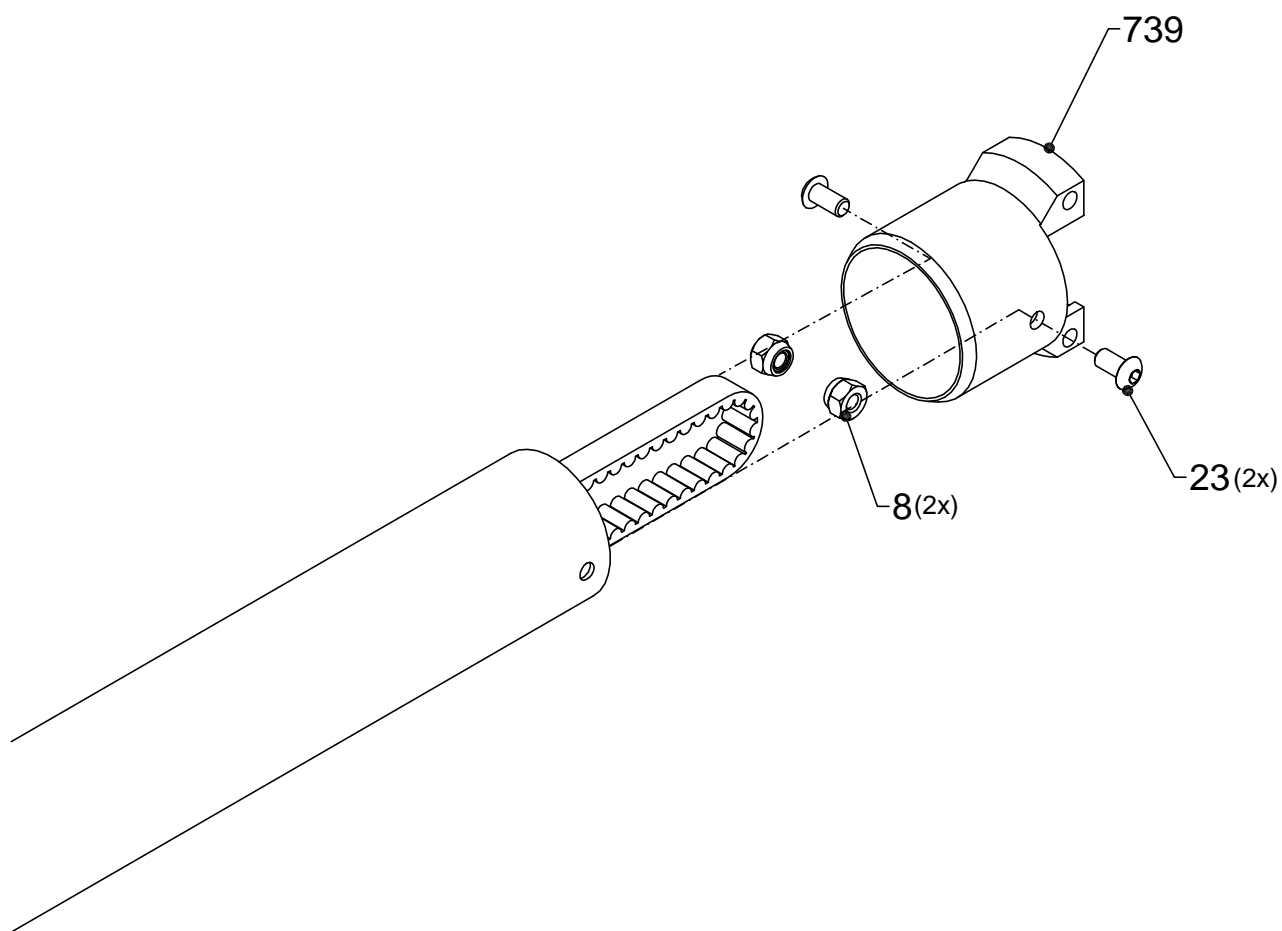


- 2 = washer M3
 8 = lock nut M3
 16 = hexagon socket screw M3 x 12
 21 = hexagon socket screw M3 x 35
 25 = hexagon flat head screw M3 x 8

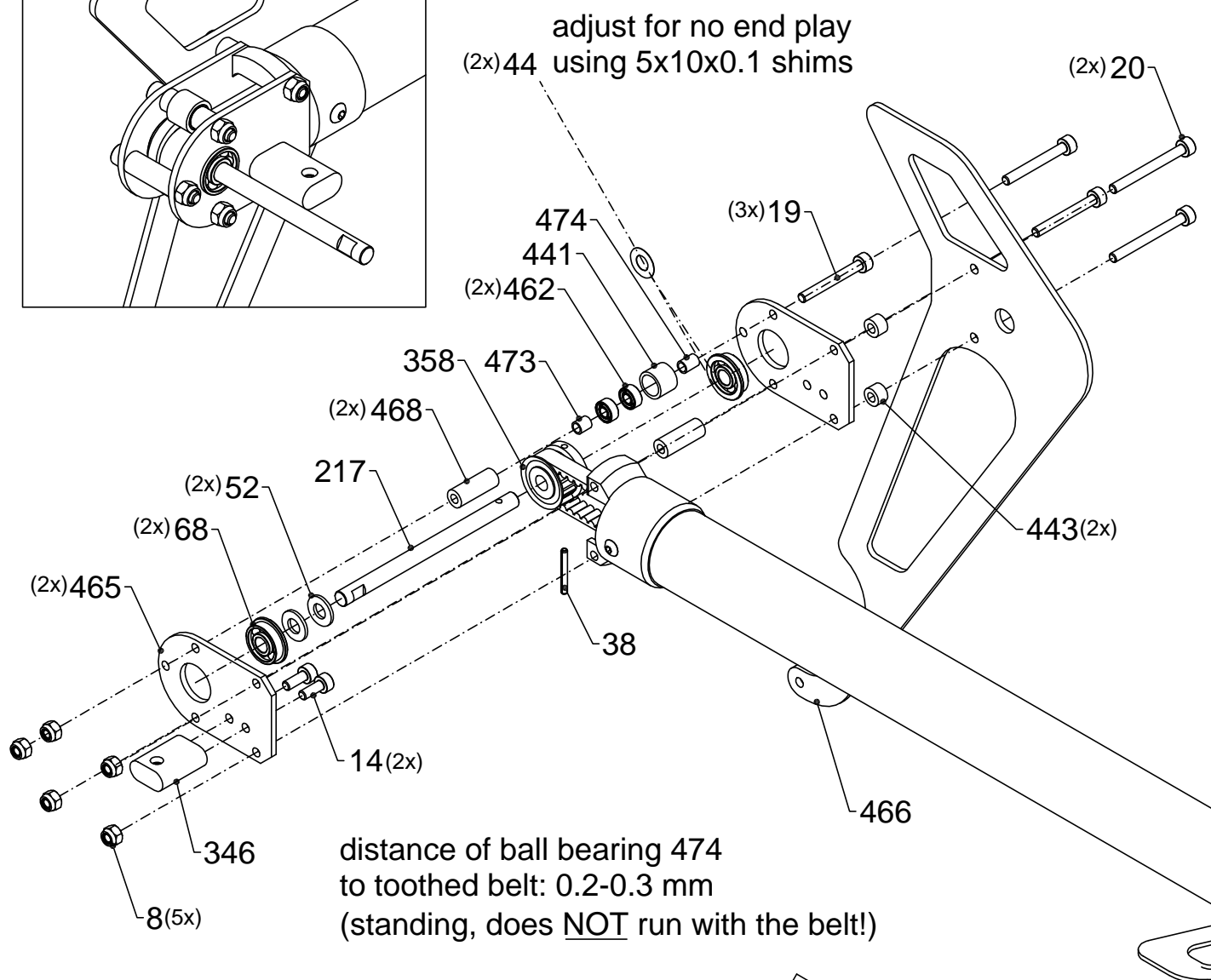
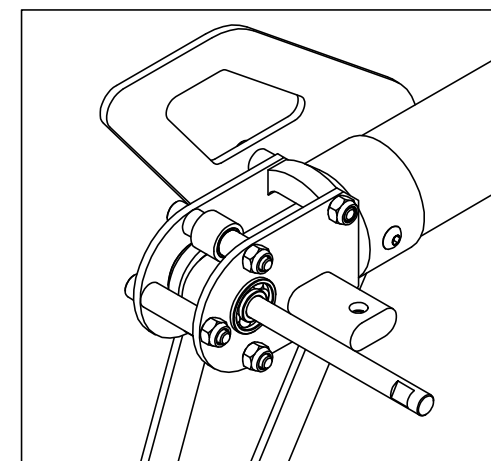


Tip: Pull belt with a cranked steel wire thru the tube!

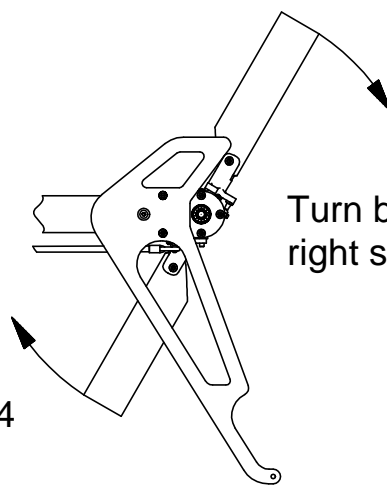
- 8 = lock nut M3
- 14 = hexagon socket screw M3 x 8
- 21 = hexagon socket screw M3 x 35



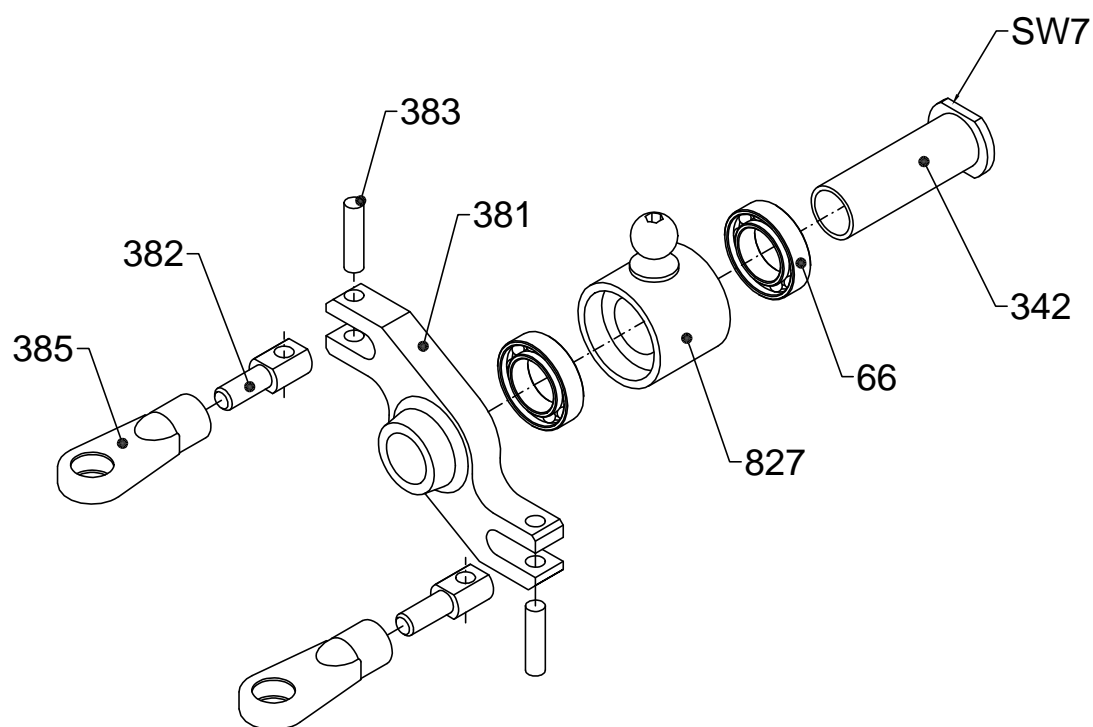
8 = lock nut M3
23 = hexagon lense screw M3x6



- 8 = lock nut M3
- 14 = hexagon socket screw M3x8
- 19 = hexagon socket screw M3 x 25
- 20 = hexagon socket screw M3 x 30
- 38 = rolled pin 2 x 16
- 52 = shim 5 x 10 x 1
- 68 = ball bearing with flange F5 x 13 x 4
- 443 = distance bush 3 x 6 x 4
- 473 = distance bush 3 x 6 x 5



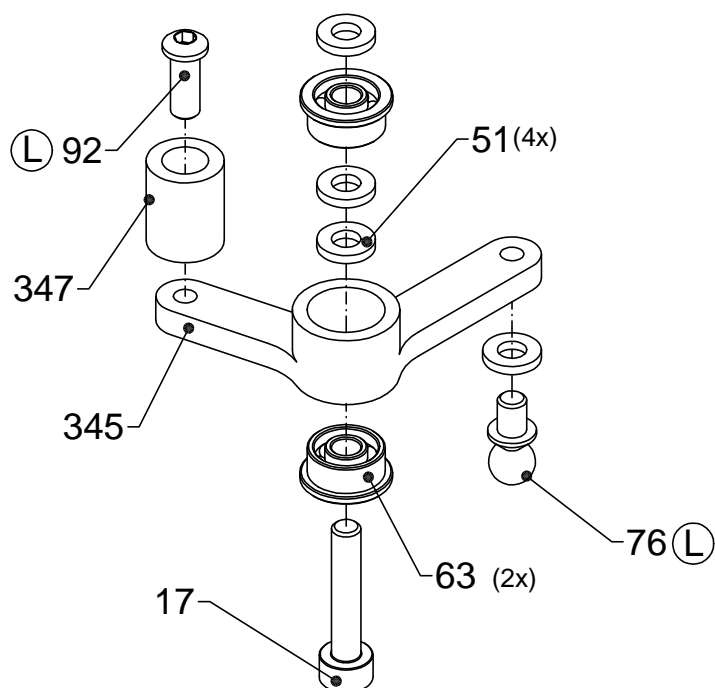
Turn belt 90 degree to the
right side (view from behind)!



66 = ball bearing 6 x 10 x 2,5

Oil bearings frequently!

Tip: Don't screw in by hand,
but press bridge on in a vice
(check for squareness)!



17 = hexagon socket screw M3 x 16

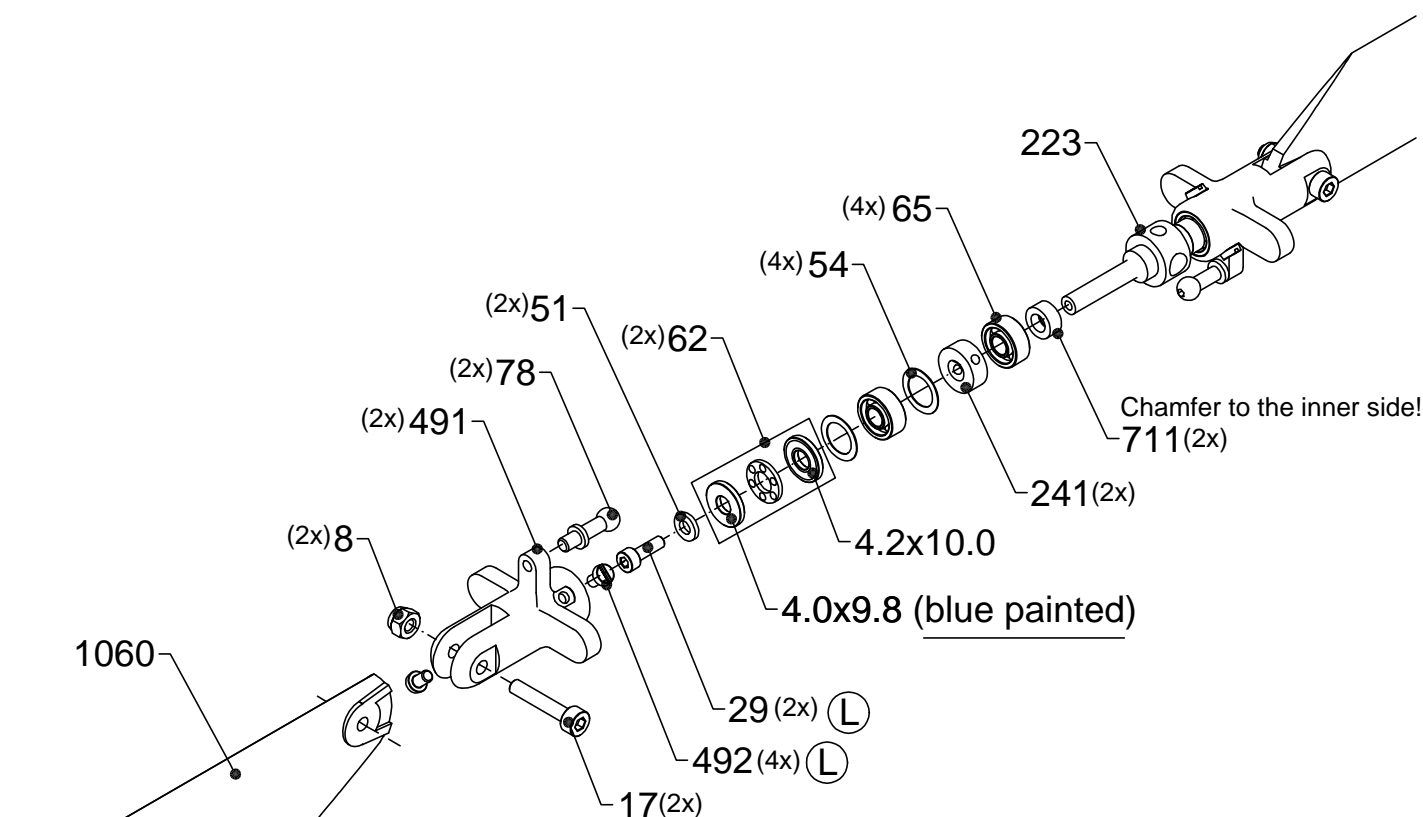
51 = shim 3 x 6 x 1

63 = ball bearing with flange F3 x 8 x 4

76 = joint bolt M3 x 4

92 = hexagon lense screw M3 x 8 Spezial

(L) = use Loctite



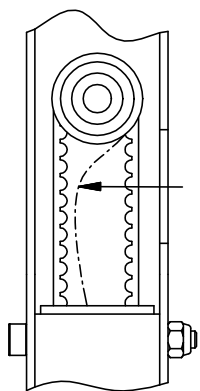
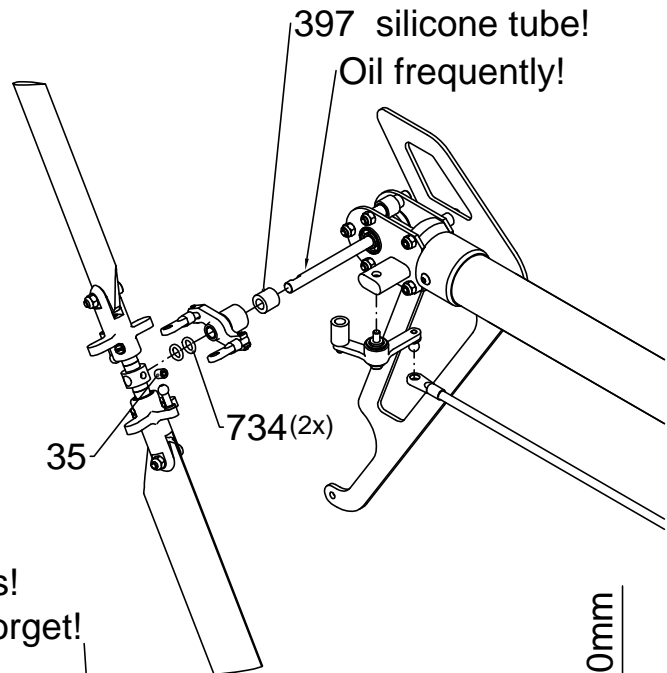
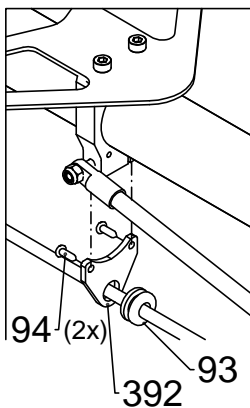
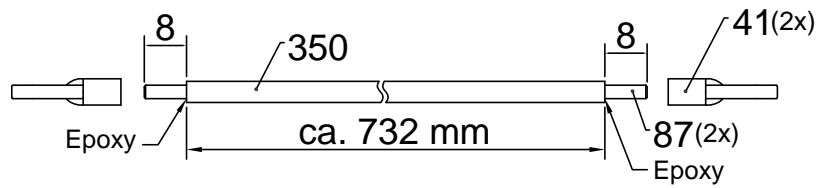
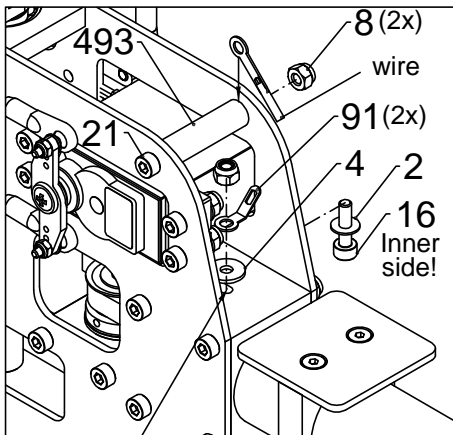
Before mounting the blade grips check the easy running of each bearing unit, eventually shorten bush 711 a little bit (remove from side with chamfer with sandpaper)!

Important: Blue painted thrust bearing washer must be mounted at the outside!

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

Ⓛ = use Loctite

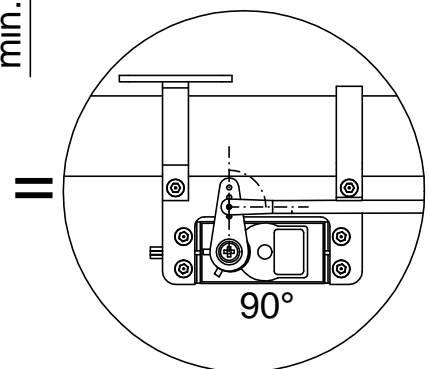
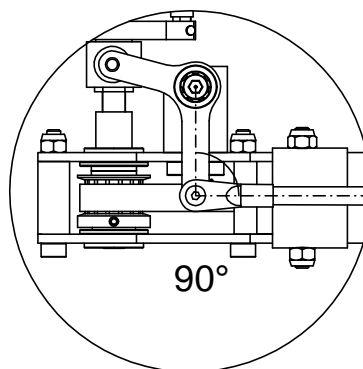
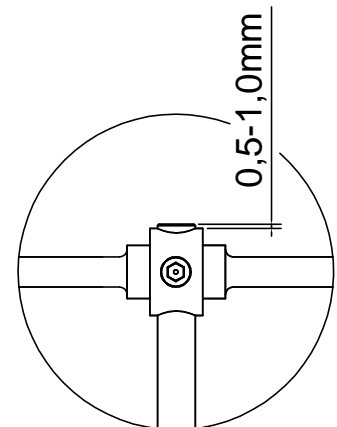
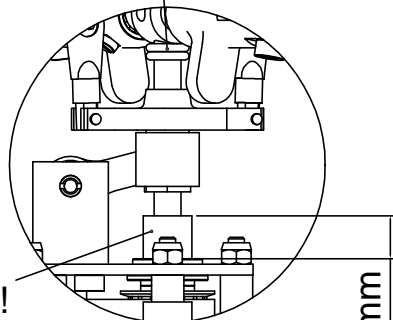
ground strap



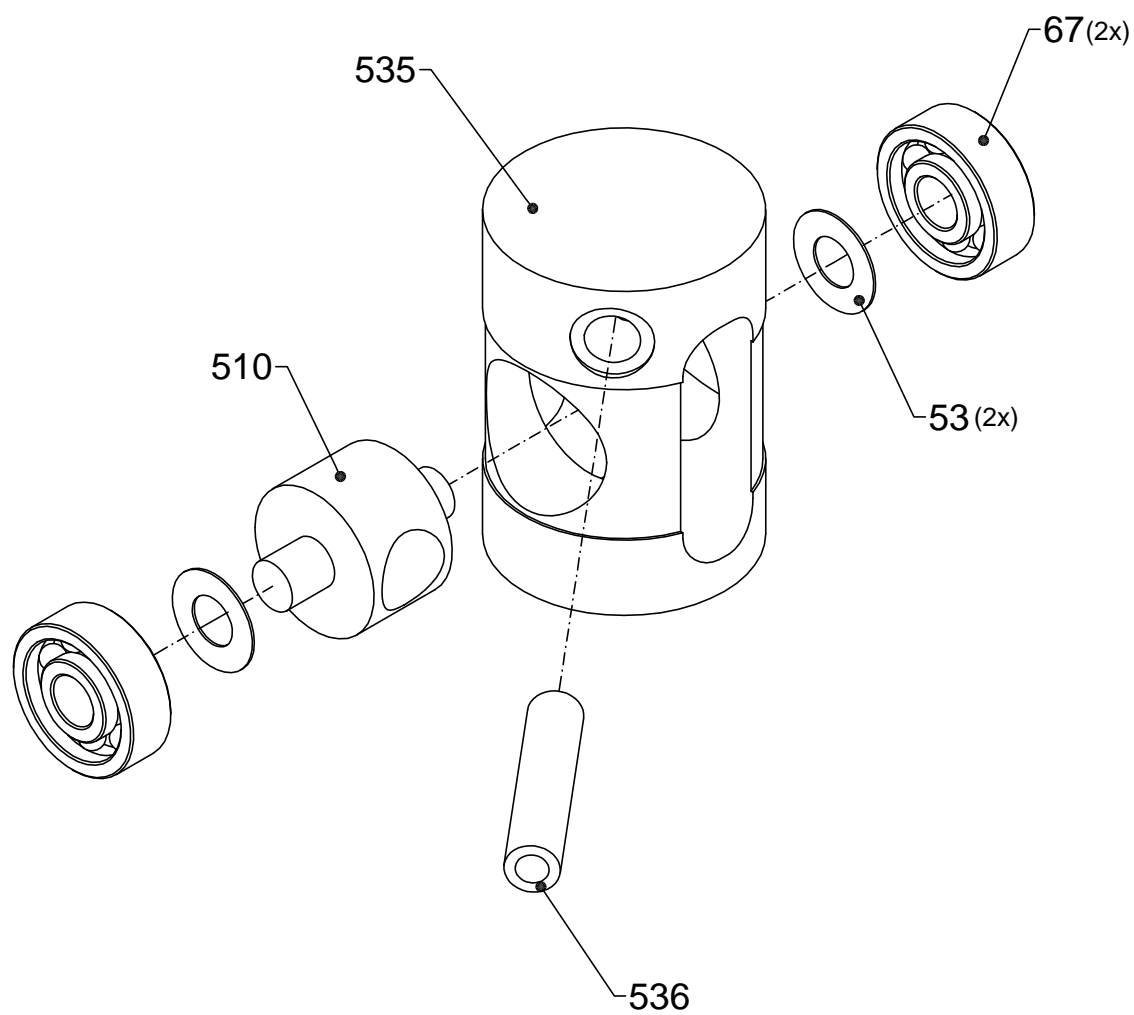
belt should not touch other side of belt (press with thumb)

O-Rings!
Don't forget!

Silicone tube!
Don't forget!



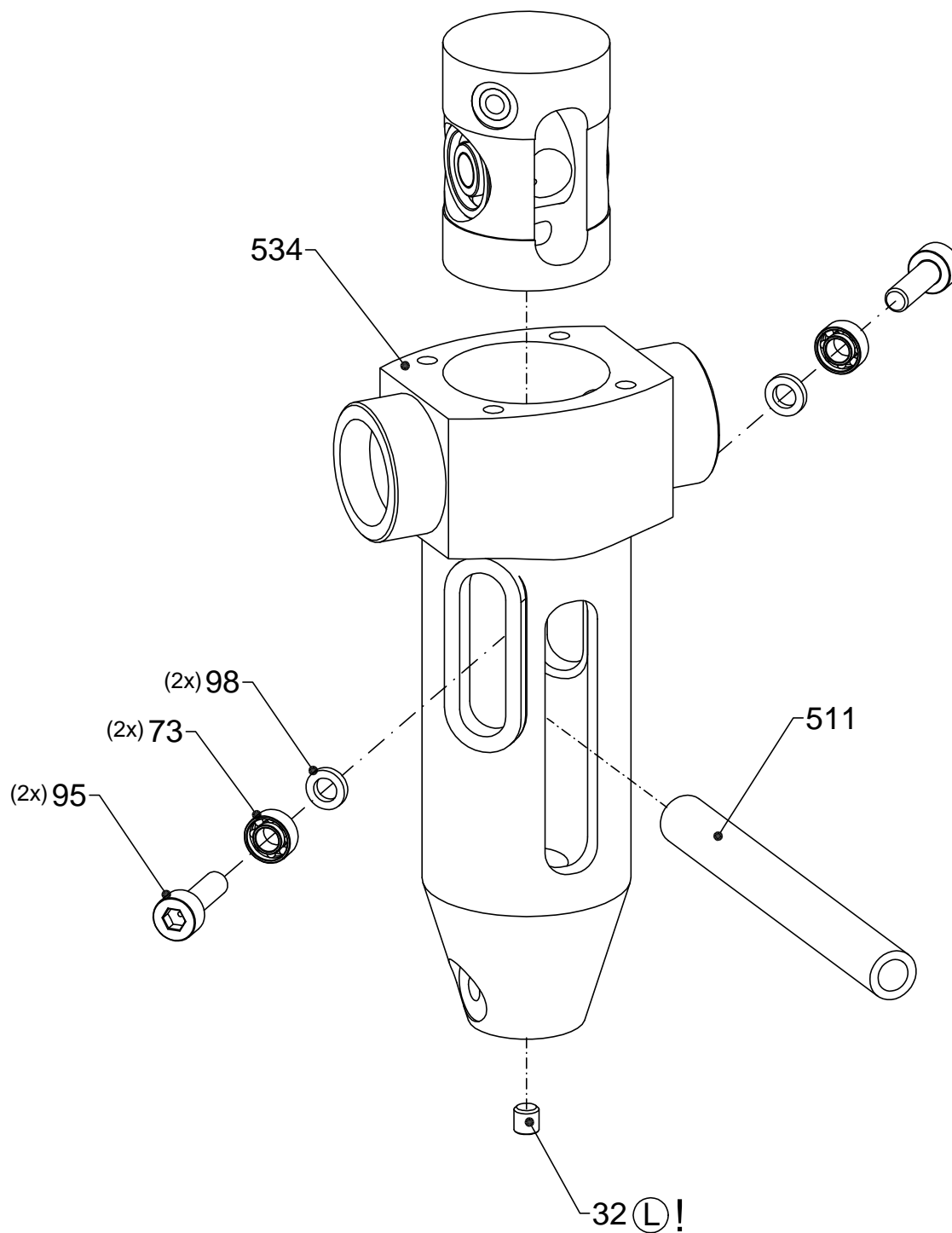
- 2 = washer M3
- 4 = washer M3 large
- 6 = clevis 2.5 PA
- 8 = lock nut M3
- 16 = hexagon screw M3 x 12
- 35 = grub screw M4 x 5
- 41 = ball joint 2.5
- 87 = control rod 2.5 x 26
- 94 = self tapping screw 2.2 x 6.5



53 = shim 4x8x0.1

67 = ball bearing 4x12x4

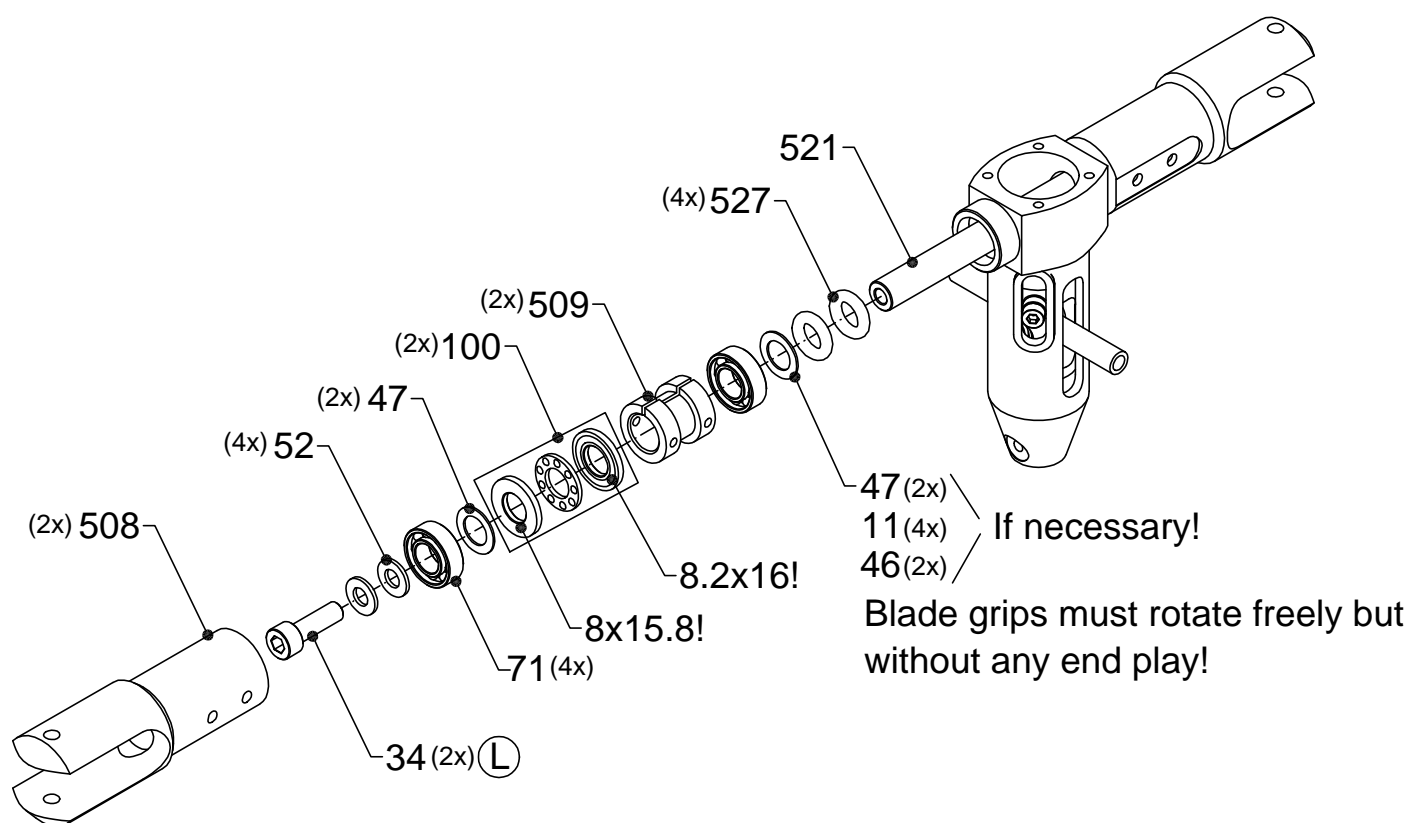
Do not oil or lubricate piston!
Keep dry and clean!



95 = hexagon socket screw M3 x 10 alloy steel

32 = hexagon grub screw with cone point M4x5 alloy steel

(L) = use Loctite



Lubricate O-Rings!

assembly may require the blade grips
to be heated to 150°C/300°F

11 = shim 8x14x0.2

34 = hexagon socket screw M5x12 12.9

46 = shim 8x14x0.1

47 = shim 8x14x0.5

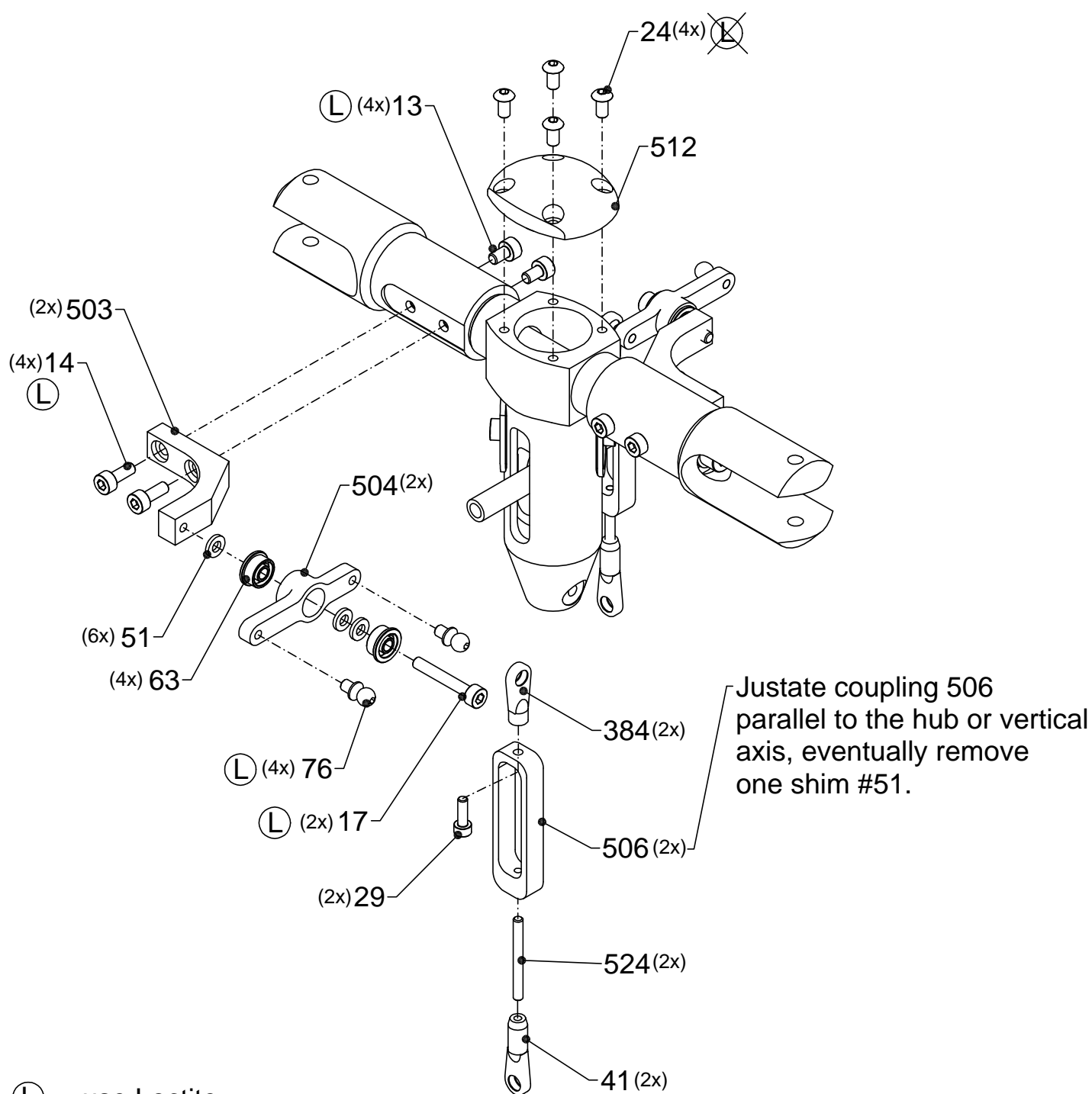
52 = shim 5x10x1

71 = ball bearing 8 x 16 x 5

100 = axle bearing B8

(L) = use Loctite

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



(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 lense screw M3 x 8

29 = hexagon socket screw M2,5 x 8

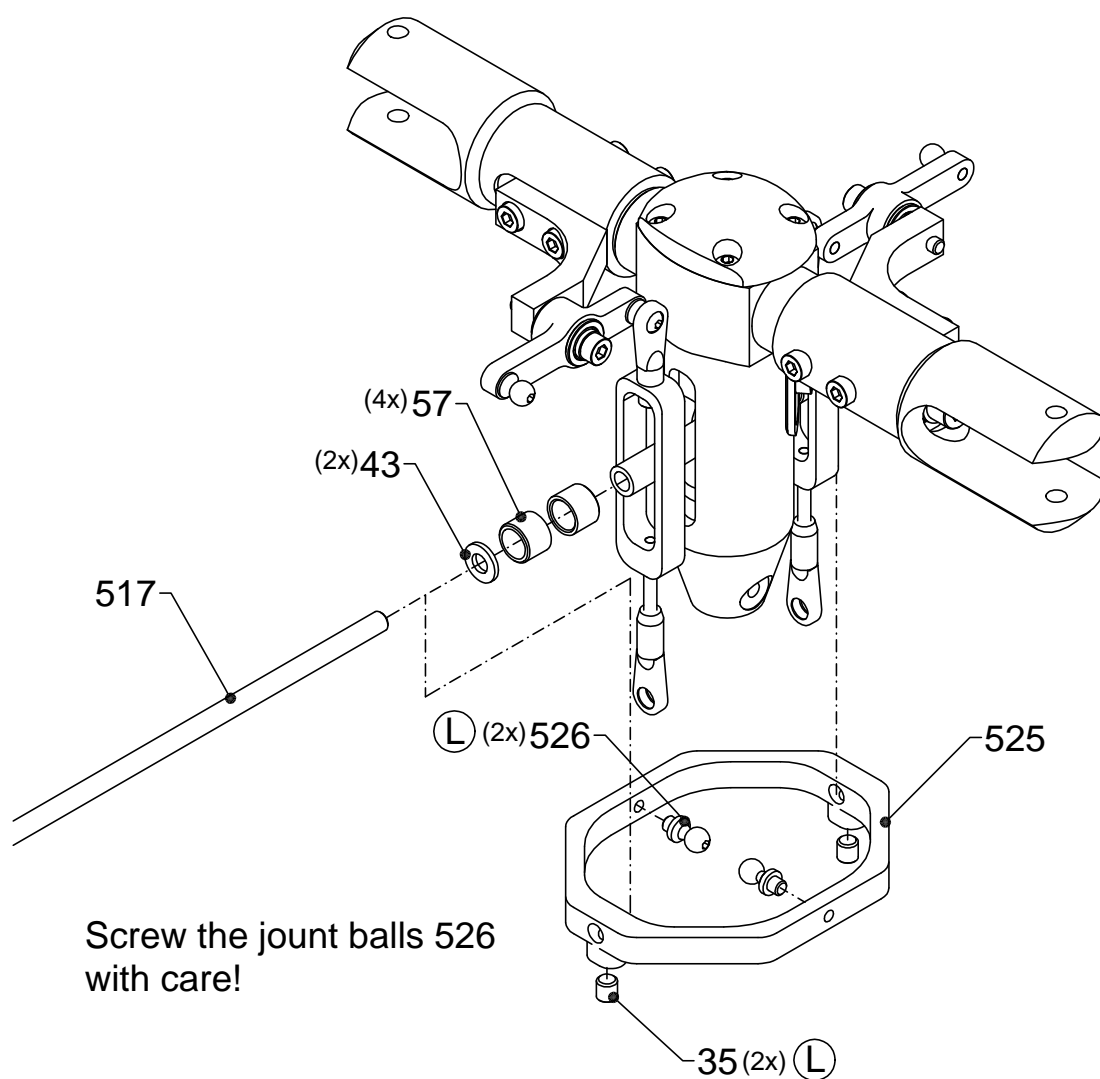
 = do not use Loctite

41 = ball joint 2.5

51 = shim 3x6x1

63 = flange bearing F3x8x4

76 = joint bolt M3 x 4

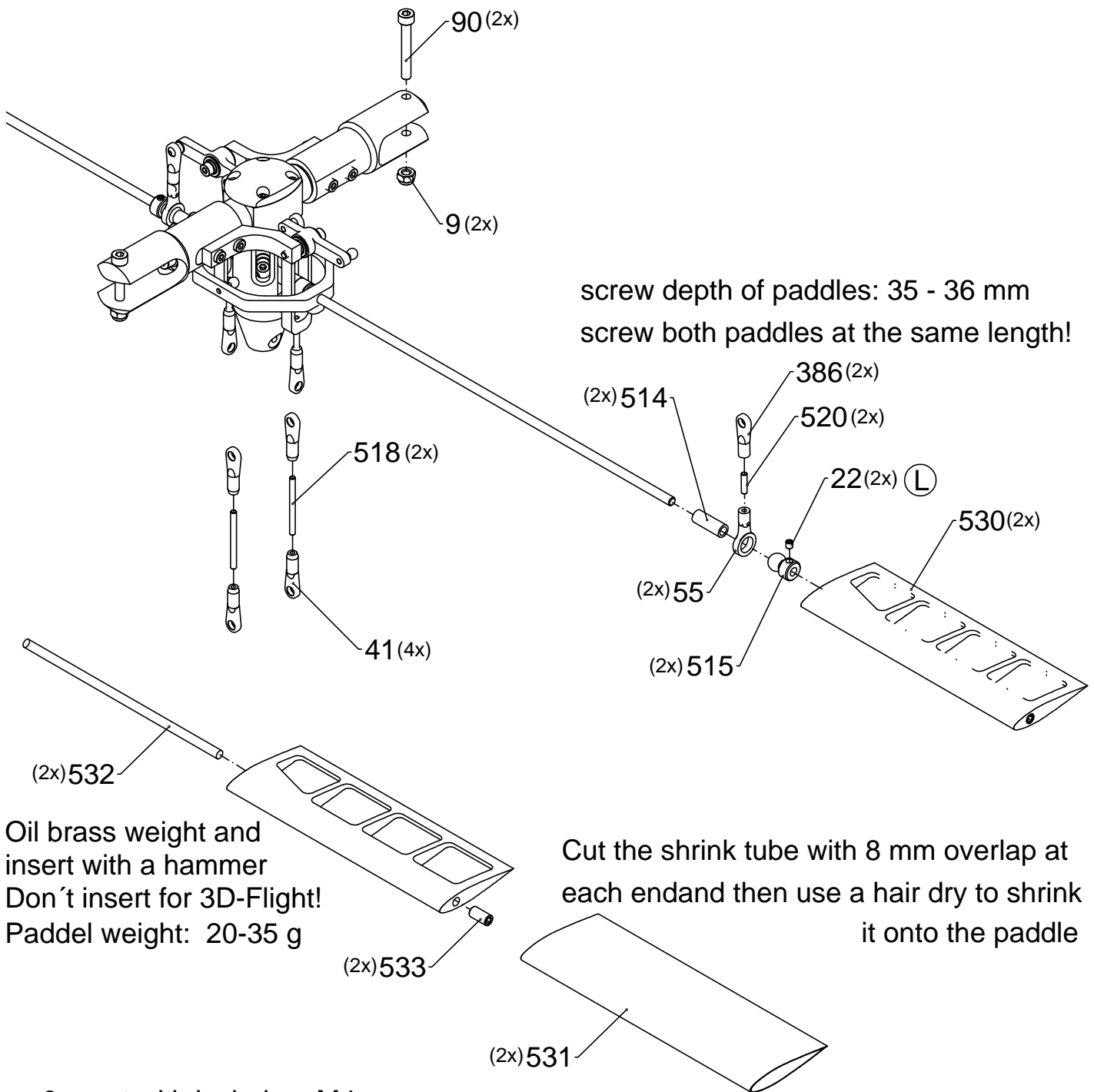


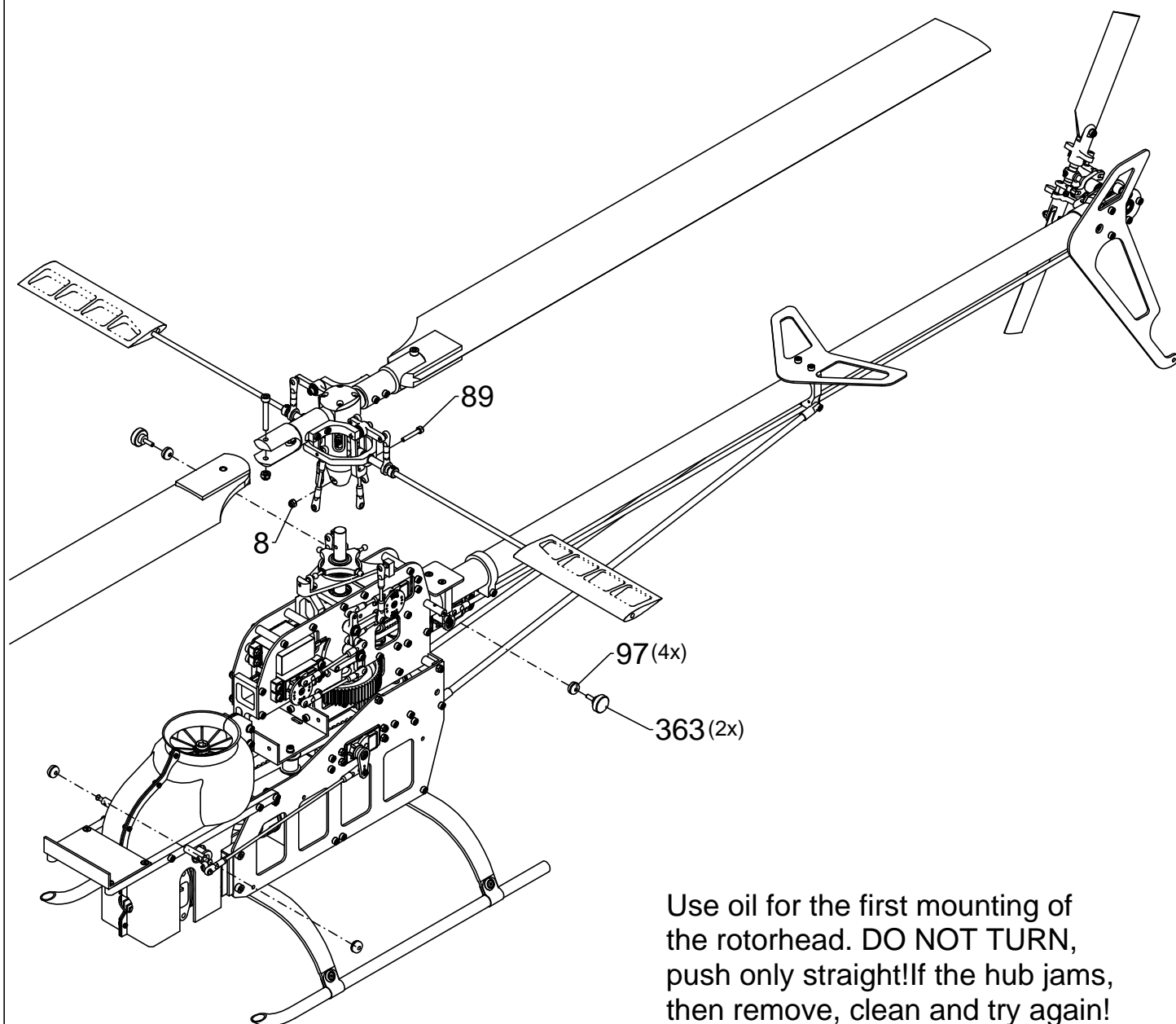
35 = grub screw M4 x 5

43 = shim 4 x 8 x 1

57 = teflon bearing

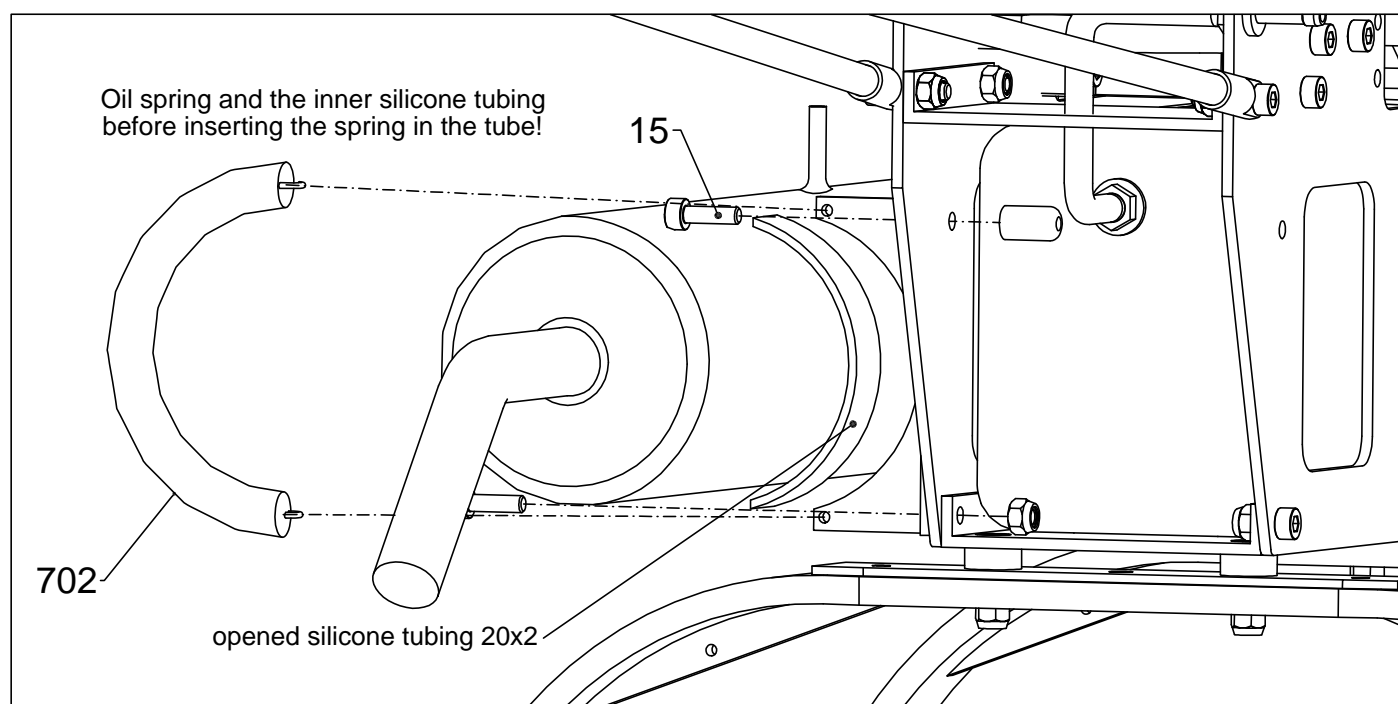
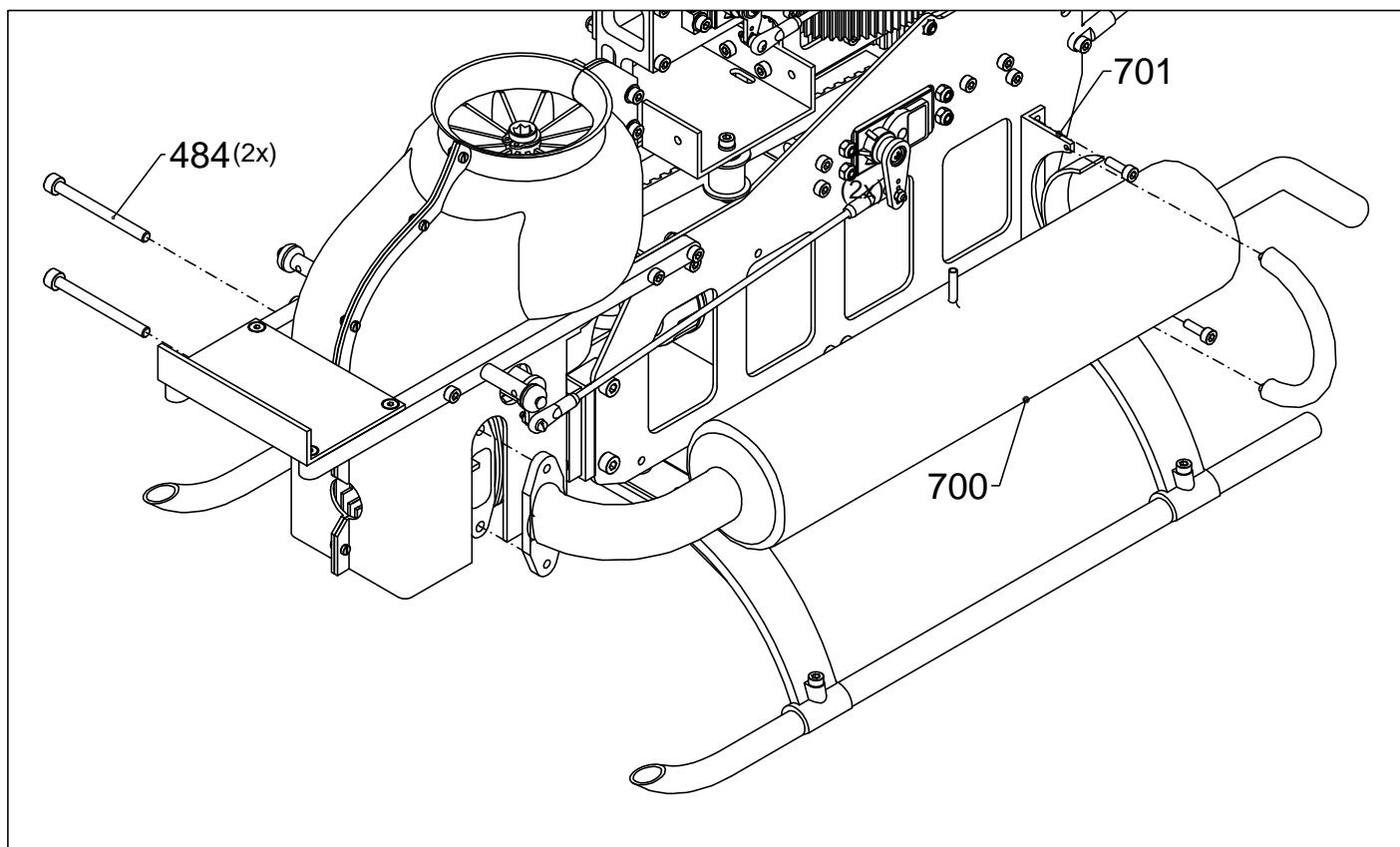
(L) = use Loctite



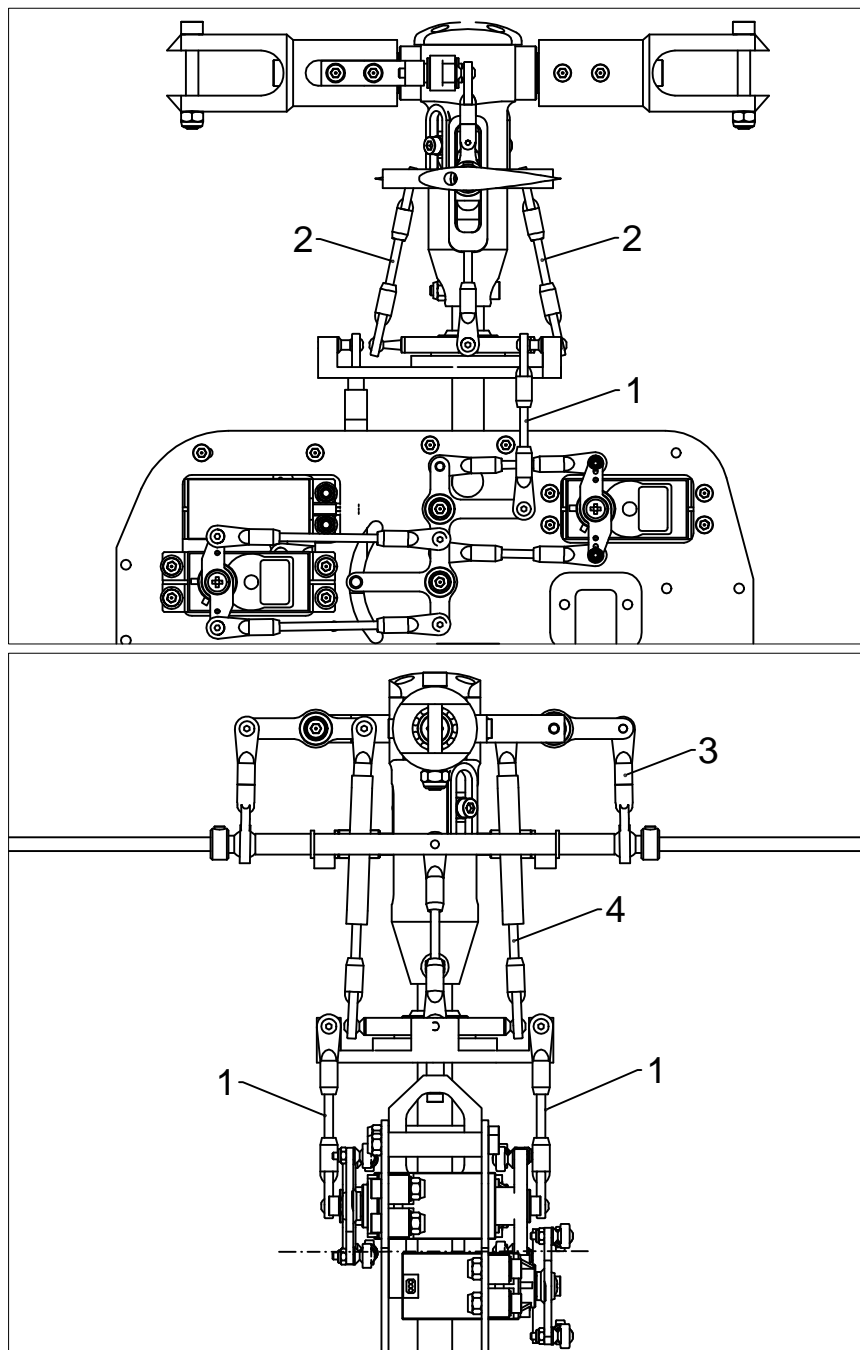


Use oil for the first mounting of the rotorhead. DO NOT TURN, push only straight! If the hub jams, then remove, clean and try again!

- 8 = lock nut M3
- 89 = hexagon socket screw M3 x19 Spezial
- 97 = rubber grommet 3 mm



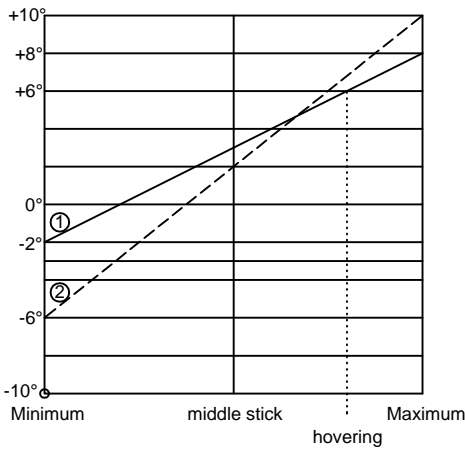
15 = hexagon socket screw M3 x10
 484 = hexagon socket screw M4 x 45



1. All servo arms and bellcranks must be vertical or horizontal.
2. Adjust pushrods (1) to level the swashplate.
3. Adjust pushrods (2) to the Hiller bridge until the antorotation ball bearing is centered in its brass lined slot.
4. Double ball links (3) between flybar and mixer arm are 42 mm long.
5. Adjust the lower ball links (4) between swash plate and mixer arms until the mixer arms are horizontal.
6. With a pitch gauge check the actual blade pitch and adjust lower ball links of rod 4 until both blades are at zero degrees pitch.

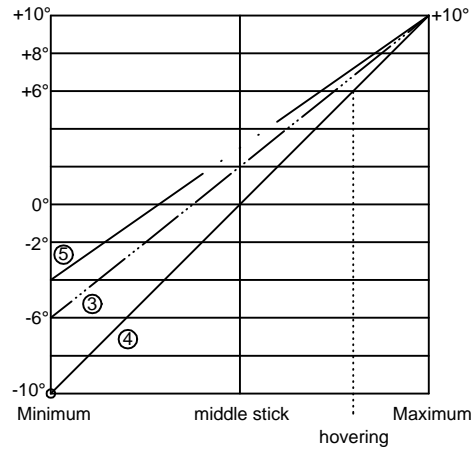
Pitch gauge

1. normal flight, 1350 1/min



- ① Hovering/Beginner
- ② Forward flight/Advanced

2. aerobatic, 1500 bis 1800 1/min



- ③ Aerobatic FAI
- ④ Aerobatic 3D
- ⑤ Autorotation

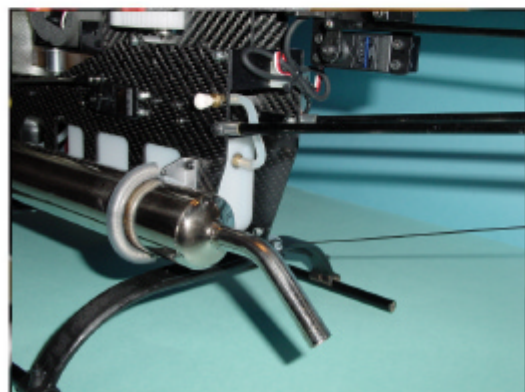
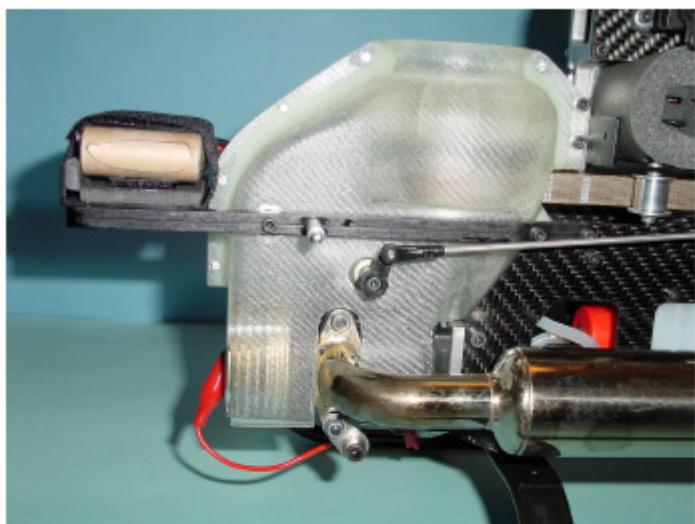
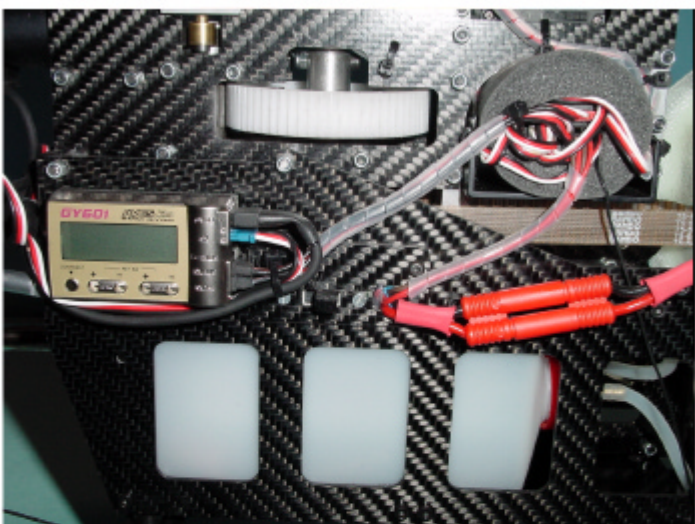
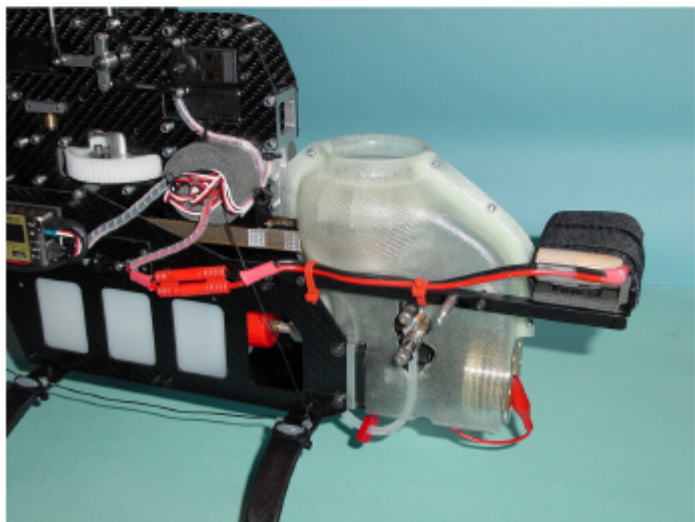
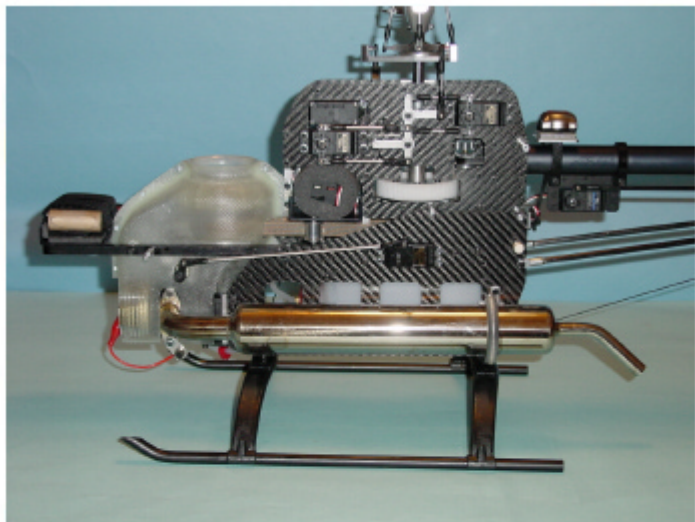
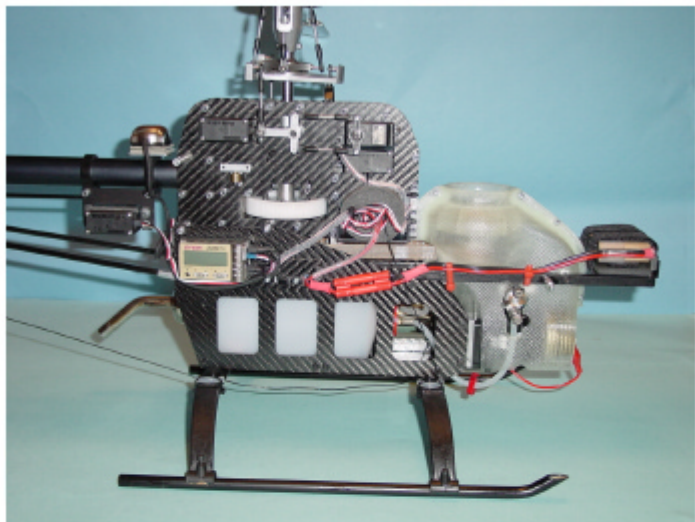
Recommended rotorspeed: 1350 - 1800 1/min

Deflections:

Elevator: Hovering 1350 1/min: 12° 25% Exponential
 Forward flight 1350 1/min: 20° 20% Exponential
 Aerobatic 1700 1/min: 20° 15% Exponential

Roll: Hovering 1350 1/min: 15° 20% Exponential
 Forward flight 1350 1/min: 20° 10% Exponential
 Aerobatic 1700 1/min: 20° 10% Exponential

Tailrotor: All Phases: +26°/-10° 30-50% Exponential



minicopter

