Assembley instructions for additional - VL3 lock

Description: The additional canopy lock prevents the canopy frame from bending open on both sides, which can occur due to strong suction at speeds of over 300 km / h.

The central lock in the middle of the canopy remains unchanged and is supplemented by two additional locking units on the left and right at the lower edge of the canopy.

The aim was to design the solution so that no additional manual operation is necessary and the lock can also be opened from the outside (safety aspect).

Retrofitting from the VL3 version with the all-round U-shaped edge in the canopy frame is possible.

At positions where the frame offers sufficient stability for fastening, a locking mechanism is screwed in, in which 6mm bolts are held in the locking position by springs. Hook noses serve as counter bearings, which are screwed to the fuselage and, thanks to an adjustable part, enable fine adjustment after assembly.

The lock bolts are actuated synchronously by means of reversing levers with bowden cables, which are laid in the hood frame and fastened to the hood lock with a special bowden control roller.

When the central top locking lever of the canopy is opened, the two additional bottom locks are automatically opened, so that no additional actuation is necessary.

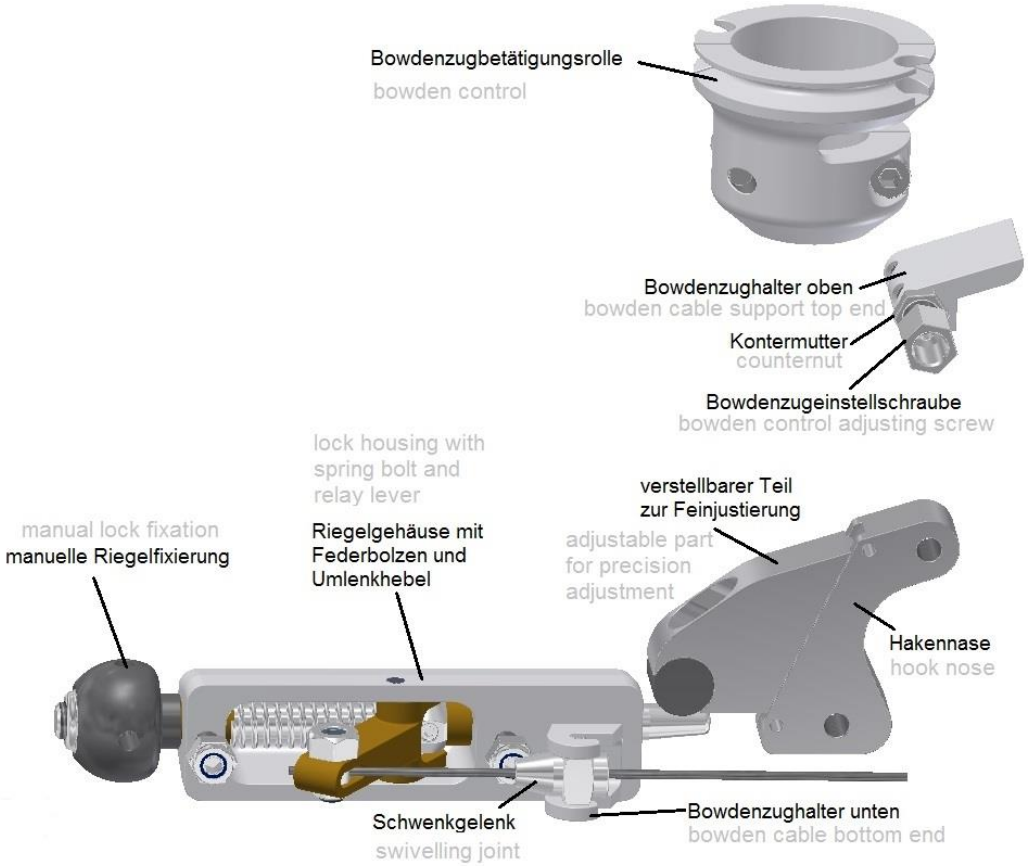
An additional positive effect of this version is that the main locking tends to be pulled in the closing direction by the tensile force of the springs, so that when the position is not completely closed, it cannot open beyond the locking point.

Installation is not difficult if you have a certain basic technical understanding and a little skill.

Caution! For all drilling work, it is advisable to lay out a large cloth or tarpaulin in the cockpit of the machine so that the fine drilling chips do not spread all over the place.

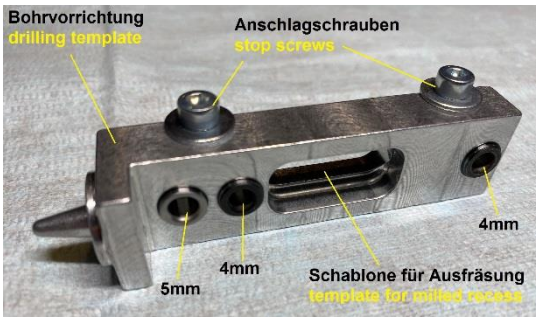
Caution! It is important to follow the installation instructions step by step in the correct order and to observe all points in order to achieve a decent result afterwards.

Please do not only look at the pictures, but also read the texts, as this contains important information!



Fastening the lock housing to the canopy frame:

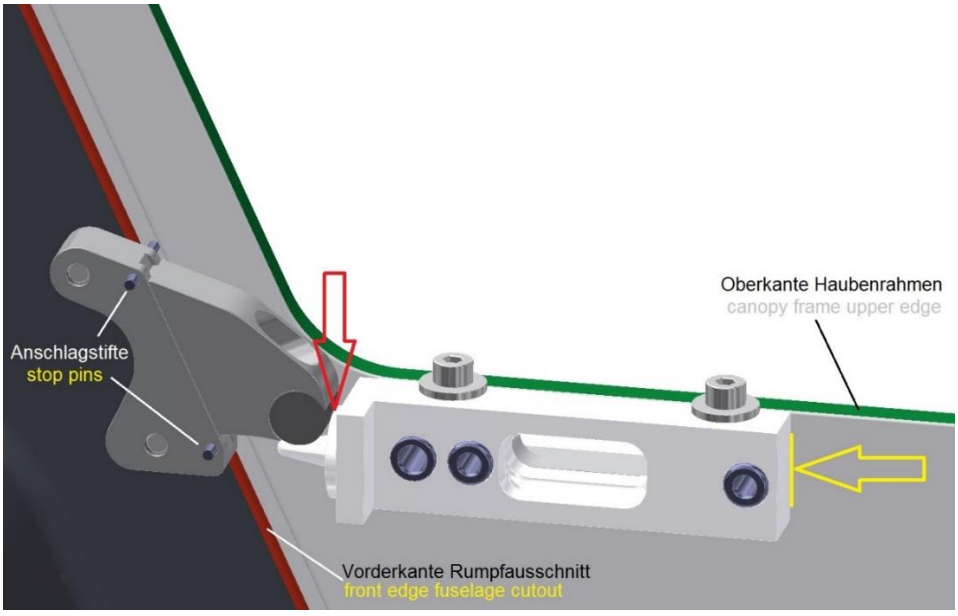
Exact positioning of the lock housing on the canopy frame is extremely important. For this we provide a corresponding drilling device which you can rent for the work for free (see picture).



In the first step, the fastening holes for the lock housing must be drilled into the canopy frame.

The installation of the lock on the left side is shown below. The same is to be done on the right. First of all, the drilling device and the left hook nose (double-sided adhesive tape on the left side) are required. Attention! the protective film of the double-sided adhesive tape is not yet removed.

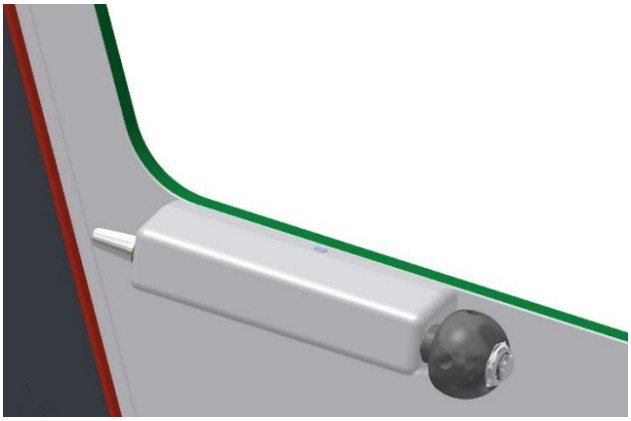
The movable part of the hook nose later enables a total correction of 3mm in the vertical direction. It is fixed at delivery so that you can later move it 1mm up or 2mm down.

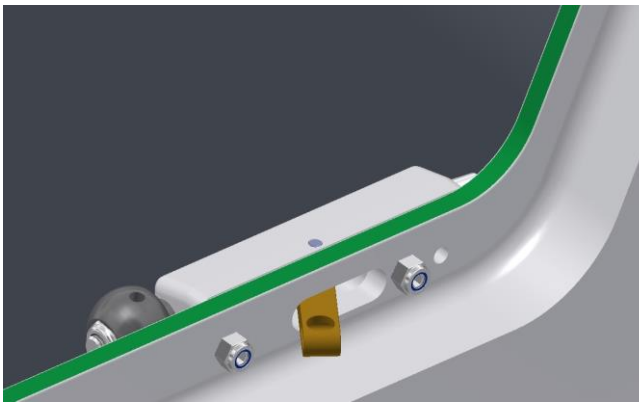


Caution! First remove the seats or upholstery from the aircraft!

To mark the horizontal bolt position (yellow arrow) you have to sit in the plane, close the canopy and lock it correctly with the central lock at the top, so that it is closed like during the flight.
Then press the hook nose with the two 2mm stop pins against the front edge of the fuselage with one hand (see picture above - colored red).
With the other hand, place the drilling device with its stop screws onto the upper edge of the canopy frame (colored green). (The stop screws can later be tightened for the right side on the other side of the drilling device).
Now push the drilling device so far back until the frontal area (red arrow) lies against the front edge of the black plastic hook nose and push the hook nose down so far that the black plastic nose also rests on the conical pin of the drilling device.
Press the drilling device firmly against the canopy frame wall so that it does not slip and set the hook nose aside.
Make a mark on the front edge of the drilling device (yellow arrow) with a thin, waterproof felt-tip pen. Now you can open the canopy again.
You can then attach the drilling device with a small parallel clamp at the marked position on the canopy frame, so that the two 4mm and one 5mm holes remain free.

Caution! To drill the holes, it is best to use drills that only look out of the chuck (approx. 30mm) so that when drilling through the drilling device and the approx. 6mm thick frame wall they do not suddenly pierce and drill into the plexiglass window.
If you only have longer drills, you can also put a protective strip in the back of the frame between the window and the wall to be drilled. When drilling, make sure that the drill is positioned at a right angle so that it does not jam in the holes in the device.
The device also has a milled slot.
Now use a felt-tip pen to transfer the contour to the hood frame.
A corresponding breakthrough must now be created for the lever. The easiest way to do this is to drill an 8mm hole on both sides and mill out the space with a Dremel and a small solid carbide bur and then smooth everything with a file.

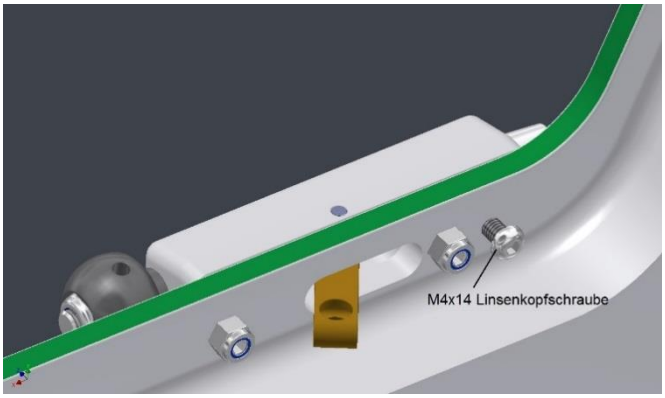


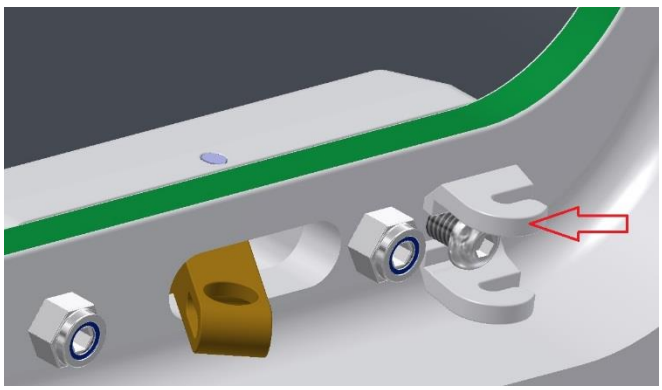


Now remove the protective films from the double-sided adhesive tape from the rear of the housing. The double-sided tape compensates for unevenness in the canopy frame and prevents it from slipping sideways.

The locking unit is inserted with its stud screws into the two 4mm holes and secured from behind with the two M4 nuts. To insert, the lever has to be pushed slightly towards the center to fit through the slot. Tighten the nuts alternately step by step with a 7mm open-ended wrench until the housing is tight and even.

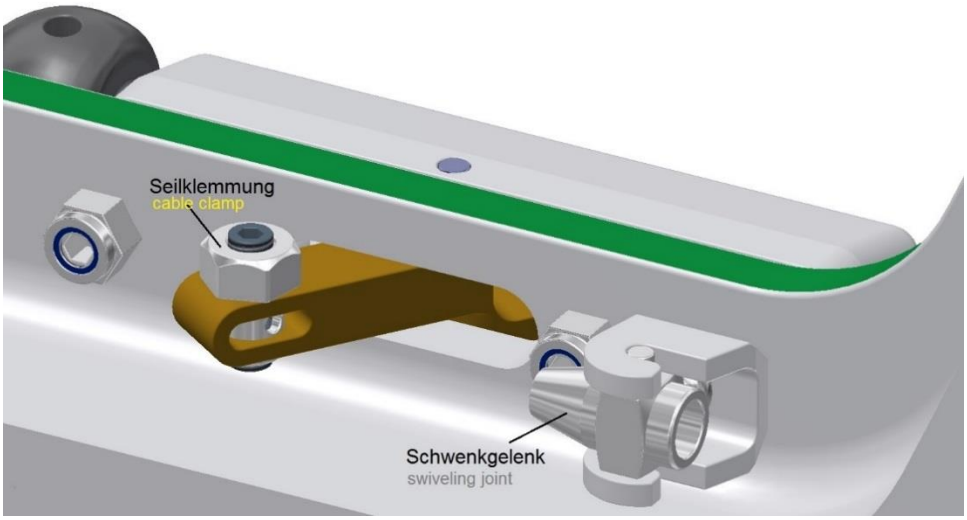
Manually test whether the bolt can still be moved after assembly by either operating the lever or pulling on the ball for manual operation. Since the spring is quite strong, some force is needed.





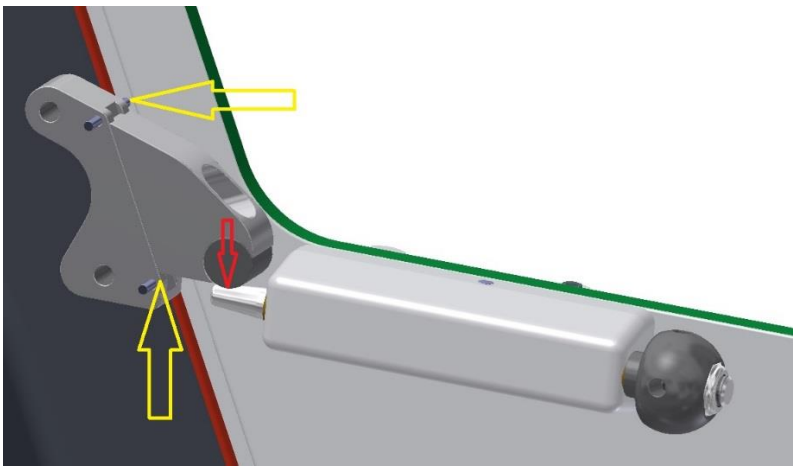
Now comes a somewhat fiddly part, because an M4x14 lens head screw has to be screwed into the free M4 hole. This is first loosely screwed in by hand so that there is still a gap of approx. 3mm between the wall and the screw head. It is difficult to get to this point with an Allen key, so that it is only used to finally tighten the lower bowden cable holder (see next picture). The bag with the screw comes with a short piece of silicone tubing, which you push a little over the lens head. The screw can be easily gripped with your fingers than. When attaching the screw, make absolutely sure to hold it at right angles to the housing until it engages.
The lower bowden cable holder (red arrow) is provided with an elongated hole that is open towards the front so that it can be slid onto the screw at an angle from the top rear.
Screw the screw in as far as possible by hand so that the holder can just be pushed on. This makes it all the less necessary to retighten with the Allen key.

Cut the short leg of a 2.5mm Allen key to such an extent that it still has a length of approx. 15mm. Align the holder approximately parallel to the housing when you tighten the screw.



The cable clamp is inserted into the lever from above and the swivel joint is inserted from behind into the fork of the bowden cable holder.

Next, the hook nose is attached to the fuselage (the picture below right shows the lock at the right side).



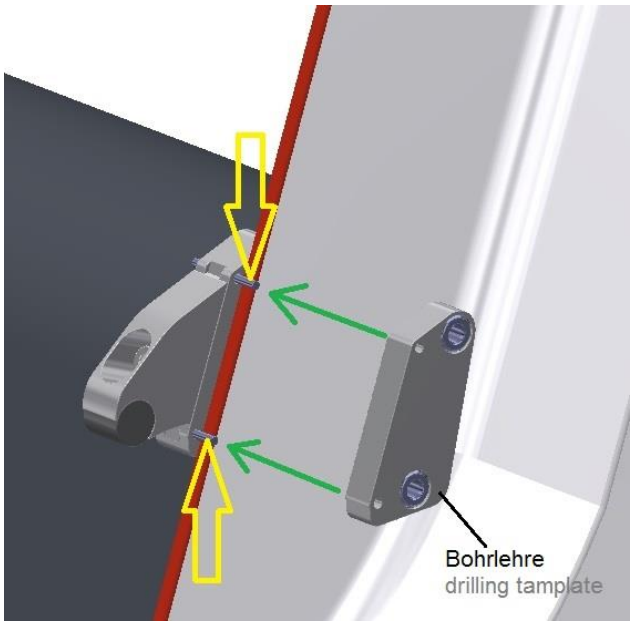
To do this, you have to get back on the plane and lock the canopy firmly with the central lock. Remove the protective film from the double-sided adhesive tape on the back of the hook nose.

Make sure that the 2mm pins (**yellow arrows**) look out at least 5mm on the back so that they act as a stop when pressed against the edge of the fuselage (colored red).

Now carefully and parallel place the hook on the fuselage side wall so that the pins are touching the front edge of the fuselage and at the same time the black plastic nose rests on the locking bolt (red arrow), as you did it before when determining the drill device position.

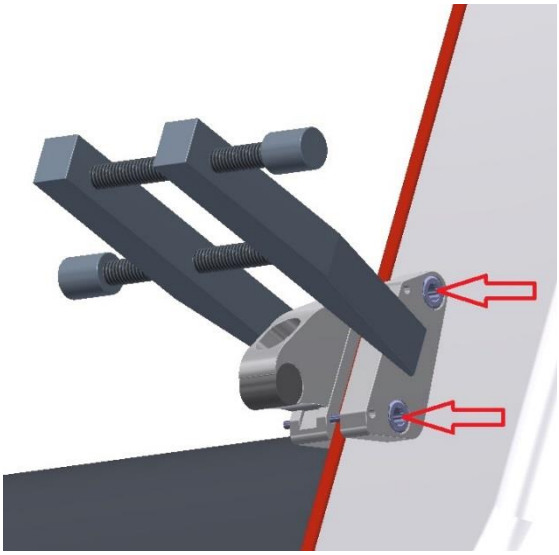
Caution! Do not touch the side wall with the double-sided tape until the position is correct, otherwise the hook will stick in an incorrect position. The double-sided adhesive tape is difficult to remove.

Now press the hook firmly against the inner wall of the fuselage so that it is temporarily fixed in place.
It makes sense to add a small marker on the top edge of the hook so that you can see whether the hook moves vertically as you proceed. The horizontal stop position of the pens can be easily checked at any time.
In order to be able to open the canopy, you must first open the bolt completely by hand, since there is still no actuating bowden cable attached. To do this, you can screw the plastic ball 12mm in (this corresponds to the total stroke of the locking bolt). This means that the bolt should not looking out of the look housing any more when the canopy is opened.
Now open the canopy to get out of the aircraft again and to be able to drill the mounting holes from the outside.



Another drilling device (also available from me on loan), with 4mm drill bushings is pushed onto the pins from the outside (green arrows).

To do this, pull the pins (**yellow arrows**) outward far enough so that both parts align with each other.



Both parts are fixed to the fuselage border with a parallel clamp.

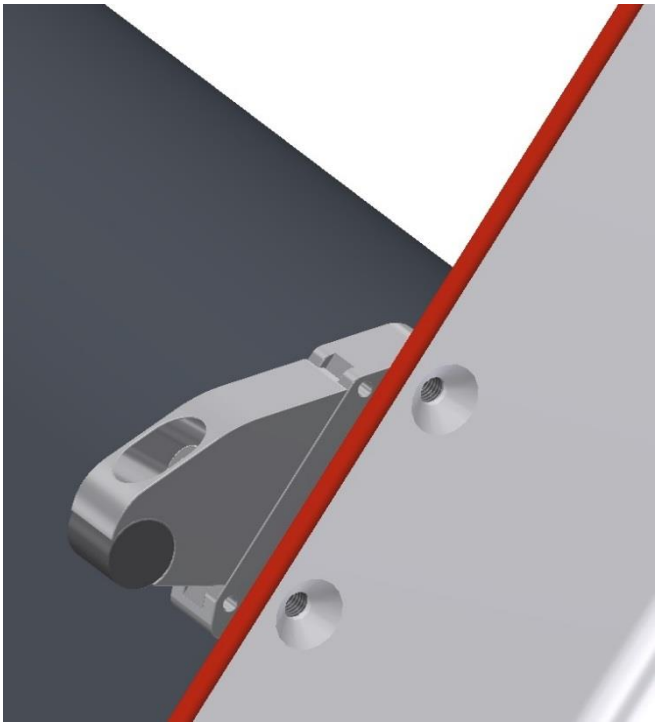
Then drill the fuselage wall with a 4mm drill.

Caution! Do not exert too much pressure and stop immediately when the wall is pierced so that you do not get into the M4 thread of the hooked nose, which is placed inside to the fuselage.

Hold the drill at a right angle.

After the holes have been drilled, the gauge can be removed.

You can now remove the two pins and the holes are best made with a 90 ° solid carbide countersink (also available from me on loan).



Lower the holes only as far as necessary so that the M4x14 hexagon socket countersunk screws are just flush with the outside.

Make sure that the countersink does not run out of the center line of the hole.

You can check the correct counterbore diameter by holding the screw upside down on the counterbore.

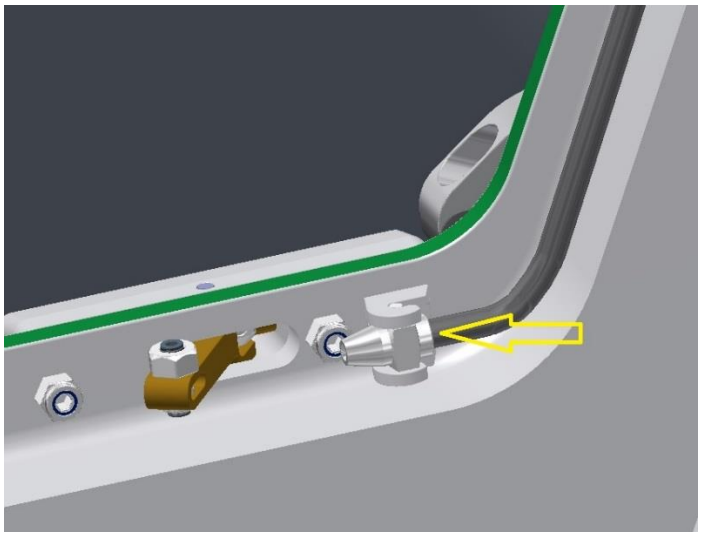
It doesn't matter if the screw head still protrudes outside a little after tightening.

If the countersink is too deep, the cone of the screw head extends into the thread of the hook, thus preventing the screw from being properly tightened.

Tighten the two screws well. Loctite is not necessary.

Attaching the Bowden cable sleeves:

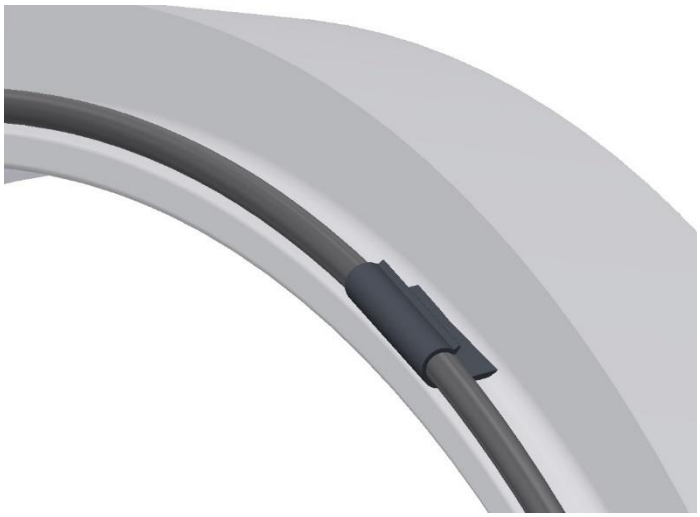
The Bowden cable covers are cut to the right length. You should bend them a little at the lower end, which is inserted into the swivel joint, so that they fit into the arch of the canopy frame without tension.



The Bowden cable cover is inserted approx. 10mm deep into the swivel joint as far as it will go and is moved upwards in the canopy frame towards the central locking system.

The Bowden cable cover is laid flush on the heel of the curved canopy in line with the frame with the front edge.

To do this, use the plastic clips that are attached to the heel with double-sided adhesive tape.

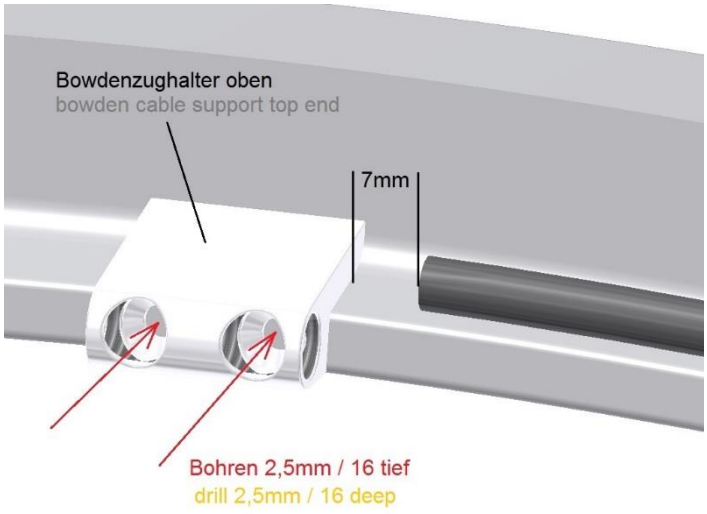


Three of these clips per side are sufficient, with the last one being positioned approx. 10 cm in front of the upper end of the Bowden cable sleeve.

The others are placed in between so that the distances are approximately the same.

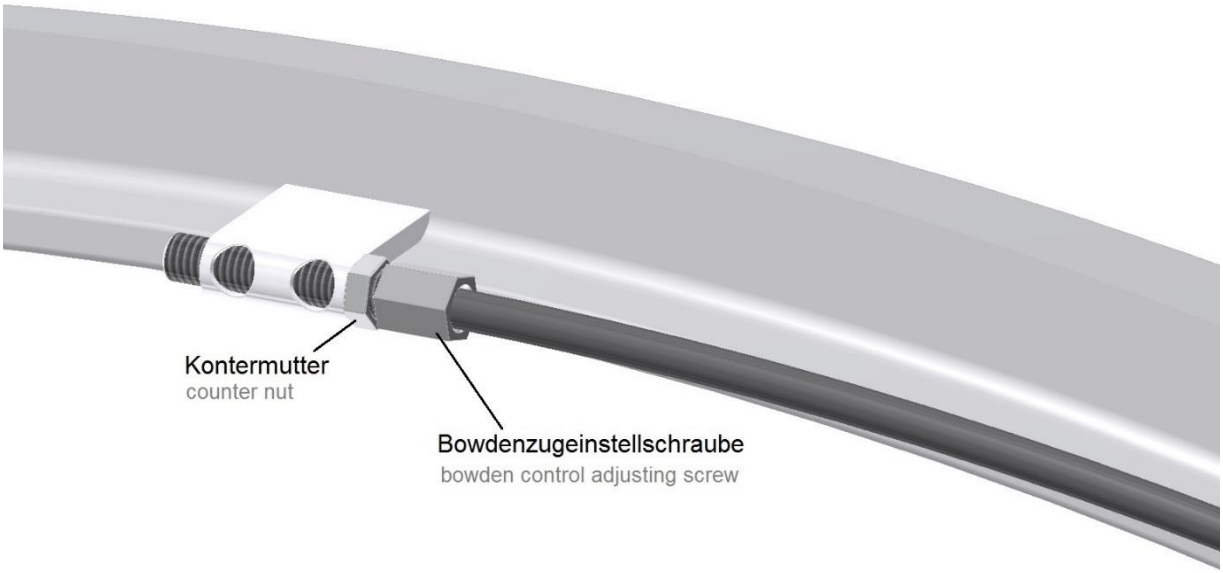
The upper Bowden cable holder is now also glued to the heel, so that there is a distance of approx. 7 mm from the end of the top end Bowden cable support (drawing below).

Now 2.5mm holes must be drilled at least 16mm deep into the heel edge at the location marked with the red arrow.



Caution! In contrast to the drawing, the plexiglass window on the top of the frame hinders this work. For this you need the smallest possible cordless hand held power drill or even better a drill with an angular head in order to be able to drill from the angle as perpendicularly as possible to the front edge. A large drill hits the plexiglass window much too early and cannot be swung up far enough.

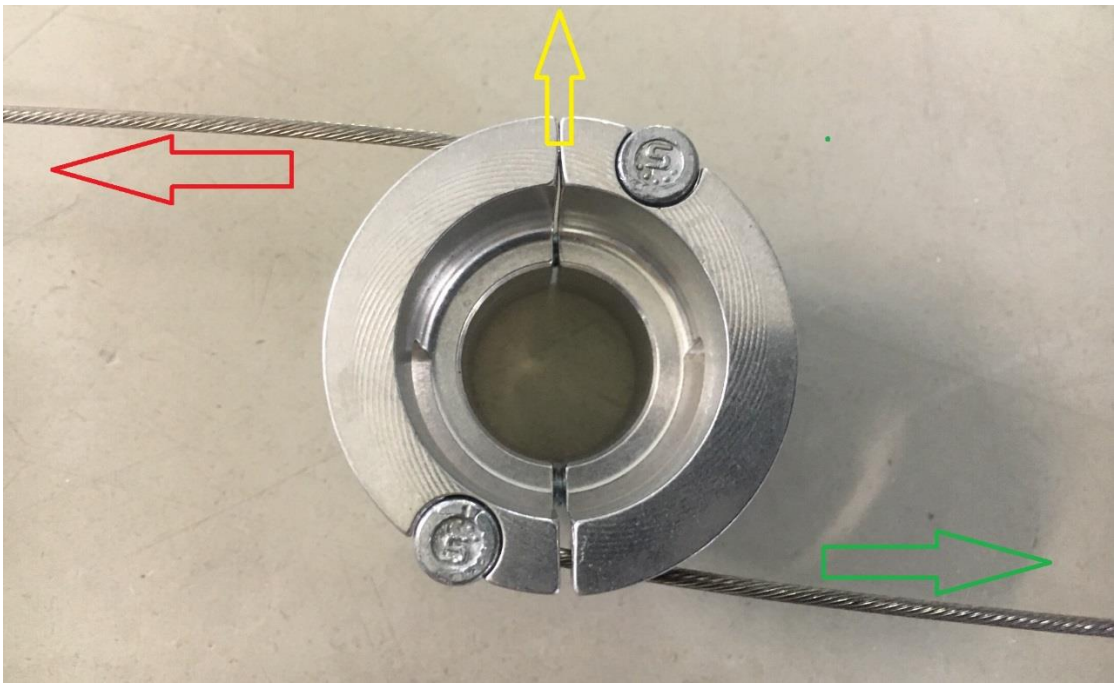
With the enclosed Phillips 3x15mm countersunk screws, the upper Bowden cable holder is screwed onto the frame from the front. The screw heads must completely disappear into the lower recess in order to release the transverse M6 thread.



Now screw the lock nut onto the adjusting screw as far as it will go and screw it completely into the upper Bowden cable holder. The Bowden cable cover is now inserted into the hole in the adjusting screw.

Finally, unscrew the adjusting screw until the shoulder of the hole lies against the end of the Bowden cable and lock the lock nut against the holder.

Attaching the roller with the pull cables to the handle of the central locking system:



The picture shows the roll from above (**yellow arrow** points in the direction of flight). The roller consists of two half-shells, which have a slot at the back, through which the locking tongue of the canopy lock looks.

The advantage of the design is that you do not have to disassemble the handle of the locking lever on the aircraft. The half-shells are simply attached to the cylindrical part of the inside handle from both sides and clamped together with two M4x12 Allen screws.

The slot is aligned with the seam of the molded plastic handle. Before assembly, the nipples of the two pull cables must be inserted into the corresponding cutouts from above.

The pull cable for the left hood bolt is at the front (red arrow) and the pull cable for the right bolt is at the back (green arrow).

When assembling, turn the central lock into the closed position (canopy can be opened).

The plastic handle inside the hood points to the front and the outside handle above the canopy points to the rear, as is the case in flight.

In the two pictures above you can see the cable guide again.

The thin red arrow in the left picture shows the slot-shaped cutout through which the locking tongue of the original central lever passes.

The picture on the left shows the loosely attached pulley half shells, but without the pull cables.

After installing the pulley, the pulling cables must now be pushed through the Bowden cable sleeves and attached to the clamping pieces of the lever.

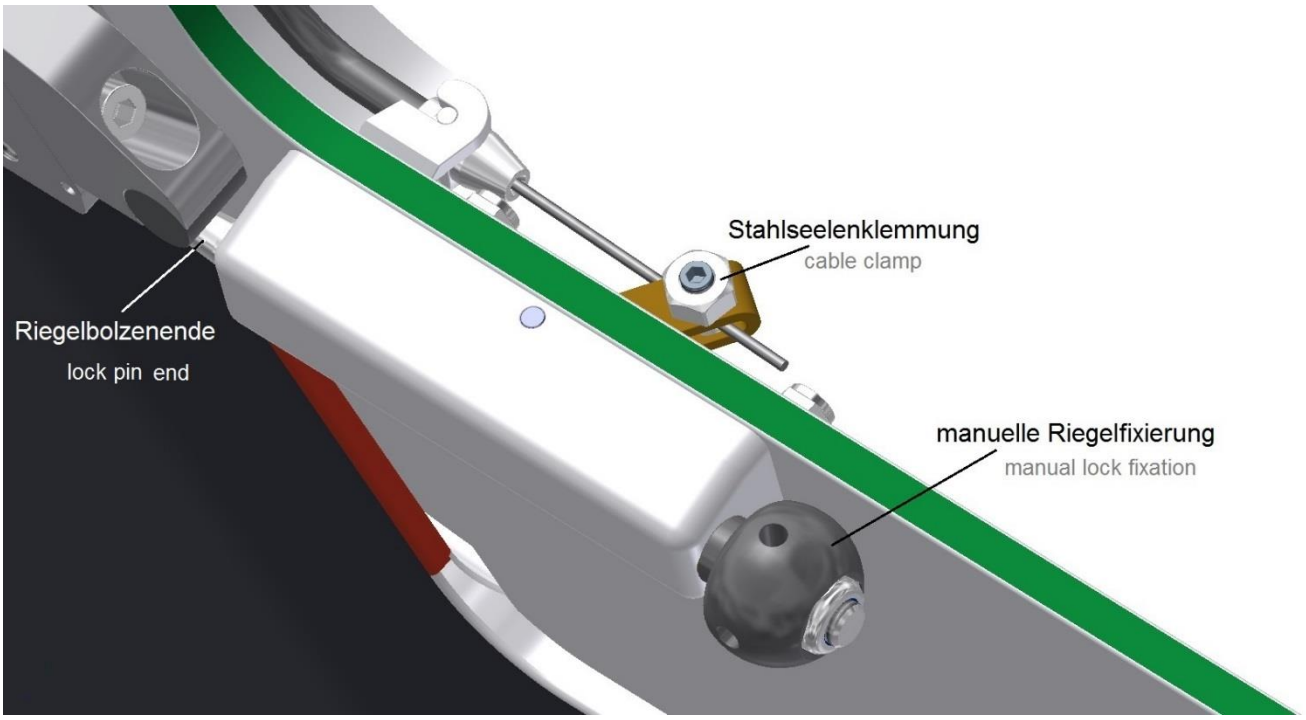
The right rope runs parallel to the front edge of the frame to the right adjusting screw, where it is has to be inserted. Be careful not to kink the rope.

The left rope runs somewhat diagonally from the pulley front to the left adjusting screw.

When pushing it through, it can happen that the cables hooks at some transition point. Mostly at the bottom of the outlet from the Bowden cable casing towards the swivel joint.

Slightly back and forth while wobbling at the shell exit is enough to push it all the way through.

The cable end is then pulled further into the slot of the lever through the hole in the steel cable clamp (see next page).



Before clamping the steel cable, you must first observe the following points.

The locking pin end of the lock must protrude completely (approx. 12mm) from the housing. To do this, the manual bolt fixation must be unscrewed to such an extent that there is a minimal gap between the end face of the plastic ball and the housing. The brass lever is in its foremost position.

It must then be ensured that the central bolt on the top of the hood is in its closed position, i.e. the handles are in the longitudinal axis direction of the aircraft.

The two steel cables must lie cleanly in the recessed circumferential guide groove of the pulley.

Use an 8 mm wrench to hold the hex head of the steel core clamp.

Pull the protruding end a little tight and clamp it firmly with the small grub screw.

If you have done this on both sides, you must check whether both locking bolts are inserted evenly flush with the housing when the central lock is turned 90 ° into the open position.

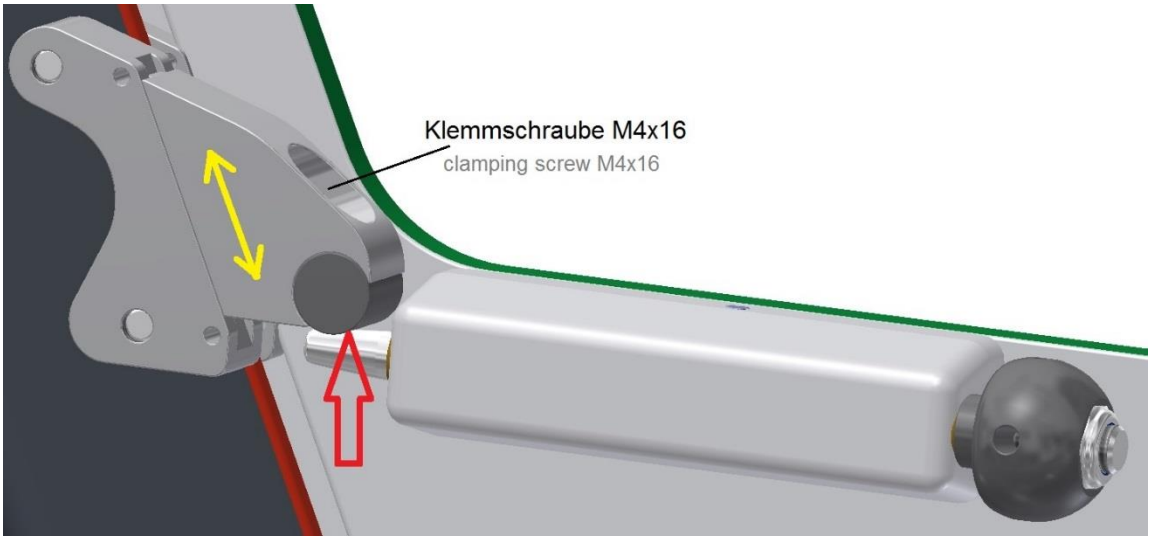
If one of the two pins lags a bit, a fine adjustment can be made at the top of the adjusting screws of the upper Bowden cable sleeve holder.

To do this, simply loosen the lock nut and unscrew the adjusting screw a little more until the bolt opens equally. Then tighten the lock nut again.

After this fine adjustment, tighten the grub screws of the clamp again and cut the steel cables with a sharp side cutter approx. 20mm behind the clamp.

If the end twists a bit, you have to twist it back together. Secure the tip of the wire with a drop of super glue or with a thin shrink tube.

Finally, there is the fine adjustment of the movable hook noses on both sides (see next page).



Take a 3mm Allen key and get into the aircraft.

Close and lock the canopy correctly.

Now loosen the fastening screw M4x16, which fixes the movable hook nose, only so little that it can be moved just so, but does not rattle.

Then slide the nose down onto the locking pin (red arrow) without pressing down the side edge of the canopy.

Tighten the fastening screw well and check whether the canopy can be opened and closed easily.

Additional tip: Sometimes it happens that the canopy rattles a little at idle speed at the ground. You can prevent this with the new additional canopy locking by minimally pressing the canopy down when you make the fine adjustment of the locking nose. As a result, the hood is held under tension by the conical bolt when it is closed. However, after the canopy has been locked, it may be necessary to push it down a bit on both sides so that the locking bolt can be fully pushed out by the spring.

R E A D Y 😉

Concluding information: The locking mechanism is greased with viscous grease and does normally not require any further treatment (no wear was found on 10,000 test cycles on a test stand).

Should the Bowden cable tear for some reason or slip out of the clamp while you try to open the canopy from the outside, there is still a way to open it.

The locking bolts are held in the locked position by the springs. If this happens while you are inside the aircraft, you can simply open it manually by pulling on the plastic ball, or you can turn the ball in as far as it will go, then the bolt is permanently open.

So if you are standing in front of a locked airplane that can no longer be opened from the outside, simply bend a wire hook made of 3mm wire. The angled end should not be longer than 10mm and the long part of the wire must be long enough to reach the ball through the small ventilation window in the front of the canopy.

Radial holes are drilled in the ball. You can then hook the wire hook in there and open the lock manually from the outside by pushing it through the small ventilation opening in the window of the canopy.

Have fun flying

Jan Henseleit

HENSELEIT HELICOPTERS