



AS TYPE PROPELLER'S MANUAL

www.PESZKE.com

This manual concerns broad line **B-LINE** and slim line **S-LINE** AS type propellers.

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CHAPTER 1

GENERAL INFORMATION

1.1 Introduction

The following document delivers vital information concerning assembly, installation and disassembly of the AS propellers. It gives helpful tips and suggestions about propellers' handling and usage. The instruction also provides details about technical inspections and tests, how to detect and eliminate some defects which might occur during standard propellers' exploitation.

Information enclosed in this document is based on data base, knowledge, professional experience of the producer and it's considered to be appropriate and sufficient for mechanics with professional aviation knowledge and experience. In other cases, any operations with the propeller should be preceded with a suitable training course.

Some drawings included in this manual may not reflect every detail and exact shape of illustrated parts but are sufficient to understand the whole content.

In case of any doubts concerning this manual or problems with propellers' exploitation, the producer should be informed immediately:

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1.2 Safety information

There are three types of designations distinguished in this manual to emphasize importance of information :

WARNING - Defines strict rules that have to be proceed. Not compliance with them may cause major injures including death.

CAUTION – Defines the ways to proceed. Not compliance with them may cause serious damages of the aeroplane and its elements.

NOTICE - Indicates some additional information which might be helpful in full understanding of this manual.

WARNING

Before any operations with the propeller are taken, the battery must be disconnected and the engine must be secured in case of unintentional starting.

Besides precautions emphasized by the producer in this manual, any other safety rules and regulations introduced by the aviation authorities must be complied. If there are any differences between safety limits mentioned in this manual and other regulations, the more restricted should be considered.

Before every next installation check if the propeller set is complete.

Every part of the propeller predestined to reuse must be examined, cleaned and assembled according to this manual.

1.3 Documents delivered with the propeller

Every copy of the propeller is delivered with following documents:

1. Propeller certificate.
2. Propeller warranty.

1.4 Manual actualization

The manual is updated by the producer. The latest version of the manual is available on the producer's web site: www.peszke.com.

CHAPTER 2

OVERALL CHARACTERISTICS

2.1 Basic information

Ground adjustable AS propellers are designed for light, ultralight, experimental aeroplanes and also for trikes, motor hang-gliders. Propellers cooperate with engines which power is up to 90 kW (120 BHP)

AS propellers are manufactured by PESZKE S.C. Company is located in Krosno, Poland. PESZKE S.C. has been designing and manufacturing aviation propellers for 15 years. Before the year 2007 company was widely known as Z.P.P. AERO-SAIL.

Firstly company produced propellers for motor paragliders and motor hang-gliders. Later company's interest has spread to light, ultralight and experimental aeroplanes. To be one step ahead of competition the company uses it's know-how, constantly developing existing as well as new range of products like flight adjustable propellers.

Technological design of AS propellers is based on carbon fibre structure with increased elasticity module and epoxide resin. The usage of newest technologies enables AS propellers to be lightweight and have low gyroscope momentum thanks to what they are good power receivers for various types of engines.

AS propellers can be delivered in 3-blade version and custom-made 4-blade version.

2.2 Construction

The elementary materials used to manufacture blades of AS propellers are carbon fibre and epoxide resin with good thermal as well as fatigue resistance. The carbon fibre has a form of roving with increased elasticity module, carbon fabric with plain wave and different tow sizes or thickness. Increased elasticity of the blade's leading edges helps to protect the propellers from the environment and to provide some increased impact resistance. The special type of metal paint used to cover the blades is also increasing their wear resistance. Thank to those features propellers are more efficient, long-lasting and comprehensive.

The propeller's duraluminium hub construction is two-piece with self-locking, double-rowed lock what enables the blades to be adjusted on the ground. The hub has anti-rust protection.

AS propellers' unique construction gives them aeroelastic qualities.

Maximal revolutions of the propeller decrease during aircraft acceleration and remains constant at speeds between 100-150 kph. While further aircraft acceleration the propeller's revolutions slowly increase to achieve or slightly exceed the level on standstill at full power.

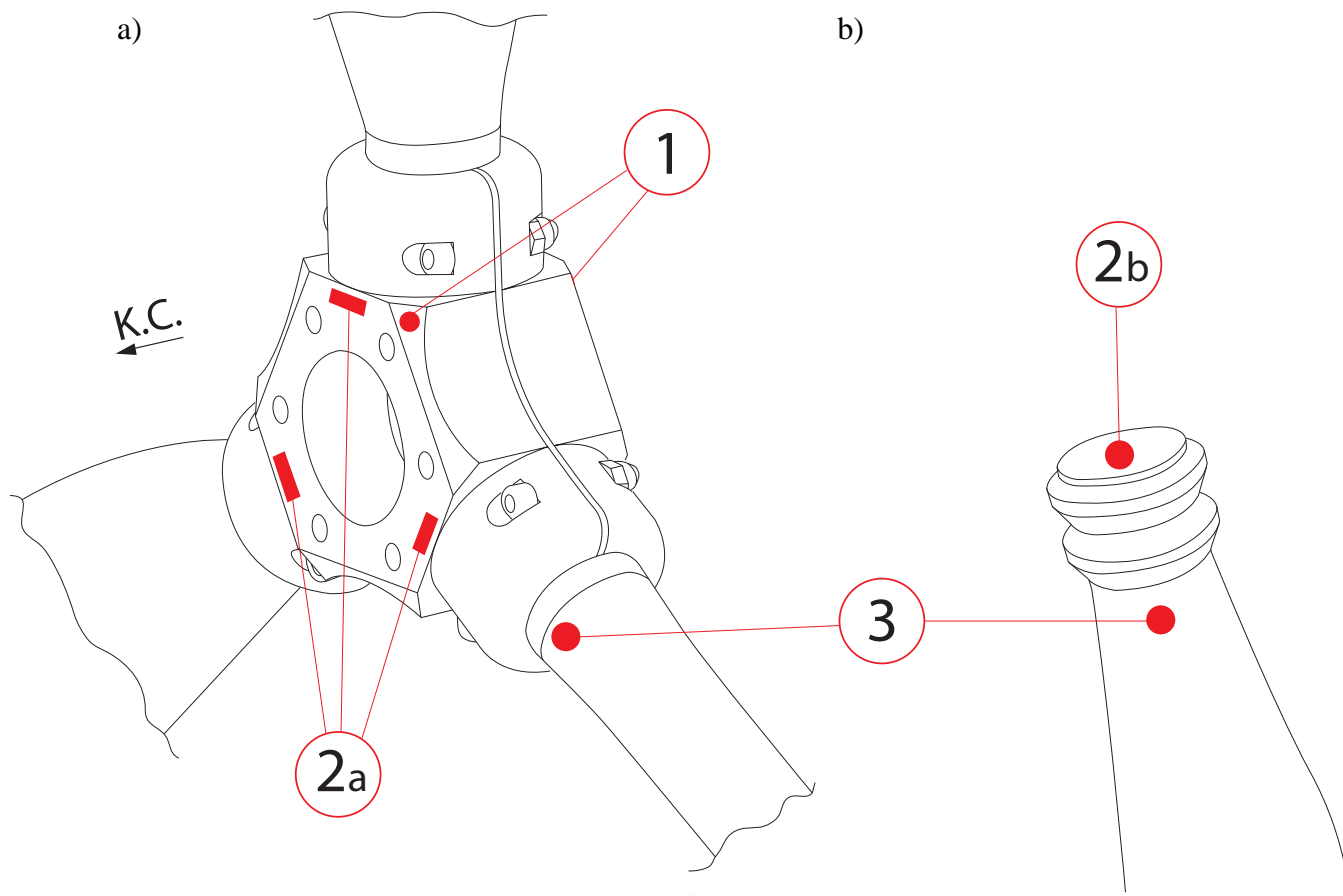
This effect helps taking advantage of engine power better .

2.3 Designations

AS propellers' designations are permanent both on hub and blades.

Location of those designations is illustrated on the drawing 2.1

2.3.1 Hub and blade numbering



Draw. 2.1 Location of designations on propeller

Drawing description:

1. Propeller's serial number and simultaneously the mutual positioning designation of hub's front and rear pieces (looking in thrust direction).
2. Blade numbers:
 - a) Blade numbers placed on the hub
 - b) Blade numbers placed on the blades
3. Propeller model designation

WARNING

- 1. Propeller's serial numbers placed on the hub must be identical on both front and rear pieces and their placement must be accordant with drawing 2.1**
- 2. Designations placed on the blades and simultaneously position of the blades must match designations placed on the hub.**

2.3.2 Propeller model designations

AS	1730/	1950	L	-2	/4
↓	↓	↓	↓	↓	↓
Type of propeller	Diameter [mm]	Average geometric pitch [mm] (not marked on blades)	Rotation direction	Subtype related to blade's shape	Number of blades (not marked on blades)
L	– left rotation propeller*				
No postscript	– right rotation propeller*				
4	– 4-blade propeller				
No postscript	– 3-blade propeller				

*Rotation

Left rotation – clockwise motion (looking in thrust direction)

Right rotation – counter-clockwise motion (looking in thrust direction)

Example designation:

AS 1730/1950-2

or 1700/1350L

Table 2.1 Characteristics of AS propellers

Model of propeller	Diameter [mm]	Number of blades	Rotation direction	Weight [g]	Inertia momentum [kg · cm²]
AS 1730/1950	1730	3	Right	3580	3450
AS 1730/1950-2	1730	3	Right	3600	3480
AS 1700/1950	1700	3	Right	3550	3450
AS 1700/1350L	1700	3	Left	3550	3450
AS 1650/1950	1650	3	Right	3500	3400
AS 1560/1350L	1560	3	Left	3500	3400

CHAPTER 3

INSTALLATION

3.1 Installation conditions

AS propellers hub installation holes spacing enables them to be installed to the most types of engines. Dimensions of the hub can be found in chapter 3.8. If the engine flange holes spacing doesn't match the propeller's hub in that case suitable extension must be used.

During propeller installation all of the engine and reduction gear producer's requirements must be taken into consideration. Propeller installation bolts must be secured in a certain way in case of unintentional unscrewing.

Propellers can be used with the spinners. Installation of the spinner must be made properly. The spinner has to be well balanced and must not be a cause of any vibrations.

Spinner's edges must not touch propeller's blades in any area.

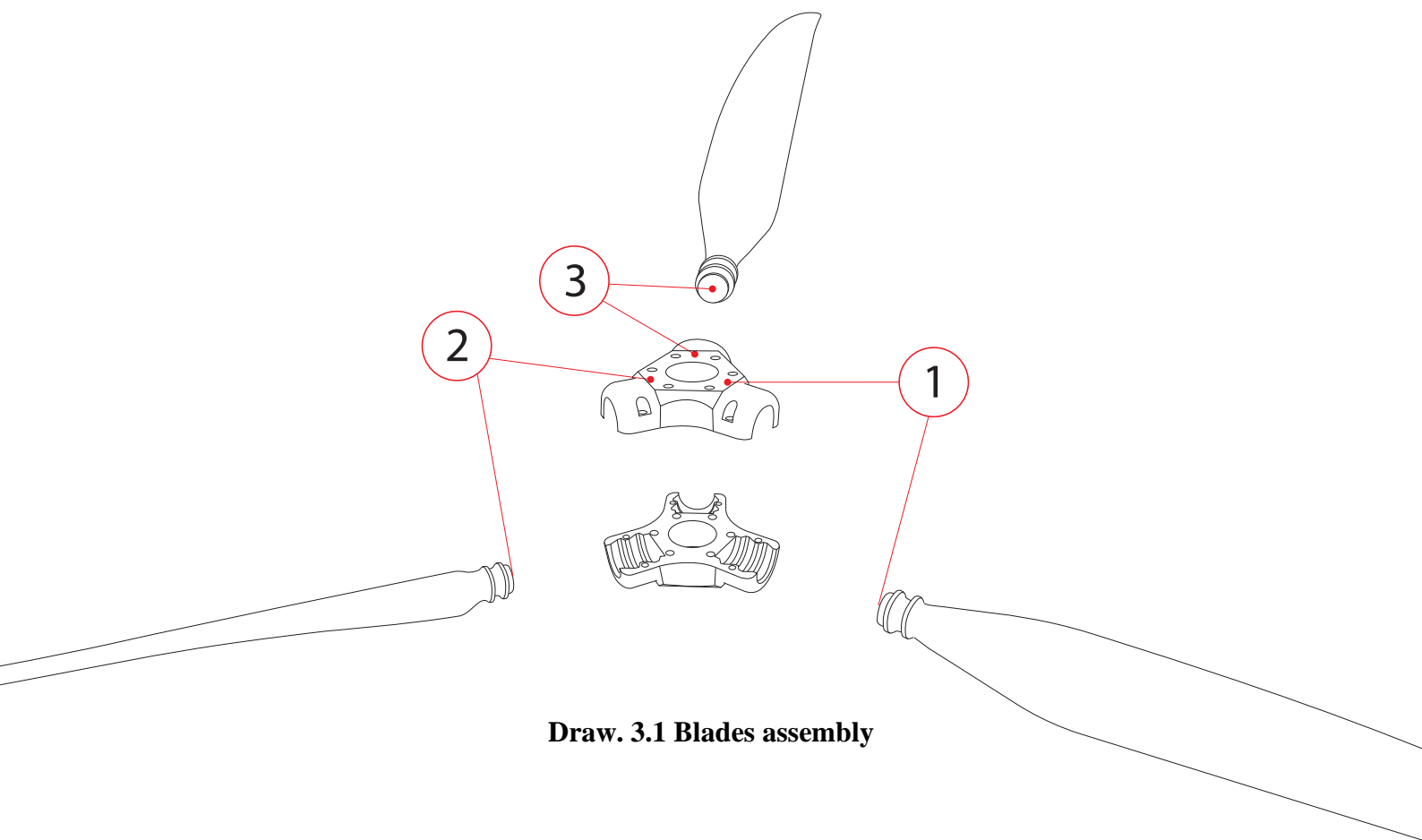
Any type of propeller can be installed to an engine using suitable extension if needed. The length of the extension must not exceed the limit defined by the producer of the engine and reduction gear. Exemplary installation of the propeller using both extension and spinner is illustrated in chapter 8.4

3.2 Blades assembly

In case the propeller was delivered in pieces the user must carry out the following actions:

1. Disassemble both pieces of the hub taking mutual positioning of serial numbers placed on both pieces into consideration.
2. Place the rear piece of the hub on flat surface (the one with serial number on it only).
3. Place all blades into sockets considering numbers both on blades and front piece of the hub (they must be the same). The convex surface of the blades must be upwards (see draw. 3.1).
4. Clench everything together with the front piece of the hub.
5. Put the bolts in the holes from the side of the front piece of the hub and next put the nipples into sockets from the side of the rear piece of the hub.

6. Screw everything together taking parallel closing in of both pieces of the hub into consideration using 6 Nm (4.4 lb/ft) of initial torque.



Draw. 3.1 Blades assembly

WARNING

Location of blades and pieces of the hub must not be changed. With every blade assembly new nipples with unscrewing protection and increased durability must be used.

3.3 Disassembly of the blades

Disassembly of the blades is advised only in justified situations when conditions to proper blade assembly and angle adjustment can be guaranteed accordingly to chapter 3.4.

NOTICE

In case there is no possibility for the user to properly adjust the blade angle consultation with the producer is advised.

In order to preserve installation warranty in case the propeller is sealed by the producer or his representative – every disassembly of the propeller must be reported to the producer or his representative.

In order to disassemble the blades, following actions must be performed:

1. Remove the propeller from aircraft.
2. Unscrew the bolts , separate the hub's pieces and extract the blades.
3. Inspect the blade's root and pieces of the hub.
4. In case any damage described in chapter 6 is detected , consultation with the producer is advised.

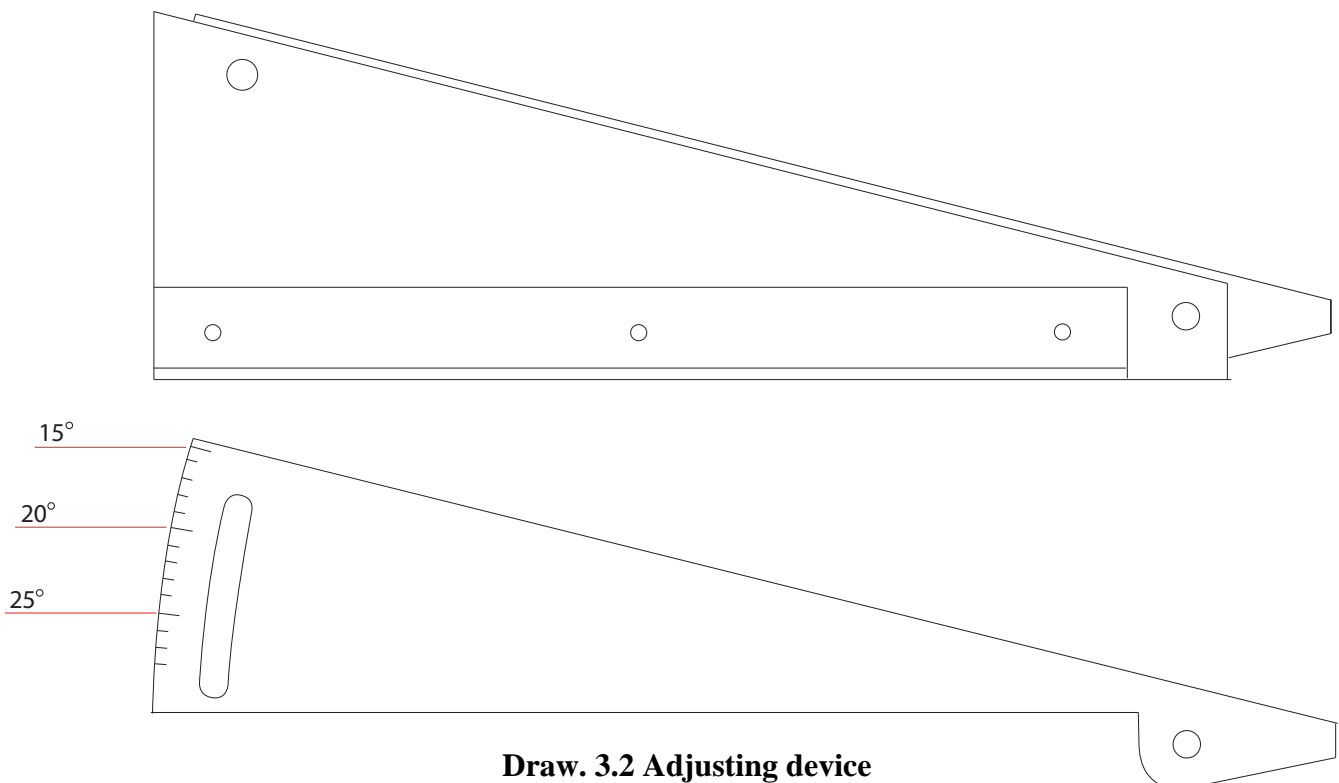
3.4 Blade angle selection, inspection and adjustment.

Selection of the blade angle β suitable for given aircraft is established by it's producer and contained in aircraft manual. Blade angle can also be established by the user after consultation with propeller's producer . Blade angle range is contained in chapter 4.

CAUTION

Appropriate blade angle selection must be confirmed by proper tests.

In order to inspect or adjust blade angle prepare flat and even surface with dimensions min. 1000x300 mm, adjusting device and hub support pad with dimensions 100x100x20 mm (see draw. 3.3). Adjusting device and hub support pad are delivered with the propeller.



Draw. 3.2 Adjusting device

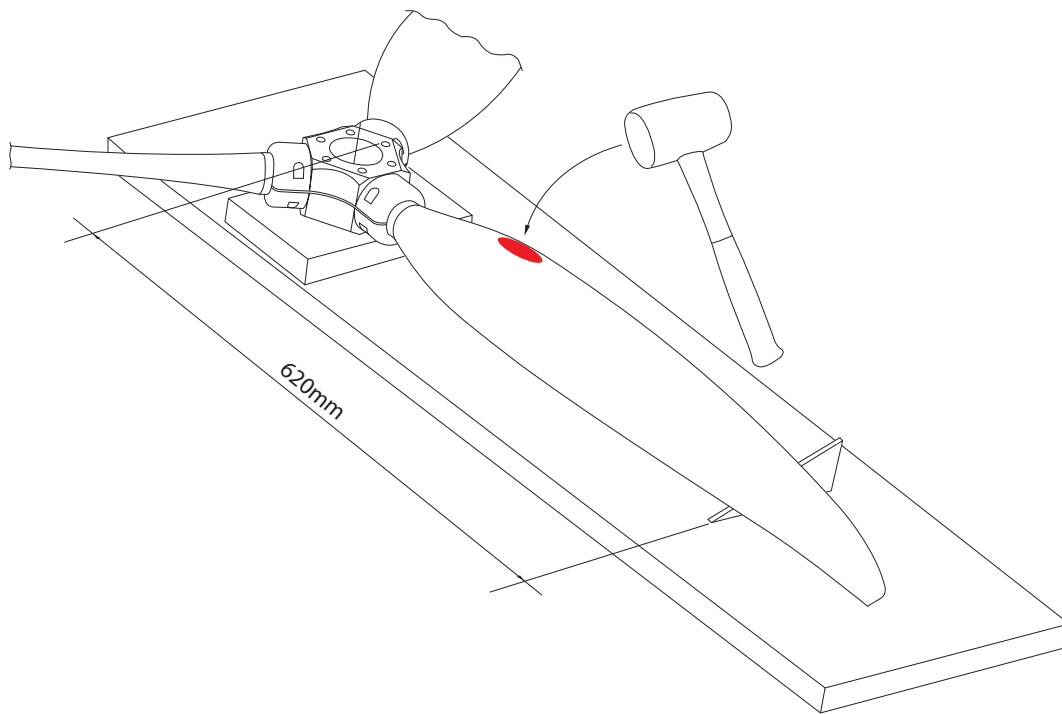
The way to proceed:

1. Put a hub support pad horizontally on even and flat surface. Put propeller on the pad in horizontal position also.
2. Set the adjusting device at the required angle and secure it by tightening the nipple.
3. Before any adjustment is made bolts should be loosened (about 1 revolution) to enable blades rotation movement.
4. Inspect each blade angle with the adjusting device. The inspection must be performed in a control surface which is located 620 mm from propeller rotation axis, perpendicular to the ground and to the blades axis. The blade angle adjustment must be made using rubber hammer (the hitting area is marked on the drawing 3.3) by comparing bottom surface of the blade do the adjustment device edge.
5. When the adjustment is made tighten each bolt with initial torque 6 Nm (4.4 lb/ft) in order showed on the drawing 3.4.
6. Inspect each blade angle one more time according to point 1.

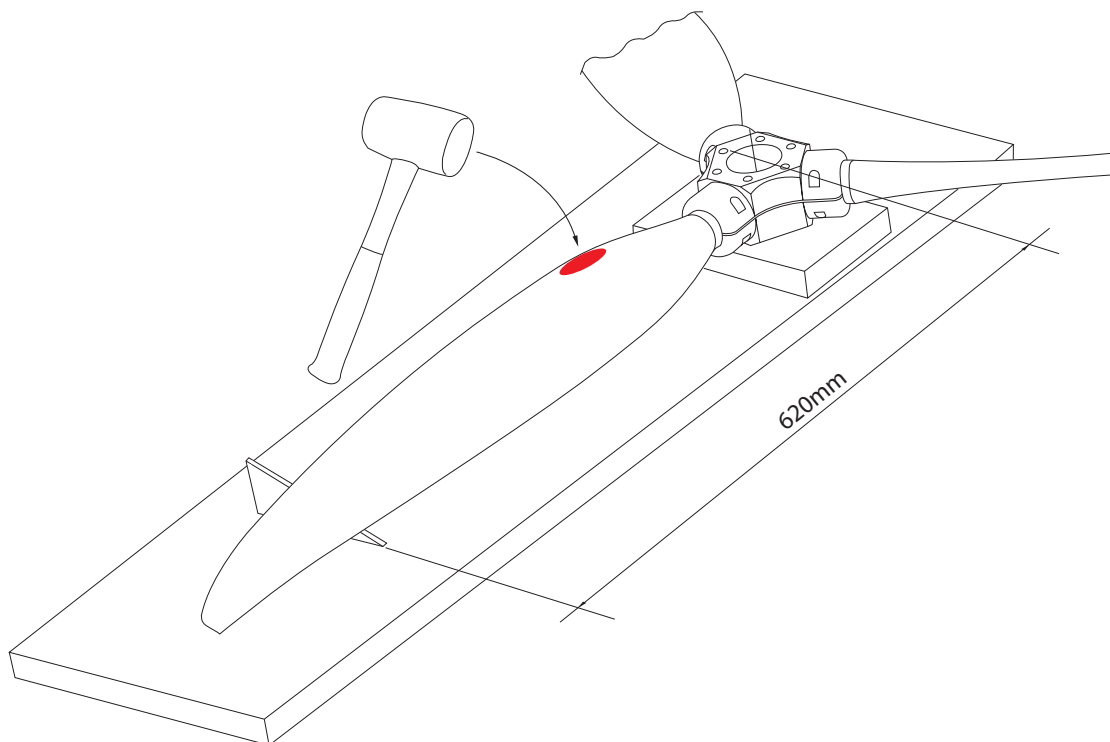
CAUTION

**The biggest acceptable difference in the angle between blades is 0,2°.
When the difference is bigger the adjustment must be performed once
more.**

a) left rotation propeller



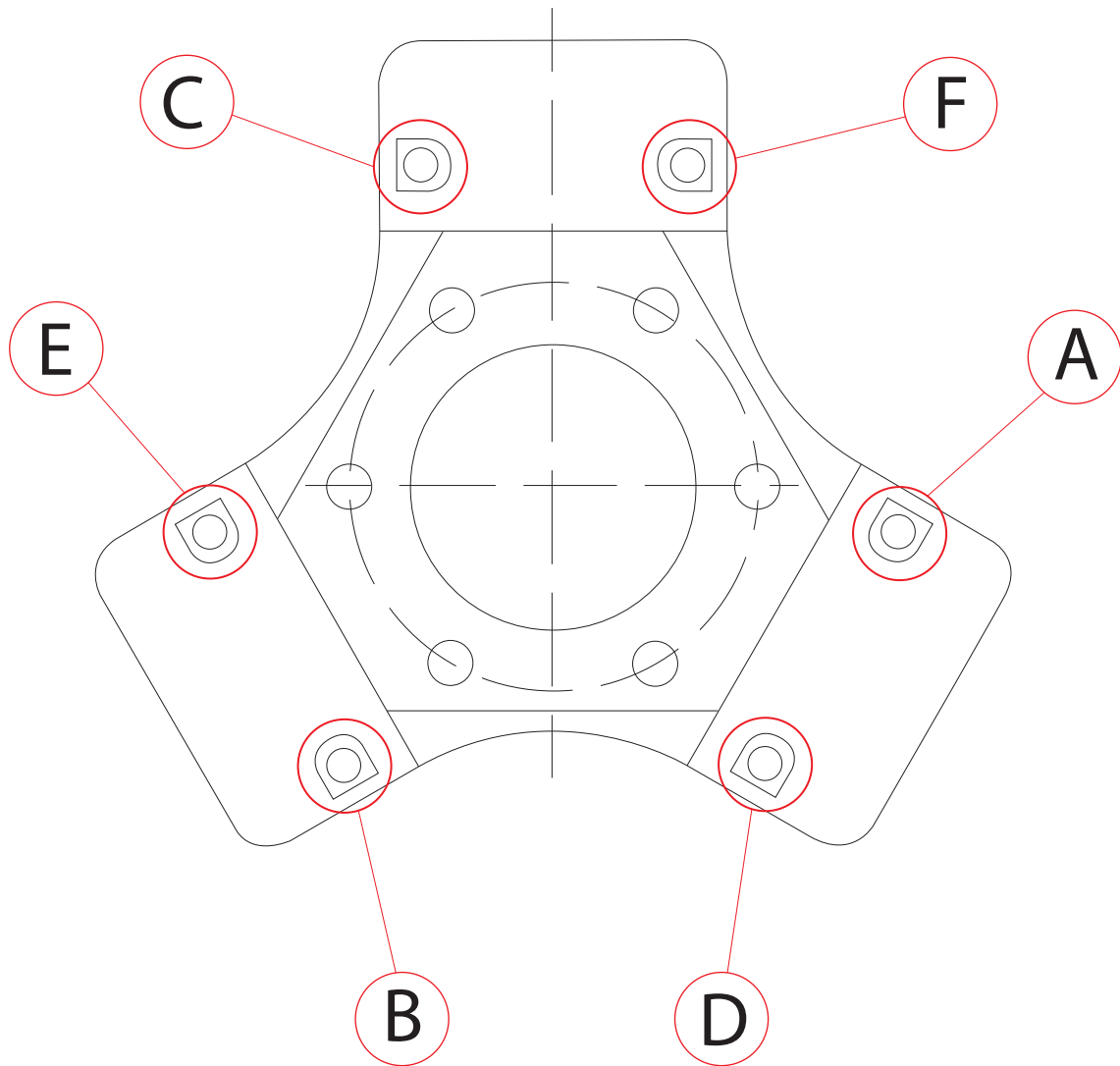
b) right rotation propeller



Draw. 3.3 Blade angle inspection

CAUTION

Exploitation of the propeller with inaccurate blade angle is unacceptable and may cause serious damage to the engine and the propeller.



Draw. 3.4 Blade bolts tightening order

3.5 Preparation to installation

1. Before installation check whether the propeller model is appropriate for the given aircraft.
2. Check if the propeller set is complete . Condition, designation and documentation checks also must be made.
3. Clean the propeller if needed.
4. In case the propeller was delivered in pieces , assemble blades (see chapter 3.2).
5. In case of second hand propeller installation, disassembly of the blades and every part inspection is advised.

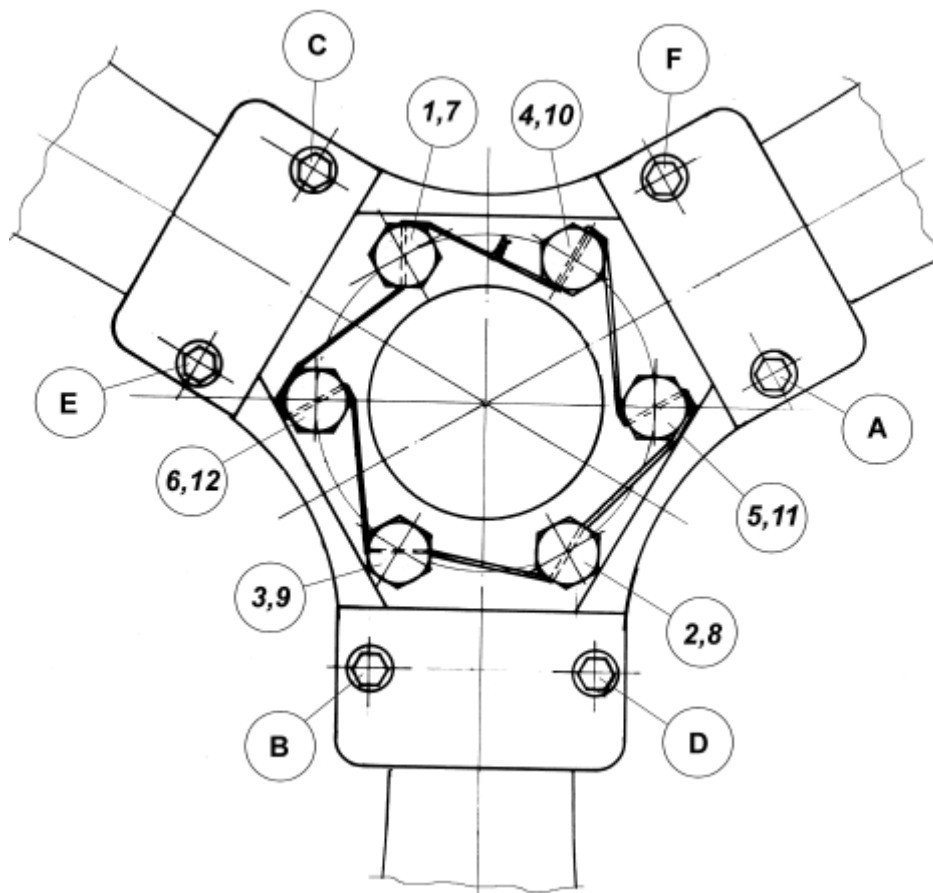
3.6 Installation and removal

In order to install the propeller following actions must be made:

1. Perform actions accordingly to chapter 3.5.
2. Put the propeller on the engine or reduction gear flange.
3. Put the installation bolts with washers in.
4. Tighten bolts in two phases in order shown on drawing 3.5. Initial torque tightening must be followed by final torque tightening.

Table 3.1 Bolt torque amounts

Bolt diameter [mm]	Initial torque [Nm(lb/ft)]	Final torque [Nm(lb/ft)]
8	12 ± 2 (8.8 ± 1)	20 ± 2 (14.8 ± 1)
6	6 ± 2 (4.4 ± 1)	10 ± 2 (7.4 ± 1)



Draw. 3.5 Installation and blade bolts tightening order

5. Inspect and tighten blade bolts using final torque 10 ± 2 Nm (7.4 ± 1 lb/ft) in alphabetic order as shown on the drawing 3.5.
6. Check if surfaces of the hub and engine flange are fitting close to each other.

CAUTION

The engine flange and the propeller hub surfaces must fit close to each other , any margin between them is unacceptable.

7. Inspect blade running track (see chapter 3.7).
8. Make sure that after tightening of all bolts the margin between pieces of the hub is at least 0.1 mm.

CAUTION

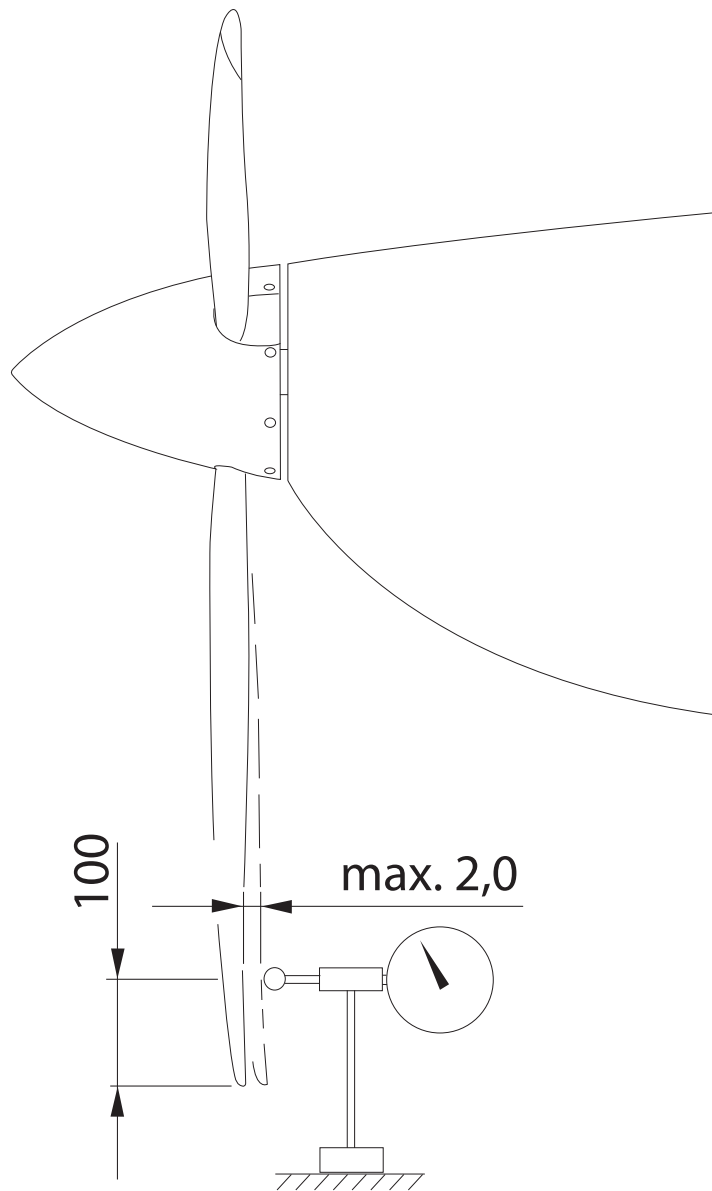
In case the margin between the pieces of the hub is less than 0.1 mm , remove the propeller and consult the producer or his representative.

9. Secure bolts in case of unintentional unscrewing by tying them with the wire or using bendable washers and nipples with unscrewing protection.

In order to remove the propeller from the aircraft, remove the bolt protection , unscrew the installation bolts and slip off the propeller from engine flange not using excessive force.

3.7 The blade running track inspection

1. Unscrew the spark plugs from the engine or enable an easy rotation of the propeller in other way.
2. Locate the aircraft on jacks in horizontal position according to aircraft manual.
3. Locate the clockwork sensor on the ground in aircraft axis so that it touches propeller's blade approx. 10 cm above the blade tip (see drawing 3.6).
4. Verify the difference between the blades' declination. The maximum difference is 2.0 mm.

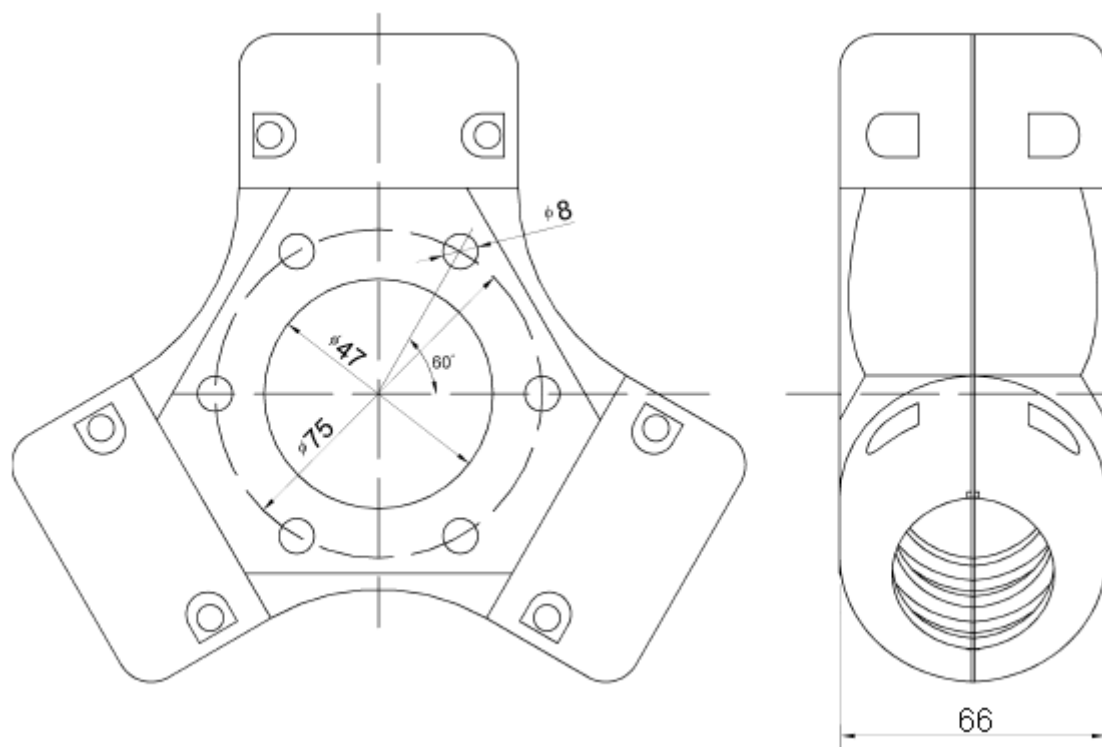


Draw. 3.6 The blade running track inspection

In case the blade running track tolerance is exceeded the user should:

1. Inspect the precision and repeatability of the blade angle one more time according to chapter 3.4.
2. In case there is no improvement in the blade running track consultation with the producer or his representative is advised.

3.8 Hub dimensions



Draw. 3.5 PS1 Hub of the AS propeller

The AS propellers equipped with the PS1 hub (see drawing 3.5) are installed to engine flange in use of six 8 mm bolts on diameter of 75 mm. The installation bolts have to have an anti-rust protection and durability at least 1000 ± 100 MPa. The steel washers with dimensions at least 16x1 mm must be used between the bolts' heads and the hub.

The PS1 hub of the AS propeller allows direct installation to the ROTAX reduction gear flange.

CHAPTER 4

LIMITATIONS

4.1 Exploitation limitations

1. The AS propellers can be exploited up to rev limit established by producers of propeller, engine or reduction gear . The lowest limit must be taken into consideration.
2. Particularly difficult exploitation conditions like extremely hot or cold climate, very wet or dusty conditions require the period between the inspections to be shortened.

4.2 Parameters of limitations

1. Max. propeller rev. limit: 3000 RPM.
2. Max. engine power: 90 kW (120 BHP).
3. Max. torque on propeller shaft: 350 Nm (258 lb/ft) .
4. The blade angle β (measured according to chapter 3.4): $15^{\circ} \div 26^{\circ}$.
5. The biggest acceptable blade angle β difference: **0.2°**.
6. Min. margin between the hub pieces: **>0.1 mm**.
7. Max. blade running track difference (measured according to chapter 3.7): **<2.0 mm**.
8. AS propellers exploitation: **according to technical condition**

WARNING

In case max. propeller rev. limit was exceeded , the propeller must be removed from the aircraft and sent to the producer including exact description of the nature, time and scale of the excess.

The producer is reserving the right to withdraw the propeller from exploitation.

CHAPTER 5

SERVICE

5.1 Inspections

The AS propellers are exploited according to their technical condition. Servicing of the propeller is based on inspections: before the flight day, after first 25 hours of work, after 100 hours of work and yearly inspection.

5.1.1 Inspection before the flight day

1. Inspect the condition of blades and hub surfaces within sight.
2. Pay special attention to the blades leading edges condition – small depressions and dents reaching depth of the paint are acceptable as well as small bruises caused by stone hits etc. Longitudinal cracks and scratches are unacceptable.
3. In case the propeller is used with the spinner , check if the spinner edges are not damaging the blades.
4. During engine test pay attention to propeller's RPM, smoothness of running and vibrations caused by abnormal work. Avoid sudden changes of engine speed.

5.1.2 Inspection after first 25 hours of work

This inspection is concerning new propellers and must be made after first 25 hours of propeller's work. The procedure is the same as with the 100-hour inspection (see chapter 5.1.3)

5.1.3 100-hour inspection

1. Perform actions according to inspection before the flight day (see chapter 5.1.1)
2. In case the spinner is used along with the propeller , remove the spinner and inspect the condition of hub, installation bolts and blade bolts.
3. Pay special attention that there are no cracks and scratches on the blade bottom surface and on the hub.
4. Verify the bolt torque amounts.
5. Check if the margin between the hub pieces is at least 0.1 mm.

6. Check the condition and mounting of the engine shaft extension.
7. Check the condition and mounting of the spinner.

5.1.4 Yearly inspection

If the propeller is exploited less than 100 hours during a year, the yearly inspection must be made. The procedure is the same as with the 100-hour inspection (see chapter 5.1.3).

5.2 Extreme conditions exploitation

In case the propeller is exploited in extremely difficult climate conditions the period between the inspections is advised to be shortened. The user decides how much this period needs to be reduced.

If the propeller is exploited during heavy rain, over high grass or stony surface , special attention must be obtained to blades leading edges.

In case of any doubts concerning propeller's condition, please contact the producer.

5.3 Cleaning

The AS propellers can be cleaned using widely available mild car care cosmetics. Usage of sharp tools for dirt or ice removing is not recommended. Remainings of water between the hub pieces must be removed using compressed air specially in temperatures below freezing.

CAUTION

Towing of an aircraft pushing or pulling it by the propeller is prohibited.

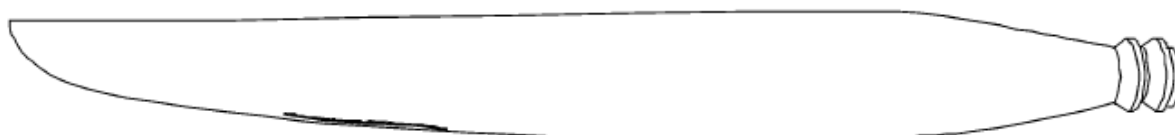
CHAPTER 6

DAMAGES AND REPAIRS

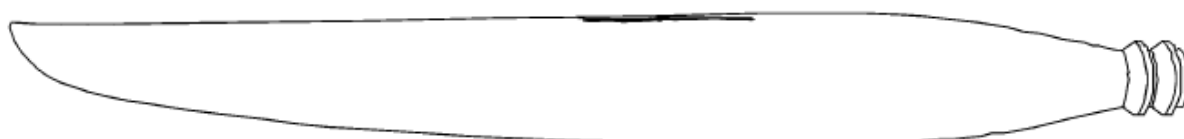
6.1 Damages

Different kinds of damages that are classified as serious. User is obligated to report those kinds of damages to the producer.

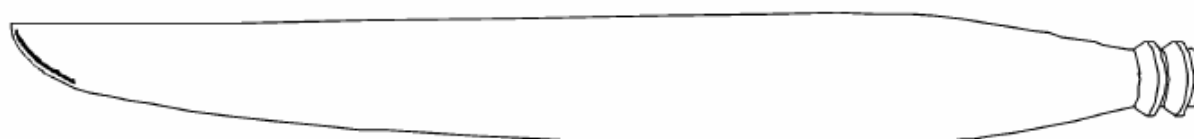
6.1.1 Blade damages



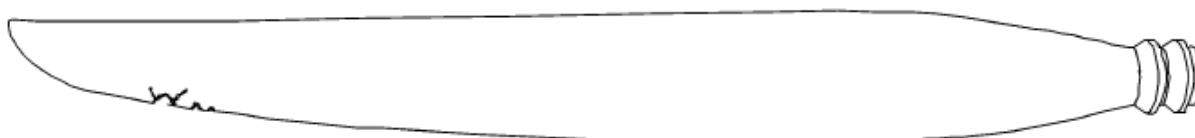
Draw. 6.1 Cracks longwise to the leading edge



Draw. 6.2 Cracks longwise to the trailing edge



Draw. 6.3 Cracks of the blade tip



Draw. 6.4 Blade damage with foreign matter that can not be repaired

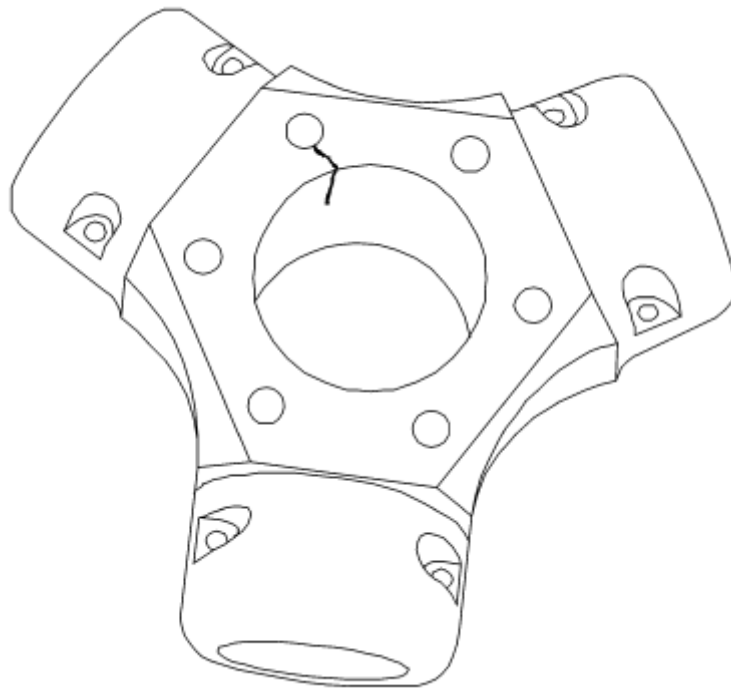


Draw. 6.5 Slanting crack

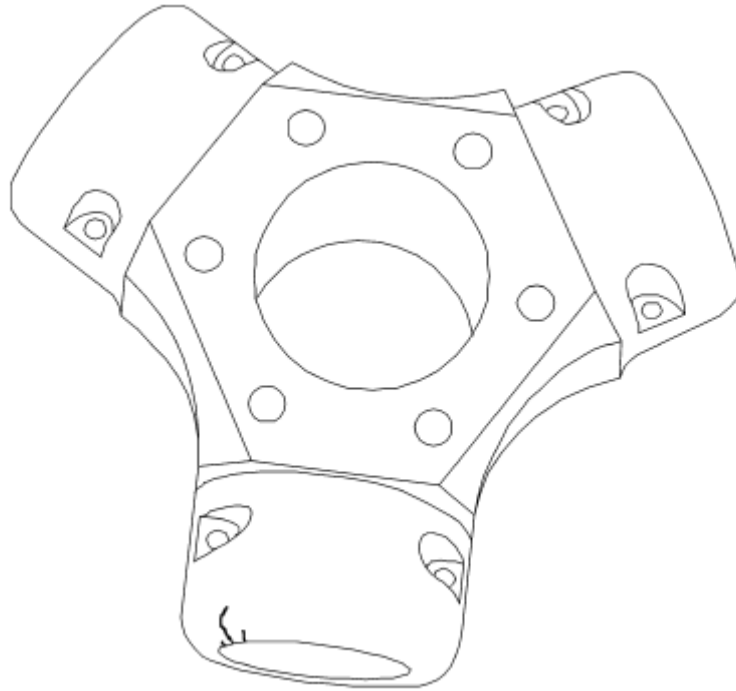


Draw. 6.6 Blade bottom crack

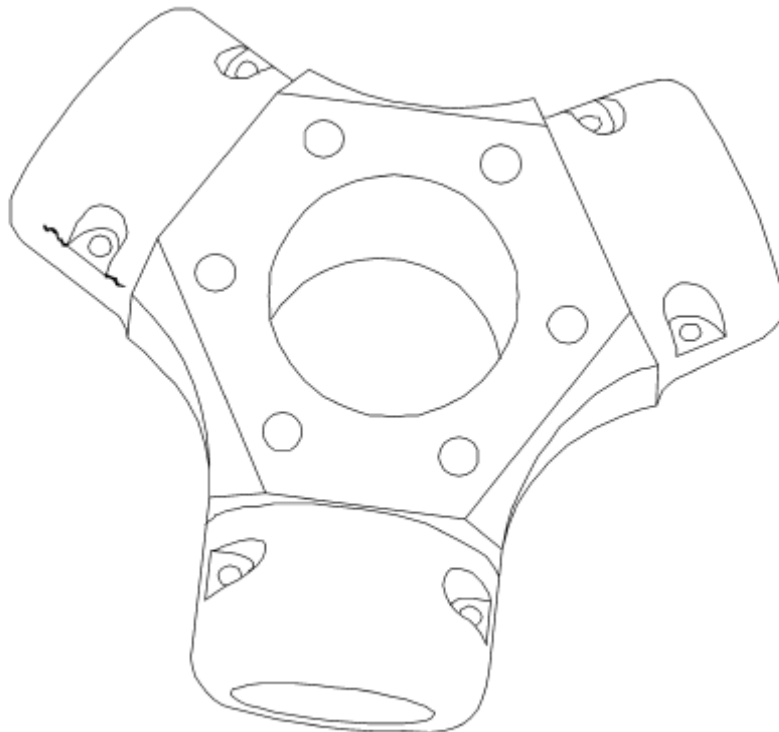
6.1.2 Hub damage



Draw. 6.7 Hub shaft radial crack



Draw. 6.8 Hub socket radial crack



Draw. 6.9 Crack longwise to the bolt shelf

6.2 Repairs

Damages of the carbon fibre structure of the blade that are not deeper than 3 mm , with area up to 15 mm², that are located at least 30 mm from each other can be repaired by the user. The damage area must be free from other cracks and scratches.

In order not to add much weigh to the blade and problems with propeller balance the least as possible material (paint, resin) must be used during repair.

Repair procedure:

1. Idle repaired area with acetone or extractive naphtha.
2. Purify repaired area with sand-paper or grinding machine. The defect can not be excessively extended.
3. Fill the defect (defects) with mixture of epoxide resin and filler. Mixture composition and drying time are contained in table 6.1

Table 6.1 Filling mixture composition

Ingredient	Resin	Thickener	Filler	Drying time
Designation	SCHEUFLER L 285	SCHEUFLER 286	Aerosil Microbalon	24 h / 22°C
Volumetric content	100%	50%	3÷5%	

4. Let the mixture dry out at room temperature and purify repaired area with fine sand-paper.
5. Spray only the repaired area using acrylic paint in colour that matches the original one.

If there are any further damages , consultation with the producer is always advised in order to establish the repair procedure.

CAUTION

In case of any doubts by judging the propeller's damage , always contact the producer.

CAUTION

If re-spraying of the propeller is necessary in an area larger than contained in chapter 6.2 , the propeller must be sent to the producer or authorized repair workshop.

CHAPTER 7

STORAGE AND TRANSPORT

7.1 Storage

In case the aircraft and propeller aren't used in a period of time longer than one year , the removal of the propeller is advised. The propeller should be stored horizontally away from heat sources in a shadowed, dry place. Using of original blade covers is advised.

CAUTION

Propeller's storage in vertical position standing on the blades is not acceptable.

7.2 Transport

In case the propeller is transported in pieces the full protection of all elements is advised , specially the blades edges and tips require care and protection from hits. Regardless of packing the blade covers are advised to use.

When the propeller is transported via post or courier in a way that doesn't guarantee proper protection special packing is required. Propeller must be wrapped with soft materials (polyurethane foam, Styrofoam) and put in a solid box. The best way of protection during transport is usage of original box delivered by the producer with a new propeller.

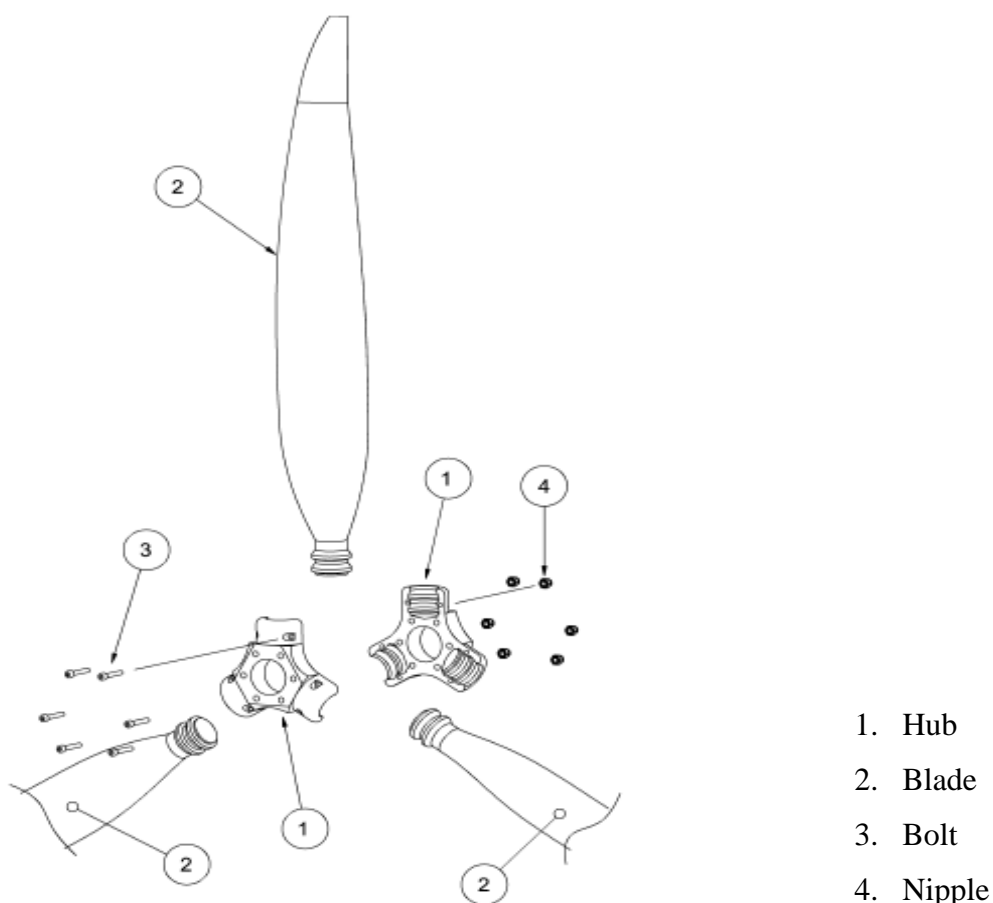
CHAPTER 8

CATALOGUE OF PARTS

8.1 Introduction

Propeller set elements are contained in chapter 8.2. Chapter 8.3 contains supplementary equipment delivered with every propeller. Producer also offers optional equipment like disc and spinner of the propeller, installation bolts etc. designed for propeller's installation to various types of engines and aircrafts. Producer enables ordering of other parts with dimensions different from the initial specification such as shaft extension etc.

8.2 AS propeller set elements



Draw. 8.1 AS propeller set elements

Table 8.1 Catalogue parts numbers

Part's name		Catalogue number
Hub		PS1
Blade	AS 1730	LS1
	AS 1730-2	LS2
	AS 1700	LS3
	AS 1700L	LS4
	AS 1650	LS5
	AS 1560L	LS6
Bolt	Hub	SA1
	Spinner	SA2
	Installation	SA3
Nipple	Hub	NA1
	Spinner	NA2
Blade cover	AS 1730, AS 1700, AS 1700L, AS 1650 AS 1560L	PL1
	AS 1730-2	PL2
Adjusting device		PKU1
Hub support pad		PPP1
Spinner	240 mm	KS1
	240 mm	KS2
	300 mm	KS3
Spinner's disc	240 mm	TK1
	240 mm	TK2
	300 mm	TK3

Table 8.2 AS propeller set elements

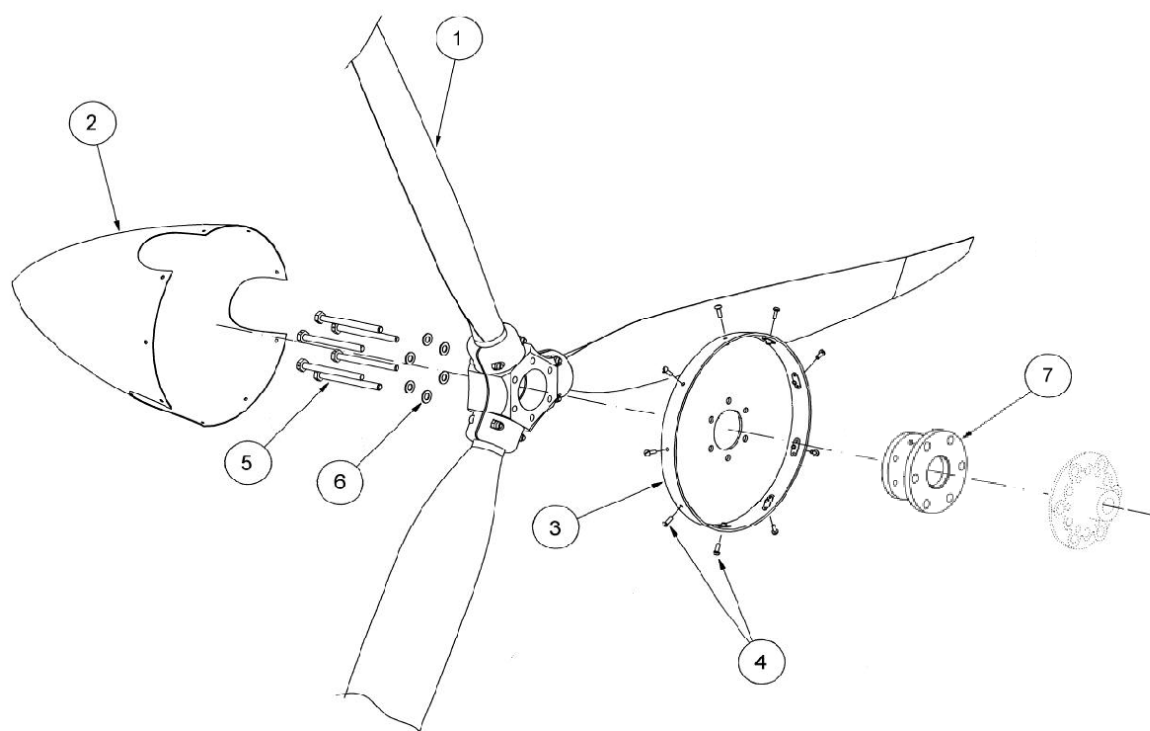
Propeller model	Blade	pcs	Hub	pcs	Bolt	pcs	Nipple	pcs
AS 1730	LS1	3	PS1	1	SA1	6	NA1	6
AS 1730-2	LS2	3	PS1	1	SA1	6	NA1	6
AS 1700	LS3	3	PS1	1	SA1	6	NA1	6
AS 1700L	LS4	3	PS1	1	SA1	6	NA1	6
AS 1650	LS5	3	PS1	1	SA1	6	NA1	6
AS 1560L	LS6	3	PS1	1	SA1	6	NA1	6

8.3 Supplementary equipment

Table 8.3 Supplementary equipment of AS propellers

Propeller model	Blade cover	pcs	Adjusting device	pcs	Hub support pad	pcs
AS 1730	PNL1	3	PKU1	1	PPP1	1
AS 1730-2	PLN2	3	PKU1	1	PPP1	1
AS 1700	PLN1	3	PKU1	1	PPP1	1
AS 1700L	PLN1	3	PKU1	1	PPP1	1
AS 1650	PLN1	3	PKU1	1	PPP1	1
AS 1560L	PLN1	3	PKU1	1	PPP1	1

8.4 Optional equipment of AS propellers



1. AS propeller
2. Spinner
3. Spinner's disc
4. Spinner's bolts
5. Installation bolts
6. Bolt's washers
7. Shaft extension

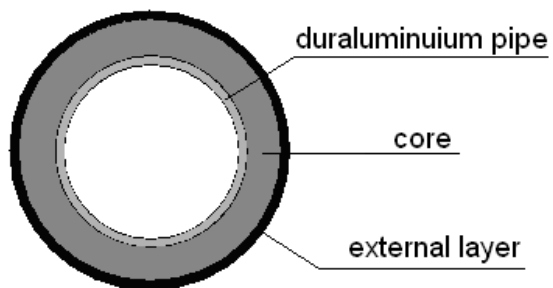
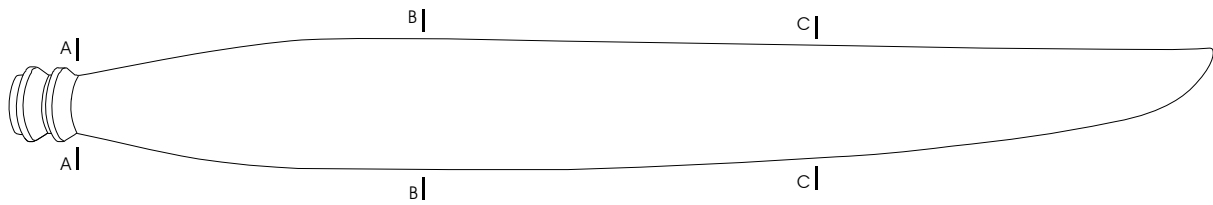
Draw. 8.2 Optional equipment of AS propellers

Table 8.4 Optional equipment of AS propellers

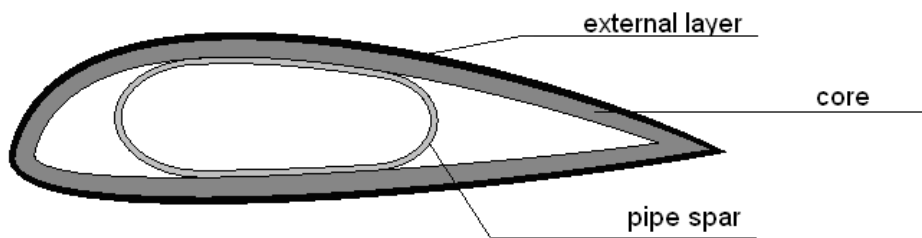
Part's name	Catalogue number	pcs
Spinner	KS1, KS2, KS3	1
Spinner's disc	TK1, TK2, TK3	1
Spinner's bolt	SA2	9
Installation bolt	SA3	6
Bolt's washer	PA1	6

CHAPTER 9

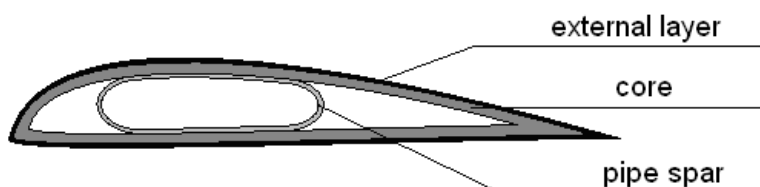
DRAWINGS



CROSS-SECTION A-A



CROSS-SECTION B-B



CROSS-SECTION C-C

Draw. 9.1 Blade cross-sections

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