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Working Instructions for inspection of the spar cap and spar web

1. Recommended devices for the inspection

- a) Video camera (colour) with approx. Ø 15 mm (0.59 in) through 25 mm (0.98 in) with additional light and adequate cable extension with monitor.
- or
- b) bright light Endoscope of large length, preferable with 70 through 90 degree direction with additional light, if required.

Remark:

If a very long endoscope is available, which enables a safe check of the bonding, fewer inspection openings (see item 2g and 2h) may be required.

2. Inspection openings for checking the bonding between spar cap and spar web

- a) Remove the attachment fitting together with the bell cranks for airbrakes and ailerons at the root rib.
- b) Cut the inspection opening in the root rib, see page 6.

For aircraft with winglets:

- c) Cut an inspection opening in the outer wing rib, see page 6.

For aircraft without winglets,

if the check can not be done completely through the inspection openings in the root rib and in the lower surface at the aileron drive:

- d) Remove the aileron; do not loosen the Askubal link at the aileron drive and apply a mark.
- e) Cut inspection openings in the rear web supporting the aileron, see page 7.
- f) Cut an inspection opening in the rear web of the wing supporting the aileron see Maintenance Manual table of contents.

If only a short endoscope (approx. 0,5 m (19.6 in) length is available:

- g) Cut inspection openings in the lower surface of the wings, see page 7.

Remark: As a result of the asymmetric wing connection the spar of the inboard starboard wing is situated more aft as the port wing spar position.

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2. Inspection openings for checking the bonding between spar cap and spar web (ctd.)

- h) Cut inspection openings in the airbrake box see page 7 and page 8.
- i) Remove the top cover at the inspection opening at the aileron drive.
- j) The pivot bearing in the port root rib is used as inspection opening.

3. Inspection:

The bonding on the rear side of the spar cap and spar web on the upper wing surface has to be checked, see cross section on page 8.

It is required that the gap between GRFP-spar web and CFRP-spar cap is completely filled with bonding material.

This can be detected through:

- excessive bonding resin at the rear upper edge of the spar cap to the spar web connection.

Showcase photos on page 9 and 10 indicate the following:

- a complete bonding with excessive bonding resin, see page 9
- a defective bonding – insufficient bonding resin, see page 9 and 10

4. Inspection procedure:

Remark:

It is recommended to start the inspection through the opening in the root rib inboard.

The bonding of the upper spar cap to the spar web has to be checked visual **over the whole length of the wing until the outer end of the aileron** through the inspection openings, see item 2.

If an area can not be clearly identified (lighting conditions insufficient) additional inspection openings may be required:

These additional inspection openings should be cut on the connecting line of the inspection openings see item 2g).

At the length of the aileron, additional inspection openings with 12 mm diameter may be cut in the rear web of the wing.

Remark:

- 1 a) Where the distance between the inspection openings **is 500 mm or more:**
After the check it is sufficient to protect the edge of the foam of the 12 mm inspection openings with resin (sickened with cotton flocks) and to tape over the opening.
- 1 b) Where the distance between the inspection openings **is less than 500 mm:**
The affected inspection openings have to be closed according the relevant repair instructions.

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2. The inspection openings in the airbrake box and in the rear web supporting the aileron should be closed at least with 3 layers of 92125 under 45 degrees. The inspection opening with 30 mm diameter in the rear web supporting the aileron can stay open.
 3. The inspection openings in the root ribs (inboard and outboard) can stay open.
 4. In case of doubts during the check regarding the safety of the bonding contact the holder of the design SCHEMPP-HIRTH GmbH.
5. Defects in the bonding of the spar cap to spar web connection:

If defects were noticed the gap depth and length should be identified with a pointer with markings for the depth (wire diameter approx. 0,7 mm and/or a thin metal sheet thickness approx. 0,3 mm).

When identifying the area of the gap, always investigate the extension of the void in span wise direction. Some photos on page 9 and 10 show examples of defects in the bonding.

Additional inspection openings in the lower wing surface also on the forward side of the spar and/or the aileron web may be required.

When repairing these defects this method of identifying the dimension of the defects should be maintained to detect the whole area.

Defects have to be repaired according the instructions on page 4 and 5.

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Repair instructions for the spar cap/spar web connection

A cross section of the wing with spar is shown on page 8.

To repair the spar cap/spar web connection the opening in the lower surface has to be increased accordingly so that the repair can be done.

Take care that the opening has a distance of more than 20 mm to the spar cap.
Also inspection openings forward the spar can be necessary.

I. Deficiency in the bonding of less than 15 mm from the edge of the web and less than 40 mm in lenght

1. Roughen the surface in the gap of spar cap and spar web.
2. Around the affected area roughen the surface of spar web and the wing shell.
3. Fill the gap with resin (thickened with cotton flocks)
4. Additional apply a layer of glasfibre 92125 under 45 degrees over the affected area. This layer should exceed the border of this area at least 20 mm covering over the edge of the spar cap and spar web.

II. Deficiency in the bonding of more than 15 mm from the edge of the web or exceeding 40 mm in length or within the flange of the spar web

1. In the area of the deficiency sand the spar web away and scarf the edge of the web flange.
2. After roughening of the spar cap and the surrounding spar web apply the following layers 92125 under 45 degrees over the area to be repaired:

wing station	numbers of layers 92125 under 45 degrees
from root rib inboard until 1800 mm (70.9 in)	3 layers for each side
from 1800 mm (70.9 in) root rib inboard until 5740 mm (226 in)	2 layers for each side
from 5740 mm (226 in) root rib inboard until root rib outboard (with winglet) respective wingtip	a total of 3 layers (C-shape web)

Remark: The minimum scarf length for **one layer 92125** is at least **10 mm**.

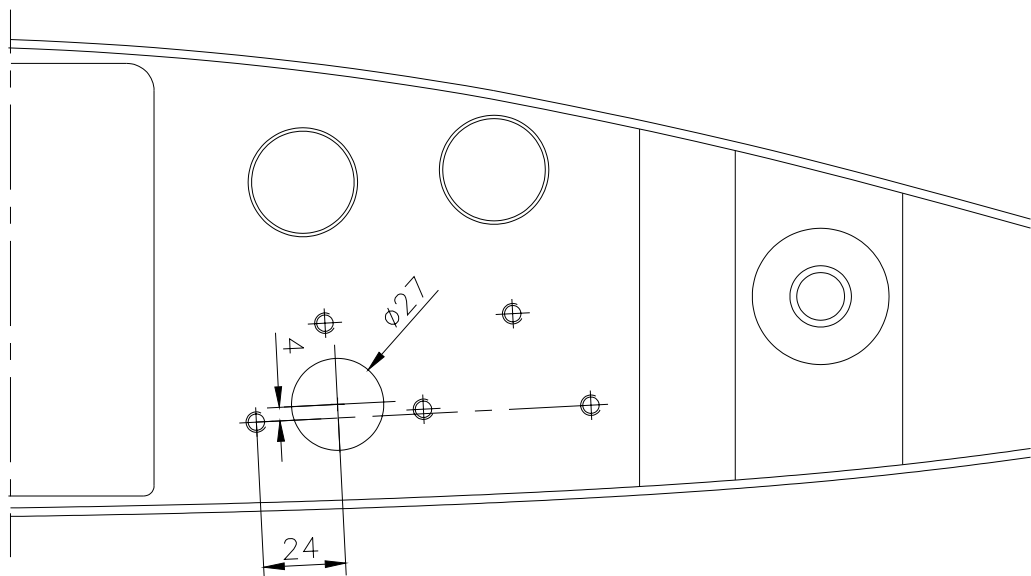
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III. General instructions to the repair of the spar cap/spar web connection and the repair of the repair openings in the wing shell

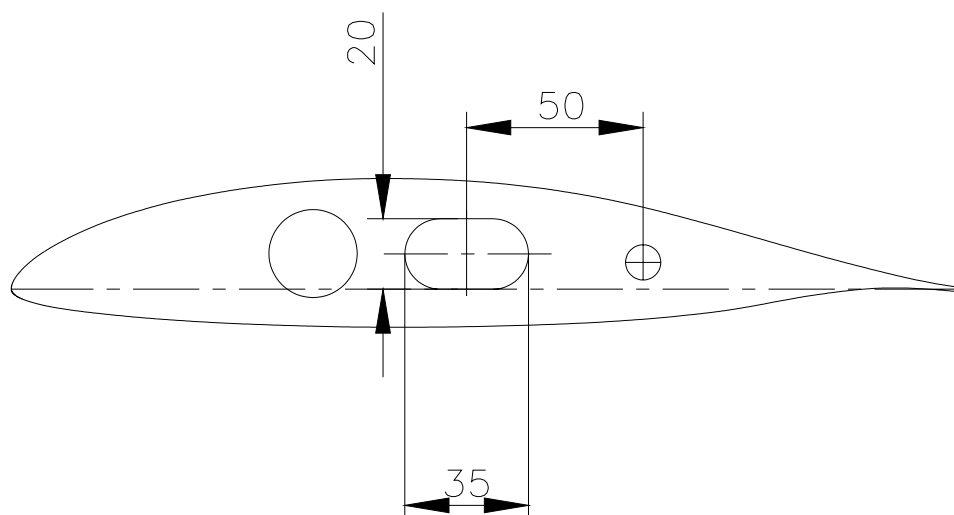
The repair of the spar cap/spar web connection and the repair of the repair openings in the wing shell must be done according following additional instructions:

- a) Repair instructions in the appendix of the Maintenance Manuals:
 - Repair Instructions Discus CS, issue June 1990
 - Repair Instructions Discus a and Discus b, issue December 1984
 - Repair Instructions Discus bT, issue October 1989
- b) Repair instructions for sailplanes and powered sailplanes constructed from fibre reinforced plastic (FRP), issue September 1991

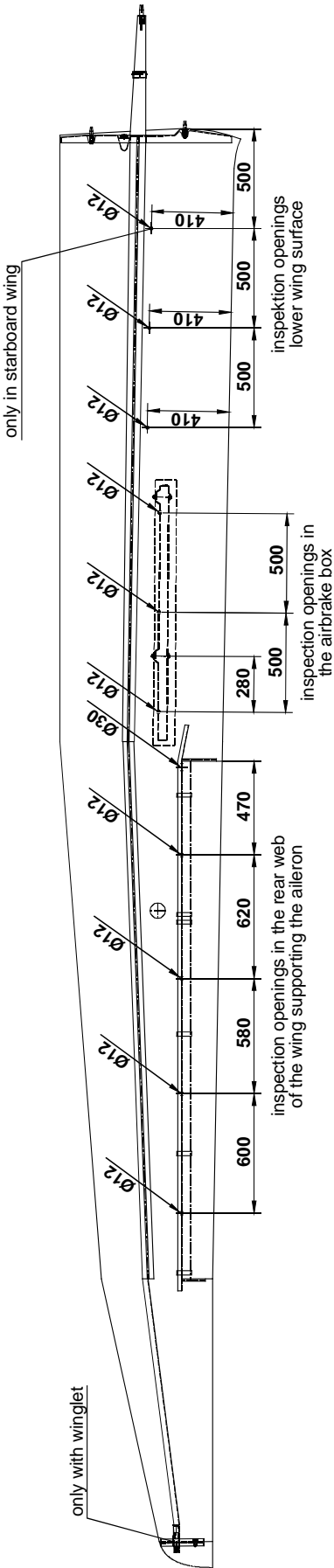
inspection opening in the root rib
(starbord root rib is shown, laterally
reversed on the port root rib)



inspection opening in the outer wing rib
(only for aircrafts with winglets)



Starboard Discus-Wing
(bottom view)



Wing cross section in the airbrake area

