TECHNICAL MANUAL

KW-30 PROPELLER
OVERHAUL AND MEDIUM REPAIR

TN – 21

	Position	Name	Signature
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A.GENERAL

A1. Contents

A2. **Revision history**

Revision	Date	Description	Changed pages
1	**11.08.2014**	Z-KW-3(x)-01 Technical change Change of minimum pitch blocking Addition of minimum pitch stop Addition of new type of spinner backplate Formal correction	**2- 6, 9, 17, 20, 32, 41, 54, 57, 58, 60, 63**
2	**29.02.2016**	Minor corrections and formal changes	**2-5, 10, 32, 33, 49, 63, 65-67**
3	**30.03.2022**	Major Change Z-KW-3(x)-05 implementation Minor corrections and formal changes	**2-64**
4	**24.03.2023**	Incorporation of experience from operation and maintenance Minor corrections and formal changes	**2, 3, 4, 5, 12, 16, 17, 19, 23, 24, 24, 25, 26, 34, 35, 36, 37, 38, 41, 55, 59,60**
5	**14.12.2023**	Major Change Z-KW-3(x)-06 implementation. Minor corrections and formal changes	**4, 5, 9, 12, 13, 20, 33, 37, 38, 39, 41, 43, 49, 56, 58**
6	**07.11.2024**	Major Change Z-KW-3(x)-07 implementation. Renumbering of pages due to the new content.	**2 – 64**

A3. List of valid pages

Page	Revision	Date	Page	Revision	Date	Page	Revision	Date
1	0	21.01.2014	31	6	07.11.2024	61	6	07.11.2024
2	6	07.11.2024	32	6	07.11.2024	62	6	07.11.2024
3	6	07.11.2024	33	6	07.11.2024	63	6	07.11.2024
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13	6	07.11.2024	43	6	07.11.2024	73		
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A4. **Purpose of the document**

This document – technology instruction (manual) defines the repair, assembly, and inspection procedures used during KW-30 propeller overhaul or other maintenance in Woodcomp Propellers s.r.o. or manufacturer's authorized service centers. This document is based on current version of KW-30 propeller's documentation, as well as the state of knowledge and practical experience from production and operation of the type. This document may be amended based on information newly obtained during manufacturing and operation of manufactured propellers.

When repairing the propeller after operational events or when removing malfunctions that occurred during operation, this manual is used to the appropriate extent for the relevant repaired parts or replacement of parts.

A5. **Validity**

This technology instruction applies to maintenance and inspection performed within Woodcomp Propellers s. r. o. organization with CZ.145.0082 Authorization, and within manufacturer's authorized service facilities.

A6. **Time between overhauls**

Overhaul means periodical disassembly, inspection, repair, and reassembly of propeller assembly. Generally speaking, the time between overhauls is defined in the terms of propeller operating hours, and/or calendar months. At each interval, the propeller is disassembled, checked for wear, cracks, corrosion, and any other unusual and/or abnormal conditions. Depending on the nature of a component, damaged components are either replaced with new components, or repaired using prescribed method. Worn parts and parts which could fail during subsequent use are replaced. This means that they are due to mandatory replacement, regardless of actual condition. Propeller is then reassembled and balanced.

Propeller's operating life is determined in TT hours (Total Time) and TSO hours (Time Since Overhaul). Propeller life time is determined by both parameters. Overhaul does not restore the propeller to zero hours (TT), but only to zero hours since last overhaul. Refurbishment or repair of propeller without performing overhaul does not change its (TT) nor (TSO).

Time between overhauls (TBO) of KW-30 propellers is determined by current version of Woodcomp propellers Service Bulletin No. 01. Other inspection times are determined by current version of propeller User Manual.

Service Bulletin No. SB 01 in its current version allows two equivalent maintenance systems according to the mode of operation of the propeller. As a default, newly manufactured propellers have a propeller maintenance system in place with an overhaul after a specified amount of operating hours or time, whichever occurs first. Alternatively, it is possible to use a maintenance system with a medium repair, which is carried out after reaching half of the operating hours or the time until the overhaul. The time until overhaul for both maintenance systems expressed in operating hours and time since production or last overhaul differs and is clearly defined in SB 01.

The operator chooses the maintenance system for the new propeller and can only change it after the next overhaul. In the case of operating an older propeller for which the maintenance system with medium repair has been implemented, the operator can decide to continue with the original system, or after the next overhaul, switch to the maintenance system without intermediate repair.

When the operator uses the maintenance system with the use of medium repair, the maintenance organization shall, after its execution, enter in block 12 of EASA FORM 1 information on operating hours and time remaining until overhaul according to the TBO value specified in SB 01 for the maintenance system with medium repair.

It is not allowed to arbitrarily confuse the two systems with each other in such a way that by means of the medium repair the established calendar and hourly maintenance limits are circumvented.

A7. **Basic rules**

!! **Overhaul must be performed according to current versions of KW-30 documentation.**

!! **All assembly, adjustment and inspection procedures must be performed by personnel with required qualification. These activities may only be performed in enclosed facilities using clean, undamaged tools and equipment approved for the purpose.**

!! **Protect propeller parts from damage during disassembly, assembly, and adjustment. Use protective pouches for propeller blades.**

!! **Use only prescribed lubricants and/or materials to lubricate and secure propeller parts, or allowed/approved equivalents.**

!! **Maintain clean and tidy workplace including its surroundings; do not smoke.**

!! **All components destined for scrapping by this procedure must be red tagged or painted red and their disposal must be documented.**

!! **Position references in the text correspond to identical numbers in assembly drawings.**

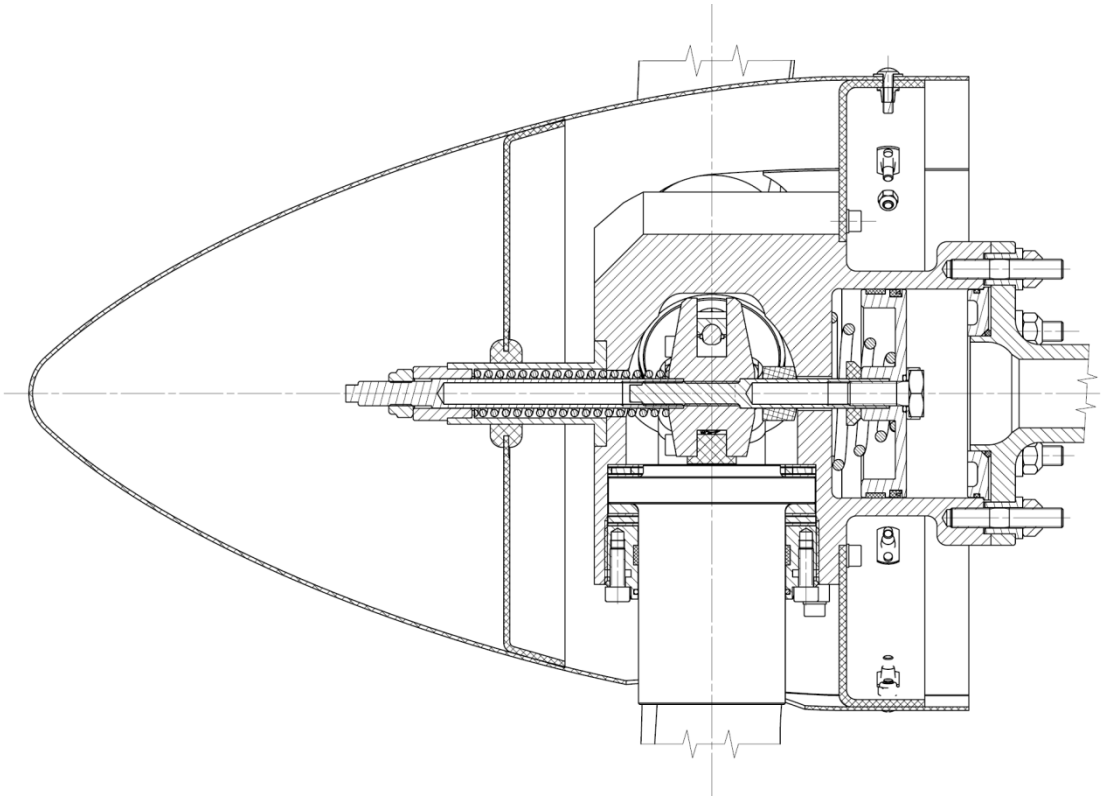
!! **When securing screws using locking wire, screws must tighten each other after securing.**

B. BASIC TECHNICAL PARAMETERS OF KW-30

B1. Propeller description

The propeller is intended for aircraft's MTOM up to 2000kg (ELA 2), with piston engines equipped with reduction gear.

KW-30 is three-blade, hydro mechanical, in-flight adjustable propeller, working as constant speed propeller with fitted hydraulic governor.



The propeller is fitted onto engine flange using 6 studs. Oil supply from engine into piston chamber is through hollow shaft. Oil pressure is used to adjust blades to high pitch.

The propeller is single acting, i.e. it returns to low pitch setting when the governor's return valve opens. Pressure within hydraulic system generated by blade mass inertia (deviation) and aerodynamic moments, actively push the piston and thus also the oil back to the governor and engine. Springs incorporated in pitch adjustment mechanism act in the same direction, i.e. to return the blades to low pitch. Springs are dimensioned to overcome passive resistances in blade adjustment system, and also return the blades to low pitch position when the engine is turned off.

Propeller hub is made of aluminum alloy, and incorporates hydraulic mechanism for adjustment of blade pitch, and blade root pockets. Propeller blades are of mixed design. Blade core is made of combination of spruce and hardened beech wood. Blade surface is made of glass or carbon laminate, protected by gelcoat layer. This structure has excellent mechanical characteristics, low weight and very good wear resistance. Blade root is inserted into aluminum ferrule, and secured by steel screws with special thread. Blade outboard leading edges are protected against damage with a layer of cast polyurethane or optionally by stainless steel sheaths, their inboard part (near the propeller centre) with a self-adhesive polyurethane wear resistant tape. Blade assembly can rotate in two axial needle-type bearings and is secured to the hub by a large retention nut.

B2. **Basic technical data of propeller**

Propeller model	**KW-30**					
Number of blades installed	**3**					
Blade type	- 031 („W“)	- 033 („C“)	- 034 („B“)	- 037 (“WA”)	- 038 (“WA”)	-041 (“G”)
Diameter ± 4mm	Right:1744 Left: 1720	1732	1752	1950	1950	1500 - 1550
Min. angle setting	5°					
Max. angle setting	50°					
Max. engine power output N_{max} - (HP / kW)	160/117	141/104	160/117			100/73.5
Max. propeller RPM – n_{max}	2552			2300	2283 continuous 2323 max 3min 2441 max 1min	2552
Temperature Service Rate	-25°C / +45°C					
Moment of mass inertia (kg m^2)	0,6			0,94		0,5
Mass of complete propeller (kg)	~ 11 - 13.5			~ 13,5		~10.0
	acc. to type of blades and spinner					
Mass of Jihostroj governor (kg)	0,90					
Lifetime	Propeller lifetime is not specified if every mandatory periodical inspection is performed in specified intervals					

C. OVERHAUL

C1. Propeller admission

On admission, exterior visual check of the propeller is performed, including completeness check as well as discovery of possible damage during transport. Complete propeller, with the spinner, bushings, and nuts used for mounting, must be delivered to the service facility.

Any missing parts and damage are recorded into Findings sheet.

C2. Propeller inspection

Clean the propeller, and remove all surface contaminants. Perform exterior inspection to determine condition and damage to the propeller. Within this operation, perform measurement, along with weighing and determination of static imbalance. Verify validity of maintenance data applicable to specific propeller serial number; related Service Bulletins, Service Letters or Airworthiness Directives applicable to specific propeller.

C3. Disassembly of propeller

C 3.1 Propeller disassembly

C 3.1.1 Propeller spinner removal

1) Use flat screwdriver to remove screws **(42)** around the perimeter of propeller spinner **(39)**. Remove propeller spinner by pulling away from propeller.
2) Position the propeller, front face down, onto assembly support P-306. Remove securing wires from six screws **(44)** holding spinner backplate **(41)**. Loosen screws using 4mm Allen key and remove them along with washers **(45)**. Remove the spinner backplate from propeller hub.
3) Remove rubber grommet **(55)** from the spinner.

C 3.1.2 Removal of propeller blades from propeller hub

1) Install propeller onto assembly fixture P-54. Tighten the propeller to the flange using at least three nuts.
2) If counterweights **(80)** are installed, measure and record their angle setting first. Then remove screws **(79)** and remove counterweights from blades.
3) Remove securing wire from three pairs of Allen head screws **(28)** on propeller blade retention nut **(35, 81)**. Loosen screws using 5mm Allen key and remove them.
4) Loosen blade retention nut **(35, 81)** using P-303 wrench. Remove the blade by turning the retention nut and pulling the blade from the hub until the nut is completely out of the hub´s thread.
5) Remove axial bearing of propeller hub (two rings and cage) from the space where propeller blade was, unless the bearing were stuck to propeller blade ferrule by grease layer and have not been removed along with blades. Use grease to stick the bearing onto ferrule of removed propeller blade.
6) Put protective pouch onto removed blade and store the blade at a safe place, before its further disassembly and repair.
7) Remove the other blades in the same manner.
8) Remove propeller hub without blades from assembly fixture for further disassembly.

C 3.1.3 Removal of spacer (if applicable)

There are two types of spacers:

Index No. **65:**

1) Loosen six nuts **(48)** holding propeller hub to spacer. Unscrew nuts and pull to remove complete spacer.
2) Remove bushings **(47)** from spacer. Remove O-ring **(23)** from the groove on front side of spacer.

Index No. **68:**

1) Using hand force, pull spacer **(68)** from propeller hub.
2) Remove bushings **(69)** from spacer. Remove O-ring **(23)** from the groove on front side of spacer.

C 3.2 Propeller hub disassembly

1) Using hand force, pull back cover **(24)** from propeller hub. Remove o-ring **(23)** from its groove.
2) Screw-in three mock-up propeller blades P-304 into holes in propeller hub, until they lightly contact inserts in yoke. Do not tighten mock-up propeller blades using force.
3) Use 5mm Allen bit to loosen spring housing **(5)** on flange secured by two screws **(3)**. Remove screws along with spring washers **(4)**.
4) Carefully remove self-locking nut **(1)** while firmly holding the spring housing **(5)**.
5) Remove spring housing **(5)** with bushing **(2)**. Remove spring **(6)**.

6) Use 7mm wrench to loosen piston rod 2 **(9)** and screw it out of the hub.

7) In center of piston **(17)** inside cylinder bore, unlock locking washer **(21)** around hex. head screw **(22)**. Carefully, using small hammer, tap washer until it is approximately flat so that 19mm socket can be applied. Loosen screw **(22)** using 19mm socket. Carefully unscrew the screw **(22)** by approx 10mm. Attach piston assembly tool P-301 on two of screws **(8)** and secure it using two nuts (M8 or M10). Set the P-301 tool so that it touches head of the screw **(22)**. Using 19mm open end wrench unscrew the screw **(22)** completely from the piston rod**.** Slowly screw out the P-301 tool's handle and the spring **(16)** will push out the piston **(17).** Remove the piston assembly tool P-301. Remove the piston **(17)** from cylinder bore.

8) Remove conical spring **(16)** from inside the piston.

9) Remove piston seal **(19)** and sliding insert **(18)** from grooves of piston **(17)**. Be careful not to damage edges of grooves in piston.

10) Remove end stop **(15)** from piston rod 1 **(14)** in piston area.

11) Use extended length 7mm socket to access piston rod 1 **(14)** through hole in front face of propeller hub, loosen and unscrew it into piston area. Remove piston rod from piston area.

12) Remove three screwed–in mock–up blades P-304 from hub and remove assembled yoke **(10)** and stop **(49)**.

13) Remove balancing screws **(59**), washers **(58)** and weights **(57)** (if installed).

14) Remove securing wire from three screw heads **(13)** on the yoke **(10)**. Loosen and remove three screws **(13)**. Remove inserts **(12)** from groove in yoke.

15) Removal of screws **(8)**.

    To remove, thread two nuts onto each screw, tighten them together and then remove screw using open end wrench applied on lower nut.

    To facilitate the removal of the screws, the hub can be heated in an oven to maximum temperature of 70°C.

C 3.3 **Propeller blade disassembly**

Complete disassembly of propeller blades is performed if required to replace any damaged part that cannot be removed and replaced from the blade in any other way. Complete disassembly is performed only for the relevant blade. In other cases, only partial disassembly is carried out, consisting in the replacement of screws (37) and sliding inserts (18) at the blade retention nut (81).

Replacement of O-rings (34) or (82) and the sliding insert (18) at the blade retention nut (35) is always carried out if the blades are completely dismantled.

If the need to replace O-rings (34) (82) due to increased leakage of lubricant from the retention of the propeller blades is detected during the processing of the inspection findings, the obligation to completely dismantle all blades arises.

It is permitted to disassemble the blades (i.e. remove the screws **(37)**) only four times. After fifth disassembly the blade **(38) (84)** must be replaced regardless of its condition.

After each disassembly stamp letter "R" on the blade ferrule **(32) (83)** after the serial number. When new blade **(38) (84)** is installed stamp only letter "X" after existing stamping. It means when four consecutive "R" letters are stamped on blade ferrule the blade must be replaced after next disassembly.

When disassembling propeller blades, work with extra attention and very carefully. Do not mix removed parts – they must be returned to their original position (correct blade).

NOTE

There are two modifications of blade retention nut. Older variant with one sliding insert (35) and newer variant with two sliding inserts and different O-ring (81). One propeller must not use two different retention nut types. Similarly some blade types use three retention screws (37) and some types four screws. This has no significant effect on blade disassembly and inspection procedures.

Complete disassembly

1) Use retaining ring pliers to remove retaining ring **(25)** from propeller blade actuating pin. Remove slider **(26)** from pin.
2) Remove parts **(29)** and (**30)** of axial bearing from front face of ferrule.
3) Fasten fixture P-294 in vice on workbench. Fix propeller blade tightly into fixture. Use 12mm socket to loosen screws **(37)** threaded into blade root on front face of ferrule **(32)(83)**.
4) Install puller P-297 on blade ferrule (Fig. C-1), lay blade on soft underlay and start pulling blade ferrule by turning the puller screw. When the ferrule is pulled out by 15mm unscrew screws **(37)** by next 20mm and continue with pulling of the ferrule. When the ferrule is pulled out by next 20mm remove puller P-297 and unscrew screws **(37)** completely. Finnish removing of blade ferrule by light tapping around ferrule collar with wooden or plastic hammer. Lay propeller blade down at location where it cannot be damaged.
5) Tube **(36)** may remain stuck in blade root, if it holds firmly in the blade it is not necessary to remove it. If the tube is pulled out along with the blade ferrule, remove it from the ferrule by gentle taping with wooden or plastic hammer.

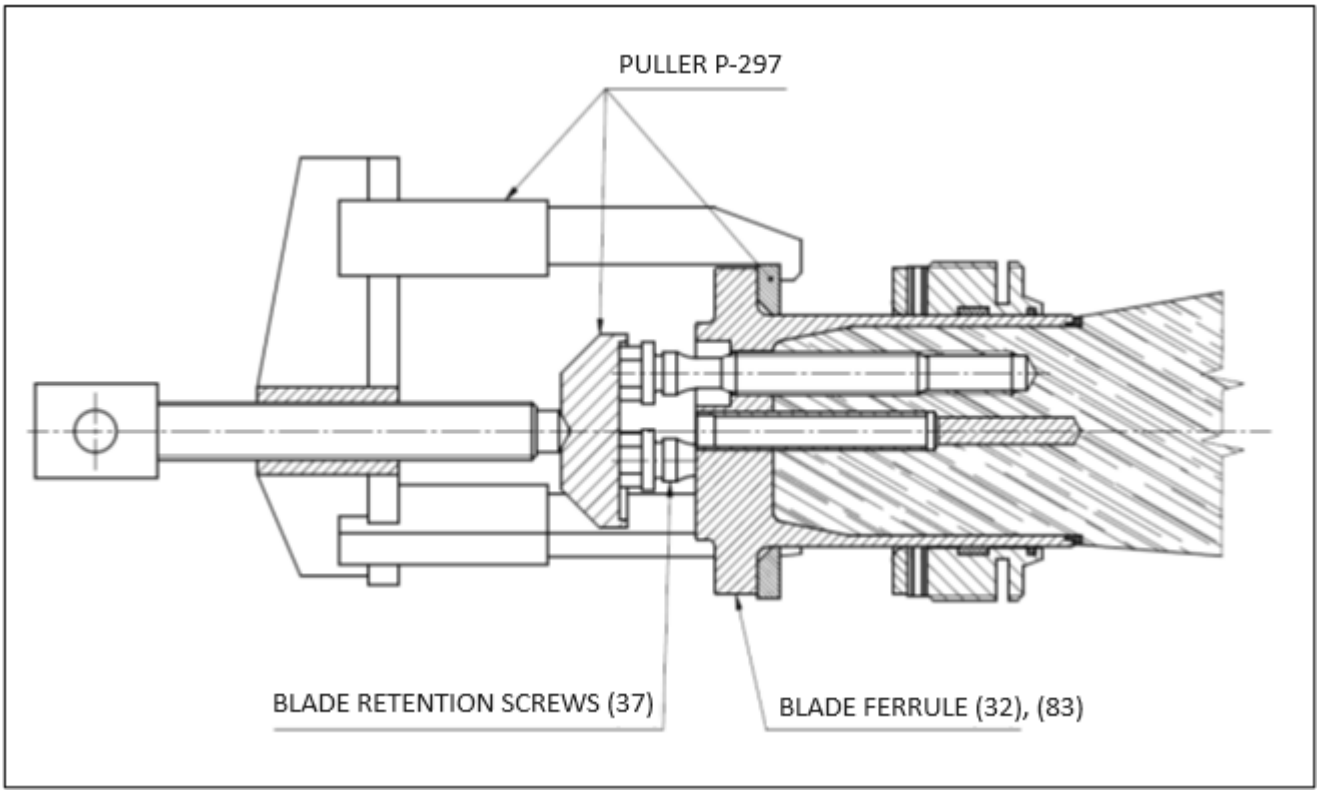


Fig. C-1 Blade ferrule removal

! CAUTION !
Blade retention screws (37) must be replaced every time when removed. Repeated use of the screws is not permitted

6) Remove traces of sealant from edge of ferrule **(32)(83)**. From removed ferrule, pull retention nut **(35)(81)**, followed by axial bearing parts **(29)** and **(30)** and bearing spacer **(33)**.
7) Remove O-ring **(34)(82)** and sliding inserts (**18)** from grooves in retention nut. When removing rings do not damage edges of grooves.

Partial disassembly

1) Use circlip pliers to remove the retaining ring (25) from the propeller blade pin. Remove the slider (26) from the pin.
2) Remove the thrust bearing parts (29) and (30) from the front of the blade ferrule.
3) Fix the P-294 in the vise on the workbench. Firmly clamp the propeller blade into the jig. Use a 12mm socket wrench to loosen the threads of the screws (37) in the blade root on the ferrule face (32), (83).
4) Remove the sliding inserts (18) from the blade retention nut groove (81).

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C4. **Cleaning**

1) Remove dirt, grease and oil from all disassembled parts of propeller.
2) Use benzine or equivalent (see chapter J. MATERIAL USED) for cleaning metal parts
3) Clean nonmetallic parts by wiping with a soft, lintfree cloth dampened with benzine equivalent (see chapter J. MATERIAL USED).
4) Allow cleaned parts to air dry.
5) Be careful not to damage parts, especially on working surfaces. Do not use metal brush or any abrasive for cleaning.
6) Do not clean wooden root of removed propeller blade by any liquid. Make sure that no liquid will penetrate into wooden root.
7) Clean out traces of locking fluid from M10 external thread on piston rod 1 **(14)** using plastic or wooden scraper.
8) Use M10 tap to clean out M10 internal thread in piston rod 2 **(9)** and yoke **(11)**.
9) Carefully clean threads in hub **(7)** using 3rd thread tap from set (M8 or M10), remove all traces of locking fluid.
10) Clean out M5 threads in hub **(7)** using M5 tap.

C5. **Inspection**

C 5.1 **General**

1) Visually check parts for cracks, scratches, dents, wear, corrosion, or signs starting corrosion. Repair minor damages according to chapter "Permitted repairs".
2) Check condition of fasteners. Elongation or stripping of threads, elongation/ bending of screw bodies, damage to screw heads, damaged surface treatment or occurrence of corrosion are not permitted

C 5.2 **Detailed Part Inspection**

C 5.2.1 Spinner (39) and backplate (41)

1) Check condition of spinner and backplate surfaces – internal and external. Check for cracks in lamination layers, damage to gelcoat on internal and external surface, also check screw holes.
2) Check connection of frontplate to spinner.
3) Check fixation of fillets **(74)** and riveted nuts **(77)**. Threads of riveted nuts must not be damaged, nuts must not be corroded.

C 5.2.2 Spacer (65)

1) Check spacer for damage to corrosion.
2) Check o-ring groove and chamfer on inner diameter (sealing surfaces). Deformations, dents on sealing surfaces or corrosion are not permitted.

C 5.2.3 Springs (6)(16)

1) Perform visual inspection of springs. Cracks, surface treatment damage or corrosion are not permitted.
2) Do a load test. Springs must meet load/length criteria according to Tab. C-1 and Tab. C-2. If load test is not performed, springs must be replaced.
3) Springs meeting load/length criteria must be ND–tested acc. to chapter C 5.3 Non-destructive tests.

! CAUTION !
It is not acceptable to repair, modify or pull spring to get it in conformance with load/length requirements; it is not acceptable to grind out locations with corrosion.

Length of spring (mm)	Load (N)
82±0,5	566 - 673
75±0,5	718- 854

Tab. C-1 Spring (6) loads

Length of spring (mm)	Load (N)
31±0,2	472 - 573
23±0,2	675 - 819

Tab. C-2 Spring (16) loads

C 5.2.4 Spring housing (5) with bushing (2)

1) Check spring housing **(5)** with bushing **(2)**. Check for damage, corrosion and dents caused by spring **(6)** on internal surface. Bushing **(2)** – check condition of hole Ø 12; it must not be step-bored (caused by piston rod 2 **(9)**) and its diameter must not be over 12.06mm.

C 5.2.5 Piston rod 1 (14)

1) Check condition of M10 external and internal thread. Stripping, elongation, bending or corrosion are not permitted.

C 5.2.6 Piston rod 2 (9)

1) Condition of M10x1 male thread. Stripping, elongation, bending of piston rod or corrosion are not permitted.
2) Use micrometer to measure diameter of rod section housed within bushing **(2)**. Permitted wear – to minimum Ø11.94mm.

C 5.2.7 Hub (7)

1) Visually inspect external and internal area of hub for damage or corrosion.
2) Check that cylindrical hole Ø85mm is intact – there must be no indentations. Use thread gauge P-288 to check M87,5x2 threads – focus especially on damage and ovality in the area of first thread.

! CAUTION !

Threads must not be damaged in any way, as they transfer rotation and centrifugal forces from propeller blades into hub. Only minor damage to 1st thread is allowed (see Permitted repairs).

3) Check condition of threads for hub mounting screws **(8)**, they must not be elongated, stripped or otherwise deformed.
4) Check intactness of all M5 threads in hub.
5) Check condition of cylinder surface. There must be no deep scratches or dents. Cylinder surface must be uniformly polished.
6) Perform ND–test of the hub according to chapter C 5.3– Non-destructive tests
7) Cracks, damaged blade or cylinder bores, damaged threads or corrosion are not permitted

C 5.2.8 Piston (17)

1) Check piston for damage to both sides, damage to grooves for piston seal and sliding insert, for corrosion. Deformations, dents on sealing surfaces or corrosion are not permitted.
2) Measure diameter of piston (Fig. C-2). Difference between the piston and cylinder diameter must be in range from 3,98mm to 4,08mm. If the difference is bigger, oversized piston must be used (Tab. C-3).

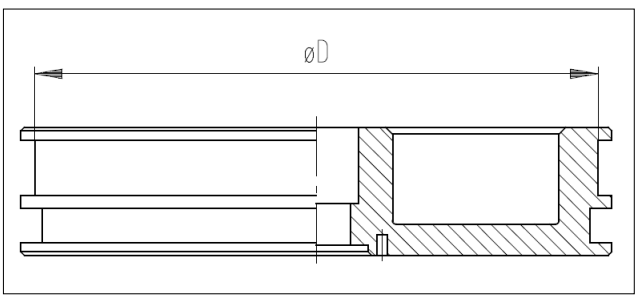

Fig. C-2Piston diameter measurement

Diameter	P/N
$81,35_{-0,05}$	B-1138-00
$81,40_{-0,05}$	B-1139-00
$81,45_{-0,05}$	B-1140-00
$81,50_{-0,05}$	B-1141-00

Tab. C-3 Oversized pistons

C 5.2.9 Back cover (24)

1) Check that cover is undamaged, focus on o-ring groove and chamfer on inner diameter (sealing surfaces). Check for possible corrosion, especially at cover's rear side. Deformations, dents on sealing surfaces or corrosion are not permitted.
2) Measure diameter of and cover (Fig. C-3) Difference between the cover and cylinder diameter must be in range from 3,10mm to 3,50mm. If the difference is bigger, oversized cover P/N B-1130-00 must be used.

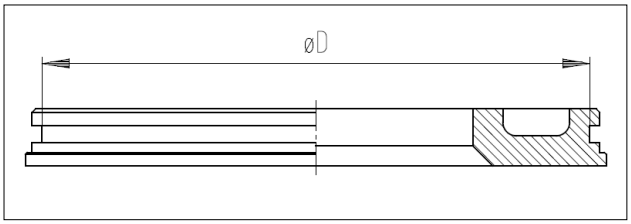

Fig. C-3 Back cover diameter measurement

C 5.2.10 Yoke (11)

1) Check groove for inserts **(12)** and sliders **(26).** Width of the groove must be in range 12,00mm to 12,05mm Yoke must not be bent nor deformed in any way
2) Surfaces of grooves which are in contact with sliders must not be dented or scratched.
3) M10 thread in the center of yoke must not be elongated, stripped, nor damaged in any other way.
4) No corrosion is acceptable on yoke.

C 5.2.11 Insert (12)

1) Check M5 threads in inserts. Check for deformation and dents at contact areas with blade. Damaged threads, deformations or dents are not permitted.

C 5.2.12 Slider (26)

1) Slider must not be dented or scratched.
2) Measure slider height (across the sliding surfaces), it must not be worn under lower wear limit 11.94mm.
3) Diameter of the hole must be in range 8,00mm to 8,05mm

C 5.2.13 Bearing race (29)

1) Check condition and uniformity of wear of bearing races **pos. 29**. Race must not have dents/waves on active surface (in contact with caged rolling elements).
2) Removed race laid on flat surface must have no visible deformation.
3) Race surface must not show corrosion or starting corrosion.

C 5.2.14 Bearing cage (30)

1) Bearing cage must not be deformed, all rolling elements must move freely in the cage.

2) Perform thorough visual check of rolling elements. Rolling needles must not have peeled-out spots nor bigger local indentations – these could later develop into pitting and crater wear of needle material.

C 5.2.15 Retention nut (35)(81)

1) Use thread gauge P-289 thread on retention nut thread must not be damaged nor indented; it must be possible to thread retention nut through thread gauge – ring – using hand force only. Damage to the first thread only at the side facing bearing race is permitted, i.e. up to 360º from the very beginning of thread.
2) Perform visual check of retention nut section separated by groove, which must not be visibly deformed – bent towards retention nut body; and must have no cracks.
3) Six M6 threads must not be damaged.
4) No signs of corrosion are permitted on retention nut.

C 5.2.16 Blade ferrule (32), (83) with actuating pin (31)

1) Visually inspect external and internal area of blade ferrule for damage or corrosion.
2) Grooves may appear on the surface of the ferrule caused by rubbing with the bearing rings. These are acceptable if their length does not exceed half the circumference of the ferrule and the depth is not greater than 0,3mm. Refer to chapter "Permitted repairs" for repair procedure.

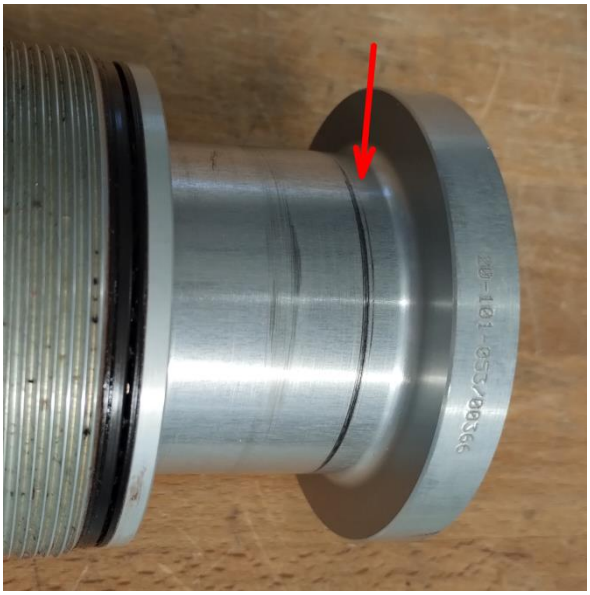

Fig. C-4 Groove caused by bearing ring on the surface of blade ferrule

3) Ferrule must be ND-tested according C 5.3 Non-destructive tests.
4) Check connection between glued-in pin **(31)** and ferrule. Pin must not be loose; no corrosion or signs of starting corrosion are allowed. Use micrometer to measure pin diameter, pin must not be worn under lower wear limit 7,94mm. Retaining ring groove must not be damaged.

C 5.2.17 Propeller blade (38), (84)

1) Perform thorough visual inspection. Propeller blade must not show signs of damage, cracks, and deformation exceeding permitted values specified below, otherwise blade must be replaced

   If more extensive damage, cracks, and/or deformation is discovered, replace blade with another, with identical static moment and pin position.
2) Blade surface

Maximum repairable surface area of single damaged spot must not exceed 2cm^2. Repairs of damages are permitted in gelcoat or composite layers only if they did not penetrate to the wooden blade core; otherwise, the blade must be discarded. Total damaged surface area must not exceed 6cm^2.

Maximum repairable depth of damage to trailing edge is 2mm, repaired locations must be farther than 80mm away from each other, and must not be longer than 15mm.

Check that black matte finish on rear side of blade is intact and solid. Check that color strip on blade tip is intact and solid. Repair finish/lacquer if damaged.

Fine cracks on blade surface are signs of bending vibrations of propeller blade. These cracks usually appear on outer half of blade. These cracks cannot cause sudden blade failure, because blade load is carried by wooden core. Hair-cracks on the blade surface are permitted if they are only in outer gelcoat layer, they must not penetrate into the fiberglass (or carbon) layers.

3) Blade root

The inspection is carried out in the case of complete disassembly of the blade. After removing the duralumin ferrule (32), (83), cracks running along the wood fibers can be found on the outer surface of the root section of the blade.

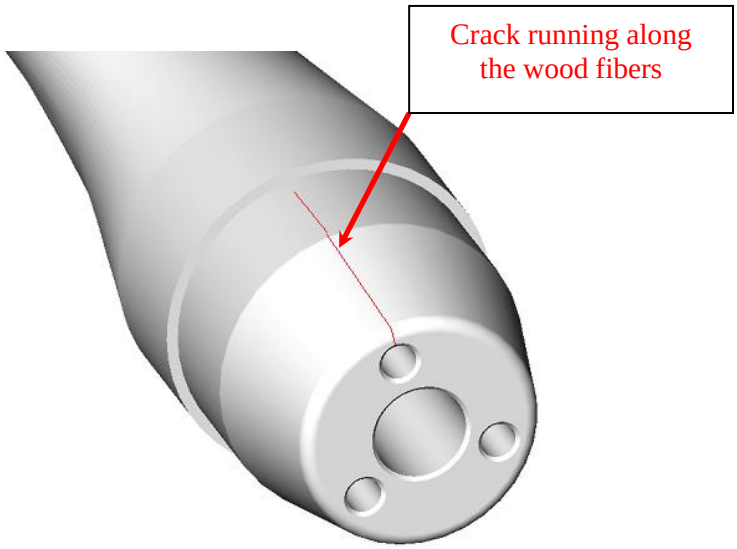

Fig. C-4a Place of occurrence of the crack, permitted direction of occurrence.

A crack can occur in the wood wall in the direction of the thread and along the fibers, as can be seen from Fig. C-4a. A crack may appear at all threaded holes for the fixing screws. It is caused by changes in the volume of the wood due to the fluctuation of the humidity of the wood root section. As it does not cause fiber breaks, it also does not affect the strength of the connection to the blade ferrule.

Cracks directed into the volume of the body of the blade towards its longitudinal axis and/or across the direction of the fibers are not allowed.

Check condition of threads for screws **(37)**. Threads must not be stripped or otherwise damaged.

4) Leading edge :

Polyurethane leading edge:

Maximum permitted depth of damage to PU leading edge is 2mm, repaired locations must be farther than 80mm away from each other, and must not be longer than 15mm. No cracks on the leading edge are permitted. The leading edge must always fully adhere to blade along the entire length.

If defects on polyurethane leading edge are exceeding inspection criteria, leading edge must be replaced according to TN-04 instruction, or whole blade must be replaced.

Stainless steel leading edge:

Maximum permitted depth of damage to stainless leading edge is 1mm, damaged locations must be farther than 80mm away from each other and must not be longer than 5mm. Only deformations with blunt edges

are permitted; any sharp edges could be starting points of growing defects. No punctures or cracks are permitted, on entire length of leading edge. The leading edge must fully adhere to blade, and no gap between stainless strip edge and blade surface is permitted. Any sign of separation of stainless leading edge from blade surface is not permitted.

If defects on stainless leading edge are exceeding inspection criteria, leading edge must be replaced according to TN-10 instruction, or whole blade must be replaced.

C 5.3 **Non-destructive tests**

1) Blade ferrule **(32), (83),** inspect using penetrant method according to ISO 9712:2021.

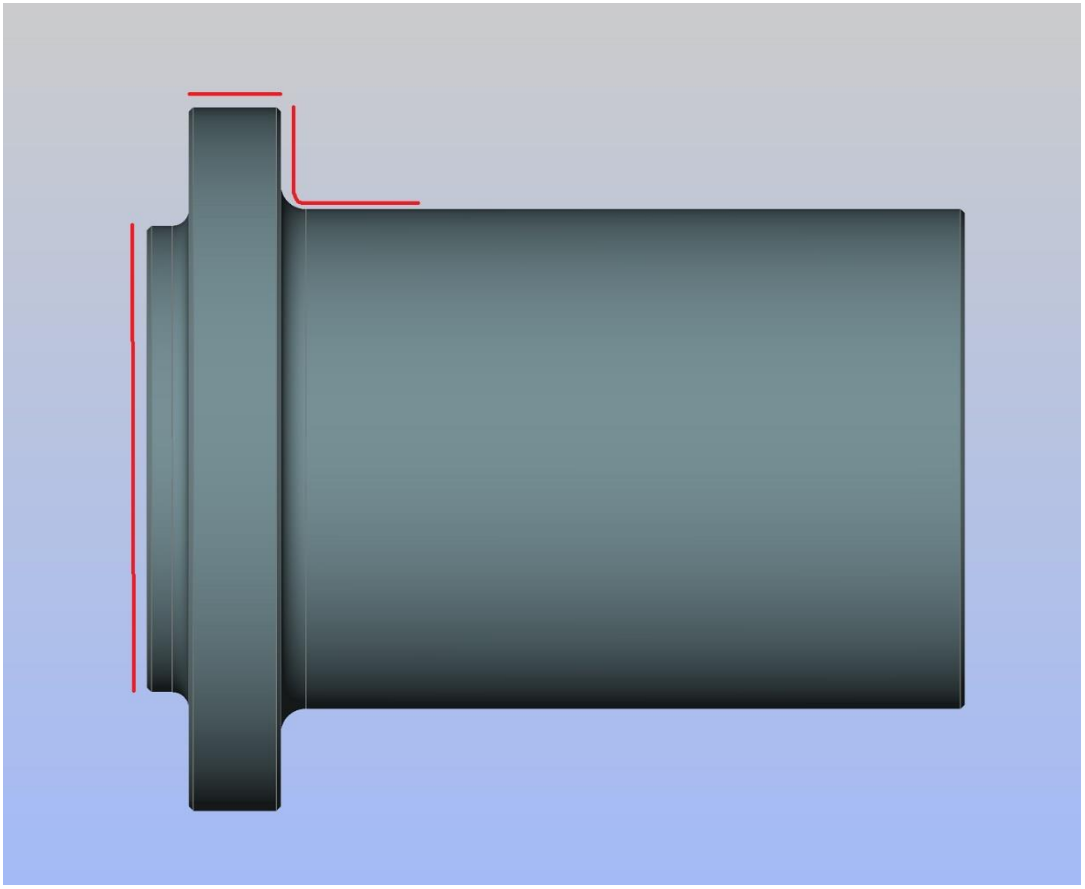

Fig. C-4b Surfaces inspected by NDT.

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C6. **Replacement**

1) Replace parts with cracks
2) Replace heavily damaged parts (deep scratches or dents, with heavy or in–depth corrosion) .
3) Replace worn, damaged or corroding bearings and bushings.
4) Replace worn, damaged or corroding fasteners.
5) Replace parts which have larger damage than permitted in chapter "Inspection".
6) Replace all parts for which the repair would have an effect on the operation or serviceability.
7) Replace all parts listed in chapter " Parts due to mandatory replacement or "Mandatory replaced parts at medium repair" respectively.

C7. **Permitted repairs**

C 7.1 **Surface protection**

1) It is permitted to repair small area defects, < 2cm^2 which only affect the surface (damaged edges, beveled edges, various scratches, scorching, etc.). Larger damage, corrosion at multiple locations – replacement with new parts.

C 7.2 **Repair of parts**

C 7.2.1 Spinner (39) and backplate (41)

1) Any damage to spinner and backplate surface may only be repaired in gelcoat layer. Surface area of single repaired spot must not exceed 250mm^2. Repair damages in gelcoat layer by applying drops of gel resin with appropriate color. Leave repaired spots to cure and then grind down using 1200 grit sandpaper under water, followed by polishing.

1) Damaged riveted nuts **(77)**: carefully drill out using 3,0 mm drill in hand held drill. When drilling out the nut, hold drill perpendicularly to spinner surface, to prevent enlarging of rivet hole. Possible rivet parts remaining in hole must be removed by gentle tapping using 3mm punch. Clean surface under removed nut using benzine. Use short screw to temporarily hold new riveting nut onto backplate. Carefully align riveting nut with rivet holes in backplate and tighten the screw. Clean out rivet holes using 3.1mm drill in hand held drill, perpendicularly to backplate surface. Apply few drops of mixed ENGUARD GE WHITE onto of new rivet stem, then rivet down. Clean excess gel from backplate surface after riveting. Remove technological screw.

2) If frontplate separates from the spinner, remove it by removing silicone putty layer. Wash spinner backplate using benzine and remove all traces of silicon from the flange. Use 100grit sandpaper to prepare flange circumference. Wash inside of spinner using benzine. Remove all traces of silicone in gluing area and use 100grit sandpaper to prepare the surface. Use clean rug moistened with methylethylketone (MEK) to clean both surfaces. Attach frontplate by center hole onto mandrel of gluing fixture P-292. Push spinner onto frontplate and use upper arm of fixture to press spinner up to fixture's base plate. Align horizontal position of mandrel with frontplate using your hand inserted through holes for propeller blades. After alignment, release upper arm of fixture and remove spinner. Use application gun to apply sufficient amount of Soudal neutral silicon onto the circumference of frontplate and onto matching inside surface of spinner. Push spinner onto frontplate, use upper arm of fixture to press spinner up to fixture's base plate, and leave to harden for at least 5 hours. After 5 hours, remove glued assembly from the fixture and apply Soudal silicone sealant (continuous strip of sealant in the shape of weld bead) around the circumference of rear face of frontplate. Assemble spinner no sooner than 24 hours after complete curing of silicone – early assembly may lead to separation of frontplate during propeller operation.

C 7.2.2 Spacer (65)(68)

1) Minor damage to edges of front face flanges may be carefully filed by a small file.

C 7.2.3 Spring housing (5) with bushing (2)

1) If spring housing **(5)** is undamaged but bushing **(2)** is enlarged and exceeds allowed wear parameters replace the bushing. Insert the assembly into the P-481 jig (Fig. C-5) and put it under the bench press. Carefully press-out the bushing from the housing.

   Remove any remnant of the sealant from the spring housing. Clean new bushing and spring housing using MEK, apply Loctite 243 on both surfaces and press the bushing into the spring housing.

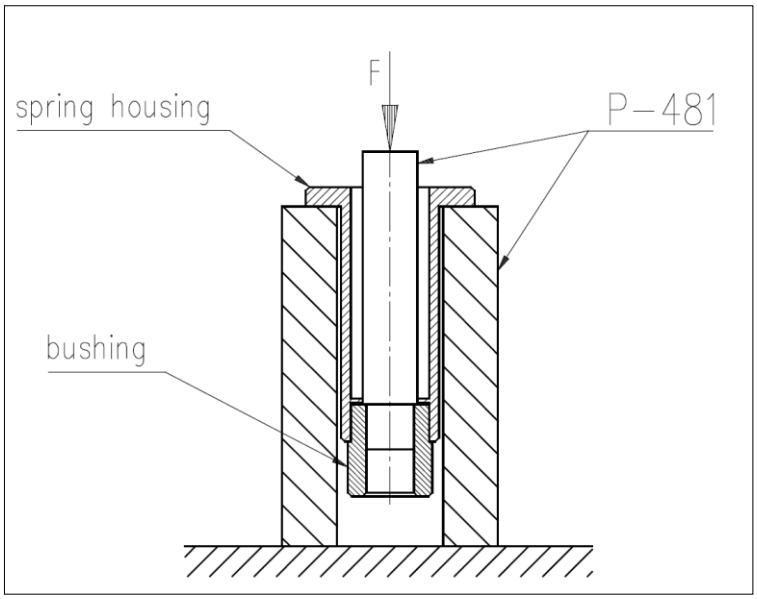

Fig. C-5 Removal of bushing from spring housing

C 7.2.4 Hub (7)

1) Replacement of screws **(8)**.

   To remove, thread two nuts onto each screw, tighten them together and then remove screw using open end wrench applied on lower nut.

   Carefully clean threads in hub using 3rd thread tap from set (M8 or M10), remove all traces of locking fluid.

   Check condition of thread, it must not be elongated or stripped otherwise deformed.

   Thread two nuts onto longer end of new screw and tighten them together.

   Apply Loctite 272 onto shorter end of screw **(8)** and to the thread in the hub.

   Thread the screw into hub. Apply 5Nm (for M8 screws) or 10Nm (for M10 screws) torque using torque wrench.

   Remove nuts after tightening.

   Clean excess of sealant around installed screws.

   Let the locking compound cure for 24hours at minimum temperature of 20°C or bake it in an oven at temperature of 50°C for 1 hour.

   If short spacer **(68),** is used screws **(8)** of appropriate length must be installed - see part list.

2) Repair of damaged M87.5x2 thread.

   Repair of the first thread only is permitted, i.e. up to 360º from the very beginning of thread. It is forbidden to pry threads back into original shape.

Use small round file to file-out deformed area of thread. Create smooth transition between repaired and undamaged area. Remove all file marks using fine sandpaper or scotch-brite.

Clean all filing and sanding debris and check repaired thread using P-288 gauge. The gauge must be easy to screw into hub, using hand force only.

3) Repair of damaged inner surface of cylinder

Repair is performed by hand grinding and polishing with the hub fastened in lathe chuck.

It is recommended to remove screws (8) before repair to facilitate access into cylinder area. The presence of the screws may cause serious injury.

Use P-371 fixture to fasten the hub to the lathe chuck. Set the lathe to 200rpm. Start grinding with 600 grit sandpaper and after removing all damage smooth the surface with 1200 grit sandpaper. Wash the sandpapers often in the water during work.

When grinding is finished remove all remnants of abrasive from the cylinder bore. Polish cylinder surface to high gloss using cotton cloth with suitable polishing compound.

Measure the cylinder diameter during work. Final diameter depends on the dept of the scratches, but it must not exceed 85,50mm. Cylinder diameter must be within 0,03mm tolerance band along the entire length. Ovality of the cylinder must not exceed 0,02mm.

After completing repair clean the hub and make sure that all remnants of abrasive and polishing compound are removed.

It is not necessary to remove all scratches completely. Shallow remnants of scratches usually have no significant effect on cylinder sealing. More important is not to increase cylinder diameter more than necessary

C 7.2.5 Retention nut (35), (81)

1) Repair of the first thread only is permitted, i.e. up to 360º from the very beginning of thread. It is forbidden to pry threads back into original shape.
2) Use small round file to file-out deformed area of thread. Create smooth transition between repaired and undamaged area. Remove all file marks using fine sandpaper or scotch-brite.
3) Check repaired thread using P-289 gauge. The gauge must be easy to screw onto retention nut, using hand force only.

C 7.2.6 Blade ferrule (32), (83) with actuating pin (31)

1) Repair of grooves caused by bearing rings (Fig. C-6)

Use small round file to file-out sharp edges of the groove. Do not increase the depth of the groove more than necessary. Remove all file marks using fine sandpaper or scotch-brite.

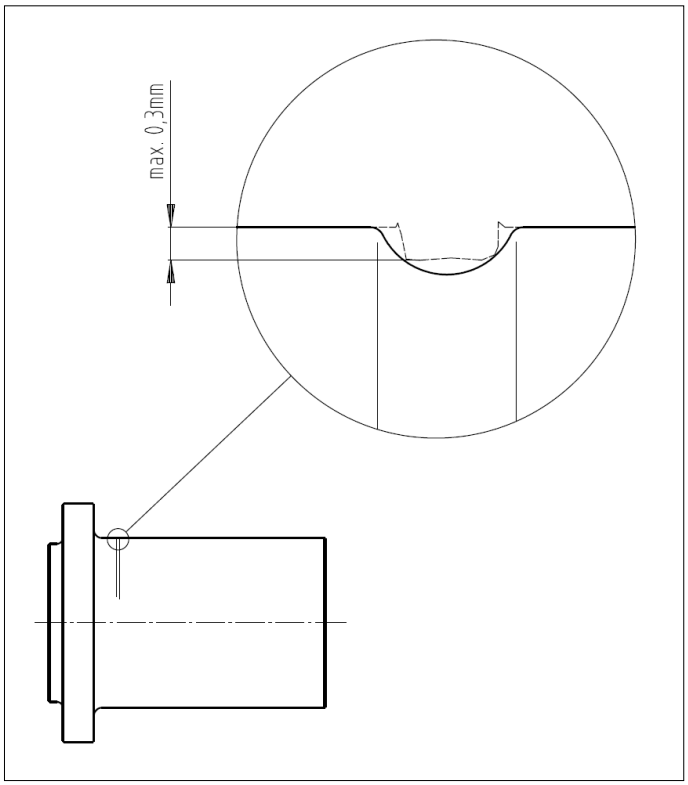

Fig. C-6 Blade ferrule repair

2) Actuating pin replacement

Carefully unscrew the pin using small adjustable pliers by grasping its Ø8 part.

Clean the threaded hole using M10 tap; remove all traces of glue.

Degrease new pin and threaded hole in ferrule using methylethylketone (MEK).

Apply mixed Lepox Metal onto M10 thread of pin. Thread pin into ferrule using hand force only as far as possible. Use small adjustable pliers to bottom the pin. Insert harder plastic insert between jaws of pliers, so that precisely machined diameter is not damaged. Use a cloth to clean excess Lepox Metal glue, also clean pin and ferrule face using cloth damped with methylethylketone (MEK).

C 7.2.7 Propeller blade (38), (84)

1) Repair of blade surface

Repair damages in gelcoat layer by applying drops of gel resin with appropriate color. Clean and dry damaged location. Use file or sandpaper to prepare the location. Surface area of single repaired spot must not exceed 250mm^2

Repair damages in composite layer repair by applying fiber glass 110 g/m2 saturated with Polylite 720-020 resin. Choose number of layers of fiber glass according to the depth of damage. Orient fibers 45° to the blade axis. Surface area of single repaired spot must not exceed 250mm^2

Leave repairs to cure and then grind to merge with surrounding undamaged surface. Spots repaired with gel resin where paint will not be applied (camber side of blade) grind using 1200 grit sandpaper under water and polish. Other repaired areas repaint with 2K acrylic paint. When larger scope of lacquer damage is discovered (typically face side of blade) repaint the entire area according to following procedure:

Sand surface with 100 grit and then with 250 grit sandpaper. Protect unpainted areas using masking tape. Remove dust from painted area and degrease with acetone or MEK. Repaint area with 2K acrylic paint. Follow manufacturer's instructions for paint application.

Tractor propellers must have face sides of blades painted with matte black. Blade tips may be painted according to user requirements, for safety reasons it is recommended to use distinctive color - yellow or red.

2) Repair of polyurethane leading edge

The repair may be done only by filling and sanding, to achieve smooth shape. Don't add any material to damaged areas.

In case of extensive damage, the whole leading edge must be removed and recast according to TN-04 instruction.

3) Installation of protective tape on leading edge:

Use only the tape provided or specified by the propeller manufacturer.

Carefully remove old tape (slightly heat the tape using hairdryer).

Clean the surface from dust and oil. The rest of glue carefully remove using acetone or MEK (Methyl Ethyl Ketone).

Measure the distance from the root section to the leading edge sheath (Fig. C-7).

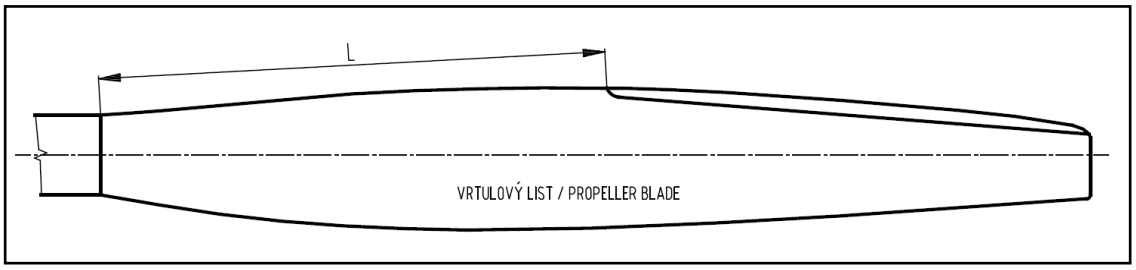

Fig. C-7 Tape length measurement

Prepare a piece of the protective tape approximately 50 mm longer than the measured length. Finish one end of the tape by radius (Fig. C-8).

Fig. C-8 Tape cutting

Carefully remove backing tape from the new tape, taking care not to touch/soil the glue surface. The end with the radius shape shall be oriented in the blade tip direction and glued approximately 10 mm over the sheath (polyurethane or stainless steel). Cut the opposite end of tape in line with the rim of the blade ferrule (Fig. C-9).

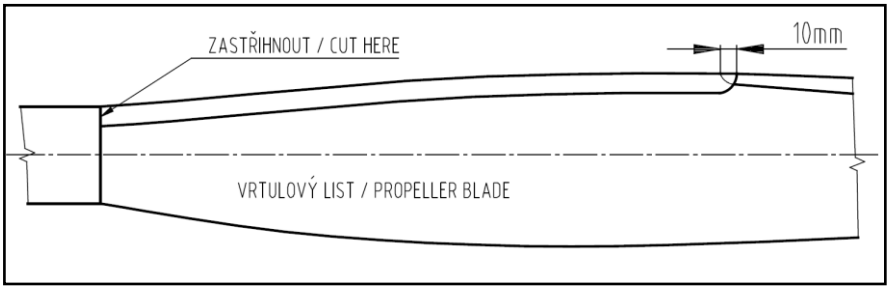

Fig. C-9 Tape position

Apply tape to prepared blade surface(Fig. C-10). Use plastic spatula to force out air bubbles, or puncture the tape by a pin, and press out air using a roller or finger pressure. Do not use a blade or razor to cut the tape!!

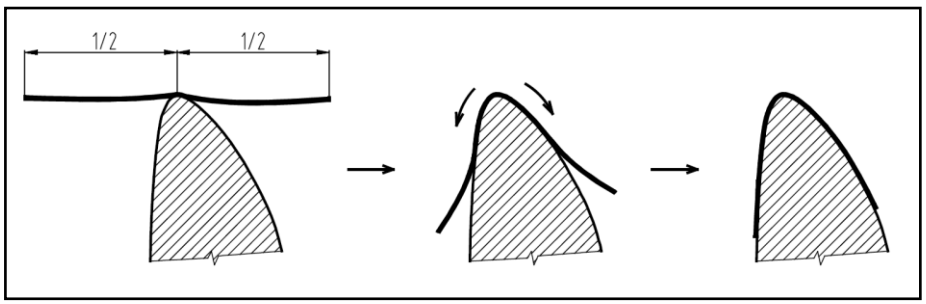

Fig. C-10 Tape application

Place the propeller into operation no sooner than after 24 hours from applying the tape, when the glue fully cures.

C8. **Reassembly of propeller**

C 8.1 **Reassembly of propeller blades**

! CAUTION !

If the parts were not replaced, assemble the same blade ferrule (32), (83) and other retention parts with the same blade (38), (84) from which they were removed. Mixing the ferrules between the blades may lead to angle difference between blades bigger than which can be compensated.

Reassembly of completely dismantled blades:

1) Grease both sides of bearing races **(29)** and bearing cage **(30)** using Unifleg C2 Fleggrease-R. Thoroughly push grease in between rollers. Apply thin film of grease onto both sides of bearing spacer **(33)**.
2) Thread bearing spacer **(33)** on the blade ferrule **(32)** with its internal radiused edge oriented towards radiused corner of ferrule. Then, thread 1st bearing race **(29)**, lubricated bearing cage **(30)**, and 2nd bearing race **(29)**.
3) Apply AeroShell Grease5 to O-ring **(34), (82)**. Insert lubricated O-ring into groove in retention nut **(35), (81)**.

   Apply AeroShell Grease5 to circumference of uncoiled sliding insert **(18)**. Coil lubricated sliding insert and insert it into 8mm wide groove in retention nut **(35)**. Use two sliding inserts for retention nut **(81).**
4) Insert retention nut **(35), (81)** with inserted rings carefully onto blade ferrule **(32), (83)**. Six openings in retention nut face must be oriented towards propeller blades. When inserting, gently press onto retention nut and rotate it slowly so that O-ring does not get damaged.
5) Carefully insert propeller blade **(38), (84)** into ferrule containing all inserted parts. Check correct position of blade profile chord in relation to blade actuating pin **(37)**
6) Mix small mount the CHS EPOXY 324 resin with P11 hardener according to manufacturer's instructions.
7) Apply small amount of mixed CHS EPOXY 324 resin on last three threads of retention screws **(37)** and screw them into propeller blade.
8) Insert blade ferrule into P-294 fixture and fasten it into a bench vice. Tighten screws **(37)** to 50Nm using torque wrench with 12mm socket.
9) Apply small amount of mixed CHS EPOXY 324 into central bore in the blade root. Insert tube **(36)** into the bore and tap it to the bottom using plastic or wooden hammer.
10) Seal propeller blade near ferrule edge at propeller blade root using Mastersil 50ShA polyurethane sealant.
11) Reassemble blades 2 and 3 using the same procedure.

NOTE

If blade ferrule is replaced, hole for actuating pin (31) must be drilled after blade assembly according to technology instruction TN-23.

12) If extensive repair of blades was performed or some blades were replaced, static moments of the blades must be matched to ensure proper balance of assembled propeller. Use P-293 balance to measure static moments of all three blades. Select blade with highest static moment and add weight onto remaining blades to achieve the same static moment. Insert weights into tube **(36)** in blade ferrule center, and secure using few drops of CHS 324 epoxy. Recheck the blades. Differences in static moments must be nearly zero. When more weight is needed than will fit in the tube, proceed according to TN-23 instruction.
13) If one or two blades are replaced, blade track must be checked before final installation (se chapter C 12.3).

NOTE

Blade sets are supplied with static moments and blade tracks matched. When new blade set is installed, it is not required to check static moments and tracks of individual blades.

14) Protect propeller blade ferrule with assembled parts by winding protective tape upon it, or use plastic pouch to prevent damage until reassembly into propeller hub. Use protective sheath on blade.

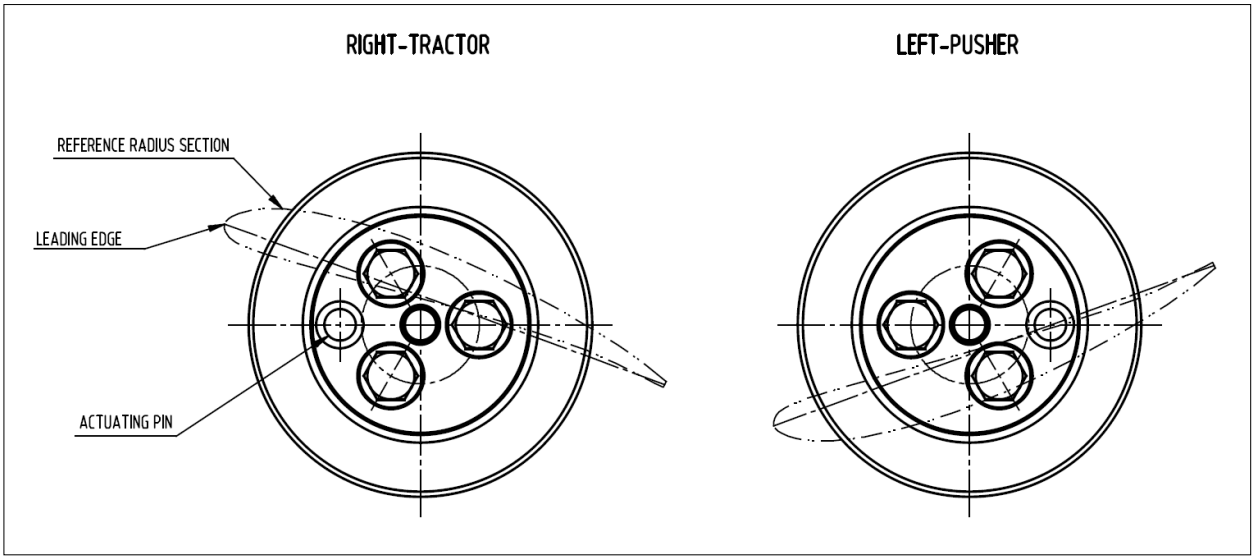

Fig. C-11 Position of blade actuating pin

Reassembly of partially dismantled sheets:

1) Mix a small amount of CHS EPOXY 324 resin with hardener P11 according to the manufacturer's instructions.
2) Apply a small amount of mixed CHS EPOXY 324 resin to the last three threads of the mounting screws (37) and screw them into the propeller blade.
3) Apply AeroShell Grease5 to the perimeter of the extended sliding inserts (18). Roll them up and slide them into the groove in the blade retention nut (81).
4) Insert the blade ferrule into the P-294 jig and fix it in a bench vise. Tighten the screws (37) with a 12mm torque socket wrench to a tightening torque of 50Nm.
5) Seal the propeller blade near the edge of the ferrule at the root of the propeller blade using Mastersil 50ShA polyurethane sealant.

C 8.2 Reassembly of propeller hub

C 8.2.1 Reassembly of yoke

1) Insert inserts**(12)** into grooves in yoke**(11)**, align holes for screws, and thread-in screws **(13)**. Use 4mm Allen key to tighten the screws.

! CAUTION !

Observe orientation of inserts according to assembly drawing – correct position of chamfered edge.

2) Secure three screws **(13)** together using Ø 0.6mm stainless locking wire.

C 8.2.2 Reassembly of propeller hub

1) Installation of mounting screws **(8)**.

   Thread two nuts onto longer end of new screw and tighten them together.

   Apply Loctite 272 onto shorter end of screw **(8)** and to the thread in the hub.

   Thread the screw into hub. Apply 5Nm (for M8 screws) or 10Nm (for M10 screws) torque using torque wrench.

   Remove nuts after tightening.

   If short spacer **(68)** is used, screws **(8)** of appropriate length must be installed - see part list.

2) Insert male-threaded part of piston rod 1 **(14)** from rear side of hub into Ø14mm hole.

   Thread stop **(49)** onto rod 1 **(14)**. Orient the stop by chamfered edge to the rear flange of the hub.

3) Insert assembled yoke **(10)** into hub **(7)**. Orientation of assembled yoke (Fig. C-12):

   Tractor configuration - side with heads of three screws must face hub side with stamped numbers 1, 2, and 3.Pusher configuration - side with heads of three screws must face rear flange of hub

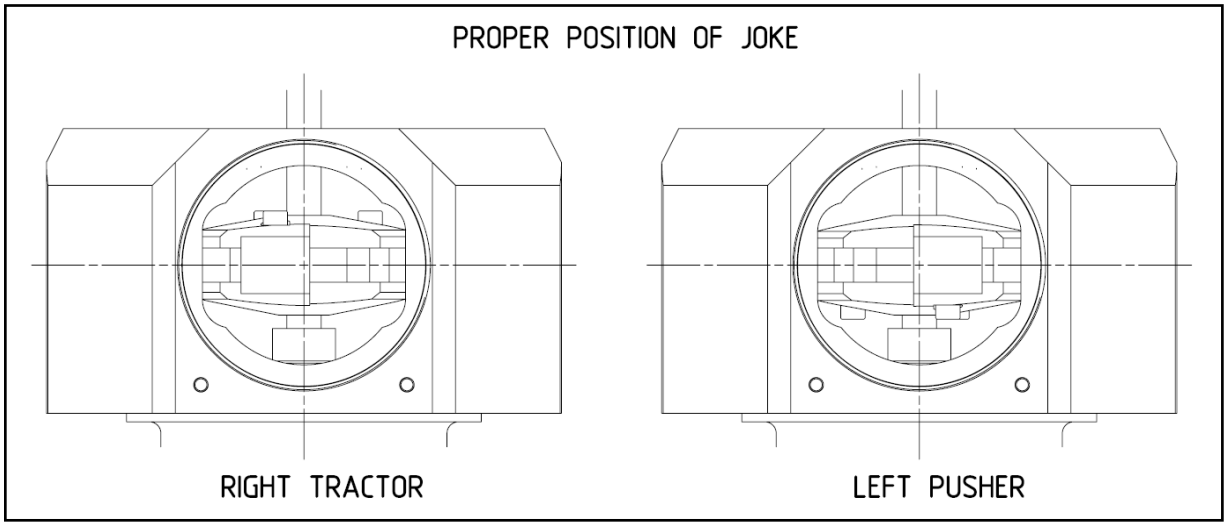

Fig. C-12 Yoke orientation

4) Thread piston rod 1 **(14)**, into the yoke **(10)**.

5) Use three mock-up propeller blades P-304 screwed in from side of propeller hub into holes for propeller blades to hold yoke in propeller hub.

6) Tighten piston rod 1 through Ø19mm hole in front side of hub, torque wrench set to 15Nm, with 7mm bit.

7) Apply few drops of Loctite 243 into internal M10 thread of piston rod 2 **(9)**. Insert internal-threaded part of piston rod 2 **(9)** into Ø19mm hole in front side of hub, and use hand force to seat into piston rod 1. Tighten piston rod 2 using torque wrench set to 15Nm, with 7mm bit.

8) Loosen mock-up propeller blades P-304 so that yoke with piston rods may move inside propeller hub.

9) Thread end stop **(15)** onto piston rod 1 **(14)** protruding from hub into piston area. Chamfered edge of end stop must face rearwards to piston **(17).**

10) Lubricate piston seal **(19)** with engine oil and thread into 5mm recess in side of piston **(17)**.

NOTE

There are two variants of piston seal ; U-profile P/N: A-2000-01 and O-ring P/N: A-1015-07. U-profile seal P/N: A-2000-01 is no longer used on new propellers, it is recommended always use O-ring P/N: A-1015-07.

If piston seal P/N: A-2000-01 is used, make sure that it is installed in proper orientation (Fig. C-13).

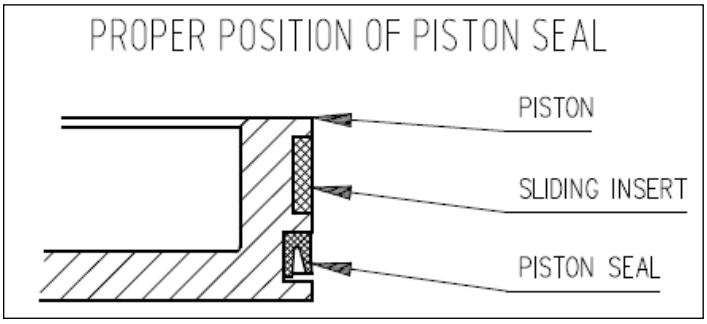

Fig. C-13 Orientation of piston seal

11) Apply layer of AeroShell 5 Grease onto conical spring **(16)**. Lightly coat walls of cylinder in rear part of hub using engine oil. Lubricate sliding insert – uncoiled strip **(18)** – using engine oil. Coil strip and insert into 8mm wide groove in piston. Hold coiled strip on piston using fingers and insert small side of spring **(16)** onto pin (Ø22) at bottom of piston. Carefully insert this assembly into cylinder (Fig. C-14).

! CAUTION !
Take care not to damage piston seal when inserting piston – it would leak.

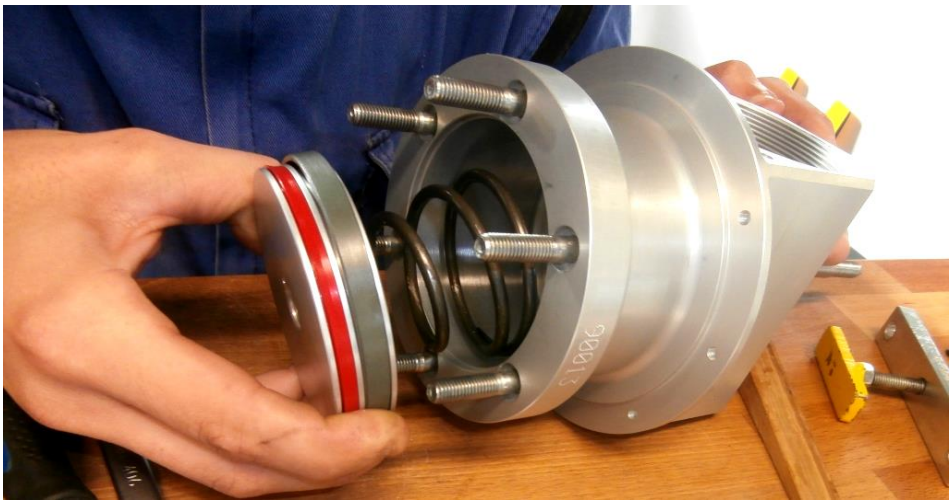

Fig. C-14 Piston installation

12) Thread locking washer **(21)** onto screw **(22)** so that its locking tab faces head of screw. Thread O-ring **(20)** lubricated with engine oil onto screw. Apply Loctite 243 to last three threads of screw **(22)** and insert it into piston center bore.

13) Attach piston assembly tool P-301 on two of screws **(8)** and secure it using two nuts. Using P-301 tool force piston into cylinder working area, stop when screw **(22)** with locking washer and O-ring can be threaded into piston rod 1 **(14)**. Make sure that locking tab of washer **(21)** is in slot in piston bottom.

14) Using 19mm open end wrench thread screw **(22)** into the piston rod **(14).** Remove the piston assembly tool P-301. Use 19mm socket to thread screw **(22)** completely. Use torque wrench set to 15Nm to tighten screw **(22)**. Bending of locking washer will be performed after first preliminary pressure test.

15) Put reassembled hub on its rear face onto assembly support P-306.

16) Apply AeroShell 5 Grease onto spring **(6**) and thread spring from front side of hub onto piston rod 2 **(9)**. Thread spring housing **(5)** with pressed in bushing **(2)** onto spring **(6)** and onto piston rod 2 **(9)**. Thread spring washers **(4)** onto two screws **(3)**. Using screws **(4)** with spring washers, fasten assembled spring housing to propeller hub. Tighten screws using torque wrench set to 6Nm with 4mm bit.

17) Remove three mock-up propeller blades from propeller hub.

18) Thread self-locking nut **(1)** onto end of piston rod 2 **(14)** protruding from end of bushing **(2)**. Use nut to adjust yoke position so that it is in the middle of holes for blades.

19) Thread O-ring **(23)** lubricated with engine oil onto back cover **(24)** and using hand force push cover onto edge of cylinder.

    If short spacer**(68)** is used, install it instead of the back cover.

    If long spacer **(65)** is used, install it instead of the back cover and tighten it to hub using at least three nuts.

20) Perform leak check according to chapter 9.1.

21) If assembled hub passes leak check, remove it from test fixture P-47. Put propeller hub its front face down onto assembly support P-306.

22) Remove back cover **(24)** (or spacer **(68), (65)**) with O-ring **(23)** from cylinder. Use adjustable pliers to bend locking washer **(21)** towards opposite sides of hexagonal head of screw **(22)**. Reinstall back cover (or spacer **(68)**). Do not install long spacer **(65)** now.

C 8.3 **Installation and adjustment of propeller blades**

1) Install reassembled propeller blades one after another into reassembled hub. Numerals 1, 2, and 3 stamped in front face of hub are blade number. First of all, install blade 1 into position 1.
2) Install propeller hub onto assembly fixture P-54. Tighten the propeller to the flange using at least three nuts.
3) Prepare sliders **(26)** for installation. The eccentricity of the holes in the sliders is essential to the adjustment of the blade angles Fig. C-15. Refer to Fig. C-16 for slider eccentricity measurement. Once the blade angles are adjusted the sliders must not be mixed between the blades or turned on the pins.

   If using original sliders it is recommended to install them to original positions in original orientation for first try. However it is possible to install any slider to any position as long as it meets dimensional criteria.

   If using new sliders it is recommended to use those with zero eccentricity for first try.

   Make a mark towards selected functional surface using black permanent marker (Fig. C-17).

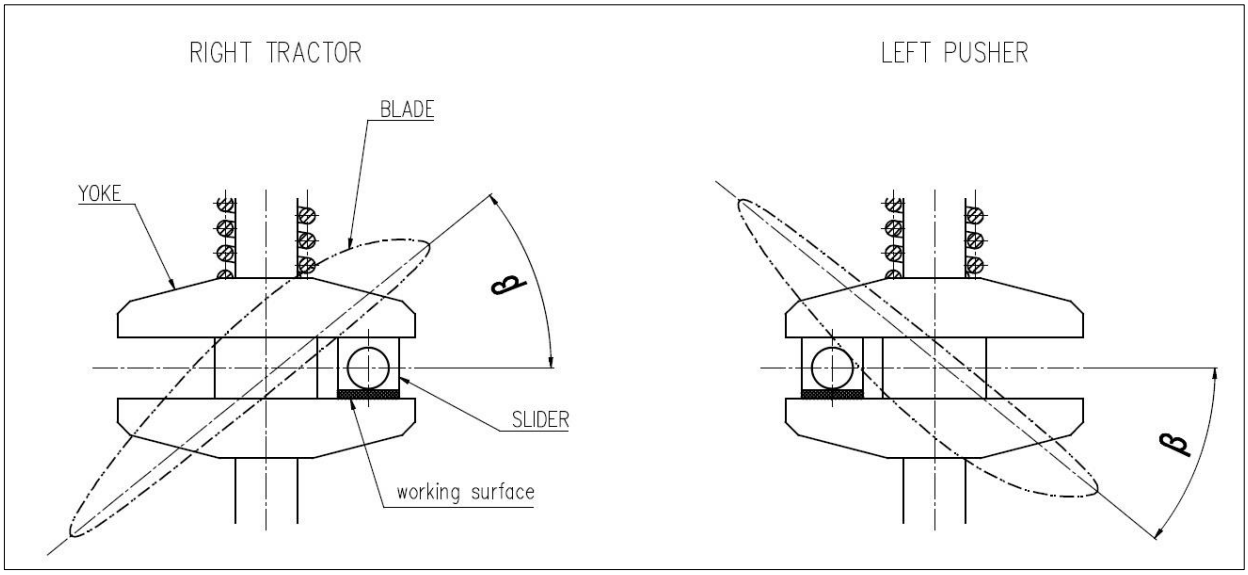

Fig. C-15 Pitch setting mechanism schema

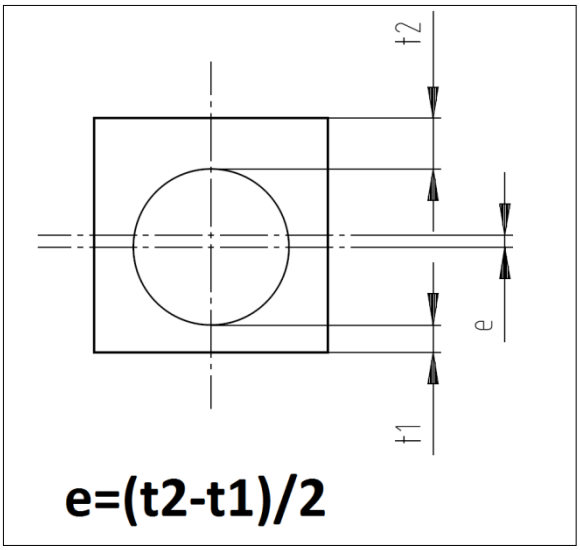

Fig. C-16 Slider eccentricity measurement

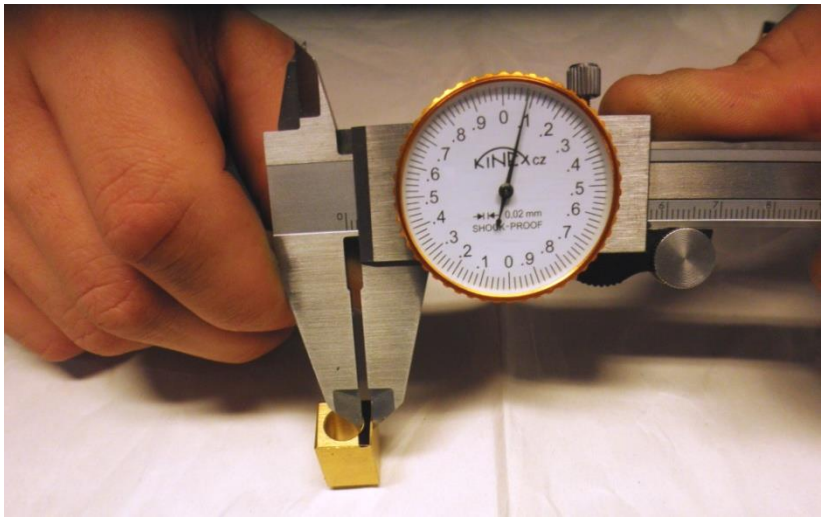

Fig. C-17 Slider measurement and marking

4) Try to insert sliders into groove in yoke. Slider without lubrication must easily move within groove, without noticeable free play. Use 0.05mm feeler gauge to check free play between all sliders and yoke. Feeler gauge must not fit between slider and yoke. New sliders are usually little bit oversize, in this case grind them down slightly using 600 – 800 grit emery cloth laid on flat surface. Grind opposite side with black marks. After grinding, wash slider in benzine are recheck its free play and movement in yoke.

5) Grease both sides of bearing races **(29)** and bearing cage **(30)** using Unifleg C2 Fleggrease-R. Insert assembled bearing into the hub bore where blade will be installed.

6) Remove protective pouch from propeller blade to be installed. Remove protective tape or plastic bag preventing loss of parts (ring, axial bearing, and retention nut) installed in blade ferrule.

7) Lubricate Ø8 mm pin protruding from propeller blade ferrule using AeroShell 5 Grease. Put marked/selected slider **(26)** onto pin and use retaining ring pliers to install retaining ring **(25)** onto pin.

8) Lubricate M87.5x2 thread in hub using Aero Shell 5 Grease. Turn slider on propeller blade pin so that marked side of slider faces rear flange of hub during fitting. Turn retaining ring so that flats with holes for retaining ring pliers do not coincide with edges of slot in yoke. Push propeller blade ferrule into opening in propeller hub. After insertion of beginning of slider into yoke, carefully push blade so that slider on pin enters slot in yoke. Use hand force to screw retention nut **(35)** threaded onto propeller blade, into body of propeller hub. Lightly tighten retention nut using P-303 wrench. Subsequently release and retighten retention nut. Repeat 3 times – retention nut and axial bearings must seat in.

! CAUTION!
When installing blades into propeller hub, ensure correct orientation of marked sides of selected sliders (26). When turning slider, measured blade angle settings may differ significantly.

Check angular position of retaining ring – risk of damage to edges of slot in yoke.

9) Draw reference diameter on leading edge of propeller blade using gauge intended for this purpose (Fig. C-18). Use the following gauges for appropriate blade type:

Blade W–031	Gauge P-285 with 170mm distance
Blade C–033	Gauge P-286 with 210mm distance
Blade B–034	Gauge P-287 with 170mm distance
Blade WA–037	Gauge P-285 with 170mm distance
Blade WA–038	Gauge P-285 with 170mm distance
Blade G–041	Gauge P-488 with 188 mm distance

10) Attach pitch angle laser indicator P-307 onto blade. Hold electronic protractor to bottom side of indicator, and read out pitch angle of propeller blade at reference diameter. Adjust Angle scale P-370 so that value indicated by laser corresponds to value measured with protractor. Use of adjustable angle scale (P-370) is not mandatory, the blade angle may be measured with the protractor only. Before measuring always rotate blade by hand in direction to low angle to eliminate play in mechanism.

Fig. C-18 Measurement of blade angle

11) Rotate nut **(1)** to set propeller blade 1 to reference angle 20º .

12) Turn propeller hub in assembly fixture P-54 by 120º. Install blade no. 2 using the same procedure and measure pitch angle of blade at reference diameter. If this blade is adjusted to 20º±15´, setting is within permissible range.

    If blade is not within stated tolerance, note measured deviation from nominal value of reference angle, including its direction – plus or minus.

13) Turn propeller hub in assembly fixture P-54 by 120º. Install blade no. 3 using the same procedure and measure pitch angle of blade at reference diameter. If this blade is adjusted to 20º±15´, setting is within permissible range.

    If blade is not within stated tolerance, note measured deviation from nominal value of reference angle, including its direction – plus or minus.

14) Remove blades that do not meet angle tolerances from propeller hub. There are several possibilities how to adjust the angles on these blades. It depends on eccentricity of currently installed slider compared to needed angle change. It is possible to exchange the sliders for new ones with a different eccentricity, exchange the sliders between the blades or just turn the sliders by 180°.

    When selecting new slider, refer to to Tab. C-4, which states change of angle of propeller blade based on change of eccentricity of the slider.

    If measured angle deviation is positive, new slider must have thinner wall.

If measured angle deviation is negative, new slider must have thicker wall.

To correct bigger deviations, install sliders manufactured with 0,1mm, 0,2mm or 0,3mm eccentricity.

Mark selected new slider at both edges of selected (measured) side using black permanent marker, check its free play in yoke according to step 4 and grind it if needed.

eccentricity of slider	angle difference (degrees)
0,05mm	0,12
0,1mm	0,25
0,2mm	0,5
0,3mm	0,75

Tab. C-4

15) Thread newly selected and marked slider **(26)** onto actuating pin and reinstall the blade. Measure pitch angle of blade at reference diameter. If this blade is adjusted to 20º±15´, setting is within permissible range.

    If blade is not within tolerance, repeat selection/replacement of slider (26) and measure again, until blade achieves required tolerance.

    If all three blades are adjusted to prescribed tolerance 20º±15´at reference angle, perform final assembly of blades.

16) Turn hub in fixture P54 so that blade 1 gets into measurement position. Use wrench P-303 to loosen retention nut of propeller blade 1 and screw it out. Pull propeller blade from hub.

    Lubricate area for slider in yoke using AeroShell 5 Grease. Lubricate slider **(26)** and actuating on pin **(31)** of removed blade using AeroShell 5 Grease. Secure the slider **(26)** using new retaining ring **(25)**.

17) Insert propeller blade 1 through opening in hub stamped 1. When inserting into hub, side of slider **(26)** marked using black marker must face rear flange of hub.

! CAUTION !

If marked side of slider is turned incorrectly during final assembly, propeller blade will be at incorrect angle.

18) Thread propeller blade retention nut into hub. Slightly tighten and subsequently release retention nut using P-303 wrench. Repeat 3 times – retention nut and axial bearings must seat in. Apply Loctite 243 into the last thread before the retention nut tightening, see Fig. C-19. Tighten retention nut using torque wrench installed on P-303 wrench. Set torque wrench to 14Nm.

19) Turn hub in fixture by 120º and perform final assembly and check measurement of blade 2 using the same procedure.

20) Turn hub in fixture by 120º and perform final assembly and check measurement of blade 3 using the same procedure.

21) Perform final check of blade adjustment to 20º±15´.

22) Adjust propeller low pitch angle by turning of nut**(1)** according to A/C datasheet or Tab. C-5. Record the angles into Assembly and measurement sheet.

NOTE

Low pitch angle at reference radius depends on aircraft type, engine type (operating rpm range) and blade type fitted. If the angle is not specified in aircraft datasheet, use angles according to Tab. C-5.

Engine	Blade type	Blade angle (degrees)	
		Low pitch	High pitch
Rotax 912 (80 HP)	**C**	15,0	35,0
	W	8,5	28,5
	B	10,0	30,0
	G	10,0	37,0
Rotax 912 S (100 HP)	**C**	17,0	37,0
	W	10,0	30,0
	B	12,0	32,0
	G	10,0	37,0
Rotax 914 (115HP)	**C**	20,5	40,5
	W	11,5	31,5
	B	14,0	34,0
Rotax 915 (141HP)	**B**	17,0	37,0
	W	15,0	35,0
	WA	5,5	25,5
Rotax 916 (160HP)	**B**	19,0	39,0
	W	17,0	37,0
	WA	7,5	36,5

Tab. C-5 Blade angles

23) Perform free running test according to chapter C 9.2.

24) When propeller is installed on P-47 device, check that blades high pitch corresponds to A/C datasheet or Tab. C-5. Record the angles into Assembly and measurement sheet.

25) If assembled hub passes free running test, remove it from test fixture P-47 and reinstall it onto assembly fixture P-54.

26) Thread six screws **(28)** into each retention nut and tighten using torque wrench to 10Nm with 5mm Allen bit.

27) Thread the nut securing screw **(59)**, version with a drilled head, into the hub (Fig. C-19).

28) Secure screws **(28)** and **(59)** in pairs using Ø0.6mm stainless locking wire (Fig. C-19).

29) Apply a drop of TORQUE SEAL marking paint onto self-locking nut **(1)** and heads of screws**(3)** and **(28)** (Fig. C-19, Fig. C-20).

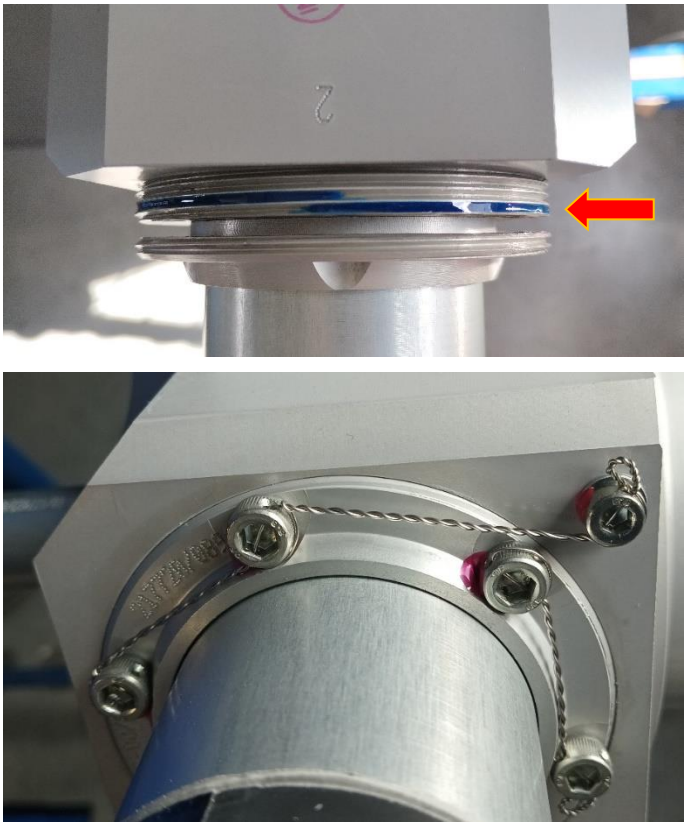

Fig. C-19 Securing of retention nut by Loctite 243 (upper) and wire (lower)

Fig. C-20 TORQUE SEAL application

30) If blades are equipped with counterweights **(80)** install them to the position measured before disassembly. Apply few drops of Loctite 243 onto ends of screws **(79)** thread them into the counterweights and tighten lightly by hand. Turn the counterweights to the right position. When counterweights are positioned correctly, tighten screws **(79)** to 25Nm torque.

C9. Leak check

Leak checks are to be performed during assembly, after specific operations, as described in assembly instruction. Acceptance criteria are the same during all tests. Tests are performed to detect possible leak during assembly, so that detected leak can be repaired in time.

Leak check and free running test is performed on test fixture P-47.

C 9.1 Leak check procedure.

1) Before fitting propeller onto test fixture, check cleanliness of test fixture's connecting flange. Check condition of sealing O-ring on changed diameter of fixture's flange – must not be damaged. Lubricate O-ring with engine oil and attach reassembled propeller (propeller hub) onto fixture's flange. Tighten six nuts using 15Nm torque.
2) Pressurize propeller cylinder with compressed air at 6bar. Close air inlet valve.
3) After 30 minutes, check drop in cylinder pressure. When assembled properly, pressure should not drop below 5.8bar. If lower pressure is detected, it is necessary to discover and remove the cause, before continuing work on propeller.
4) Remove hub (complete propeller), which passed the test, from test fixture, and continue with subsequent work according to assembly instruction.

Possible causes of leak:

Causes of leak listed below presume that test fixture is in perfect condition and all sealing elements were installed into propeller hub. If any sealing element is missing, pressure drop will be very fast, sometimes hiss can be heard.

- Incorrectly placed or damaged O-ring**(23)** on back cover.
- Damaged O-ring **(20)** under locking washer **(21)**
- Piston seal **(19)** reversed during insertion or damaged.
- Incorrectly placed or damaged O-ring on test fixture's flange.

C 9.2 Free running test procedure

1) Pressurize propeller cylinder with compressed air at 6bar.
2) Check that blade movement is smooth. After movement of blades between end positions, keep cylinder pressurized for one minute. Then, release air pressure. Spring pressure must return blades to initial position. Return movement must be smooth; blades must not "stick". Repeat this procedure at least 5 times.

Possible reasons of bad blade movement:

- Blade retention nut(s) tightened too much.
- Some parts not lubricated (actuating pins, sliders, etc.).

C10. Accessorization of propeller

C 10.1 Installation of spinner

1) Position the propeller, front face down, onto assembly support P-306.
2) Set backplate assembly **(41)** onto rear face of propeller hub. Position backplate so that red dot on external surface and numeral 1 on inside surface points towards blade 1. Center six holes in backplate onto M5 threads in hub. Insert washers **(45)** onto of six screws **(44)**. Thread-in screws and tighten to 4Nm using torque wrench with 4mm bit.
3) After tightening, secure screws in pairs using 0.6mm stainless locking wire. Apply a drop of TORQUE SEAL paint onto head of each screws**(44)**.
4) Turn propeller on assembly front side up. Insert grommet **(55)** into hole in spinner front plate. Apply thin layer of AeroShell 5 Grease into grommet opening. Thread propeller spinner onto spring housing **(5)** by inset grommet **(55)**. Turn spinner's cutouts for blades so that the cutout for propeller blade 1 is above blade 1. Carefully insert spinner onto backplate **(41).** Align spinner mounting holes with backplate holes. Tighten spinner onto back plate using nine screws**(42)** with washers **(43).**
5) Check free space between spinner and blade root. Minimum required gap is5mm.

C 10.2 Installation of spacer (if applicable)

C 10.2.1 "Short" spacer (68)

1) Insert o-ring **(23)** slightly lubricated with engine oil into groove on front face of spacer.
2) Insert six bushings **(69)** into appropriate holes in propeller hub.
3) Thread spacer **(68)** onto six screws on rear flange of propeller hub and push it into piston chamber.
4) Prepare mounting hardware for installation onto engine. Pack six 13mm bushings **(47)** six nuts **(48)** and o-ring**(46)** into plastic bag. Dispatch propeller including these parts.

C 10.2.2 "Long" spacer (65)

1) Insert o-ring **(23)** slightly lubricated with engine oil into groove on front face of spacer.
2) Insert six bushings **(47)** into appropriate holes in spacer**(65)**.
3) Thread spacer **(68)** onto six screws on rear flange of propeller hub and push it into piston chamber Thread six
4) Thread six self-locking nuts **(48)**.onto screws **(8)** and tighten them (22Nm for M8 or 43Nm for M10).
5) Prepare mounting hardware necessary for installation into plastic bag and dispatch it with the propeller:

Bushing	**(47)**	6 pcs
Screw	**(66)**	6 pcs
Washer	**(67)**	6 pcs
Self-locking nut	**(48)**	6 pcs
O-ring	**(46)**	1 pcs

C11. **Balance**

C 11.1 **Static balance**

1) Install propeller onto flange of balance machine ZZ–01.
2) Rotate propeller slowly and wait until it stops. Uppermost location is the lightest one.
3) Attach smaller piece of modeling clay under this location, onto rear wall of backplate, approximately 15–20mm from perimeter of backplate towards axis of rotation, then turn propeller again and wait for it to stop. Change weight of modeling clay attached onto rear wall of backplate until propeller stops in various positions (not in the same position every time). At this time, propeller is statically balanced.
4) Mark center position of modeling clay and remove it from spinner backplate. Weigh removed modeling clay with 1g precision. Prepare assembly consisting of screw **(62)**, washers **(61)**, and self-locking nut **(60)**. Select dimensions and number of washers so that the weight of the assembly matches with weight of removed modeling clay. Choose fasteners type according to Tab. C-6. Use maximally ten washers at one screw. Maximum weight of 25g at single location is allowed.
5) Drill appropriate hole for selected screw at marked location on backplate wall. Attach components of balancing assembly to both sides of backplate wall (Fig. C-21).

! CAUTION !
Be extremely careful when drilling backplate near to blades to avoid blade damage.

When installing weights near to blades make sure that there is at least 5mm gap between the weight and blade. Always use at least one washer under screw head and one under the nut for stress relief.

Index	Description	Dimension	Standard
60	Self-locking nut	M4 -M6	ISO 7040 / DIN 982
61	Washer	M4 -M6	ISO 7089 / DIN 125 ; ISO 7093 / DIN 9021
62	Screw	M4 -M6	ISO 4762 / DIN 912 ; ISO 4017 / DIN 933

Tab. C-6 Balance weights

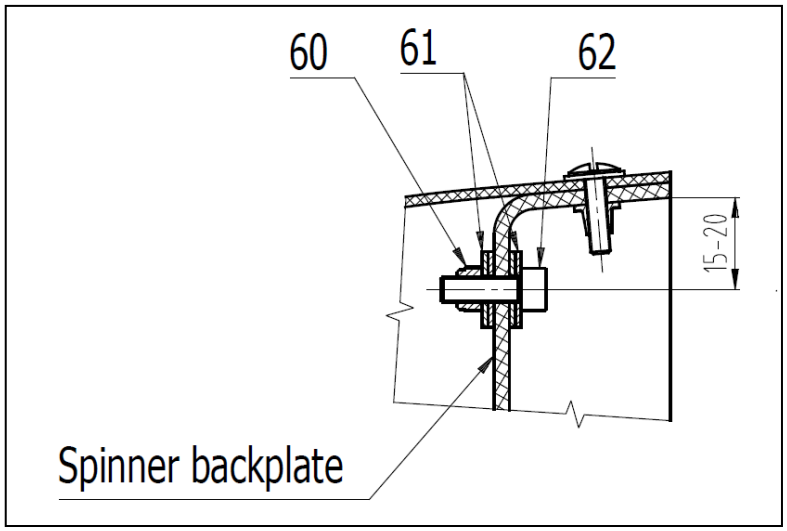

Fig. C-21 Balance weight installation

6) When more than 25g of balance weight is needed it is possible to install some weight onto propeller hub faces where M5 threads are prepared. Select appropriate weight **(57)** and correct length of Allen head screws **(59)** – at least 6 threads of screw must protrude from brass weight. To achieve very slight correction,

it is possible to select different length of screw **(59)**, or use washer(s) **(58)** under screw head. Screw threads must not protrude from brass weight including washer(s) more than 14mm, otherwise, thread in hub could be damaged. Apply few drops of Loctite 243 onto end threads of screw **(59)**, install it into required position, and tighten to 6Nm torque. When the screw **(59)** serves also for securing of the blade retention nut **(35)** or **(81)** by wire, use the version of screw **(59)** with a drilled head.

7) Reinstall propeller spinner including all screws and nuts onto complete propeller. Do not tighten spinner mounting screws **(42)** fully. Recheck propeller balance
8) If balance is satisfactory, remove spinner attaching screws **(42)** one after another. Apply few drops of Loctite 243 onto end threads of screws and use flat blade screwdriver to tighten fully.
9) Remove propeller from balance machine.

C 11.2 **Dynamic balance**

1) Dynamic balance is not mandatory however it is recommended to perform this procedure after each new installation to the engine and/or aircraft.
2) Any device intended for dynamic balance of propellers may be used. Perform dynamic balance according to balance device manufacturer's instructions.
3) Choose and install permanent dynamic balance weights in the same manner as static balance weights according to chapter 11.1. Do not install dynamic balance weights onto propeller hub
4) Mark dynamic balance weights appropriately so that they can be clearly distinguished from static balance weights.

C12. **Propeller measurement**

Perform measurement during installation of propeller blades, recording results into assembly and measurement protocol. Propeller measurement is performed in inspection fixture P-07.

C 12.1 **Measurement of diameter of propeller and difference in radial blade tip position.**

1) Measure radial distances from the center of the propeller to the blade tip of each blade. Diameter of the propeller is twice of longest measured distance (Fig. C-22). Permitted propeller diameter tolerances are in Tab. C-7.

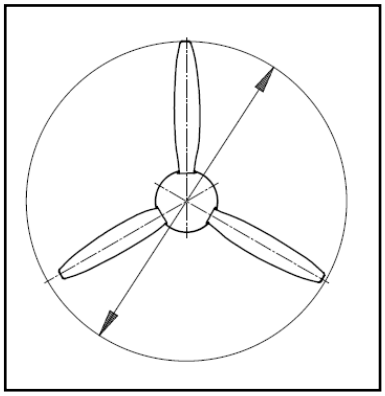

Fig. C-22 Propeller diameter

Propeller diameter	Blade type B	1752±4mm
	Blade type C	1732±4mm
	Blade type W	right: 1744±4mm left: 1720±4mm
	Blade type WA	1950±4mm
	Blade type G*	1500 – 1550±4mm

**/ The nominal value of the diameter is given in the propeller documentation*

Tab. C-7Propeller diameters

2) Find the longest blade and calculate difference in length of other two blades (Fig. C-23). The difference must not exceed 4mm. Record values to the form (fill "0" to the column belonging to the longest blade).

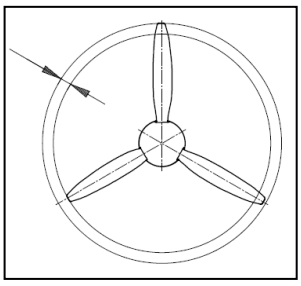

Fig. C-23 Max. difference in length of blades

C 12.2 **Measurement of angular separation of the blades.**

1) Mark centre of the blade tip using template P-322, 323 or 324 (depending on blade type).
2) Measure angular separation of blades (Fig. C-24). Permitted tolerance is 120º ± 30´

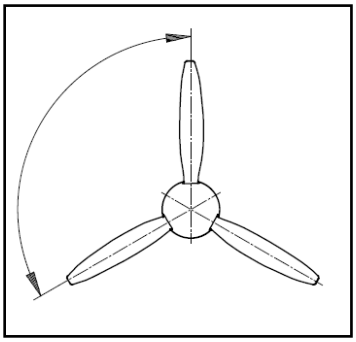

Fig. C-24 Angular separation of blades

C 12.3 **Measurement of blade tips axial position (blade track).**

1) Measure height of the blade tips above the base of the P-07 fixture.
2) Find the highest value and calculate difference in height of other two blades (Fig. C-25). The difference must not exceed 5mm. Record values to the form (fill "0" to the column belonging to the highest blade tip).

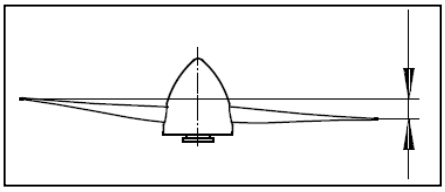

Fig. C-25 Blade track

C 12.4 **Measurement of blade pitch angles**

1) Measurement of pitch angle is performed during adjustment of propeller blades during assembly in assembly fixture P-54.
2) Measured values must be within ±15´ tolerance band from nominal value.

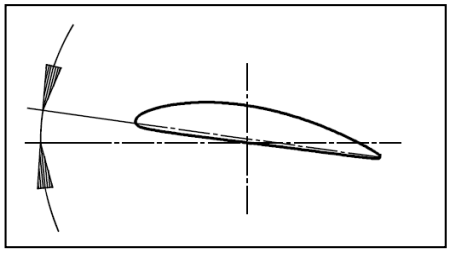

Fig. C-26 Blade pitch angle

C 12.5 **Measurement of blade angular play**

1) Using pitch angle laser indicator P-307 measure angular play of each blade (Fig. C-27).
2) The play must not exceed 1,5°.

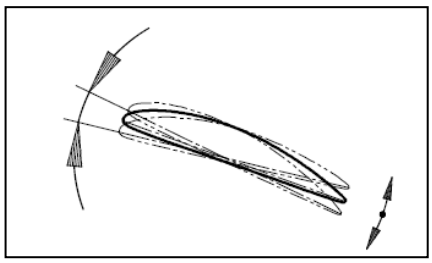

Fig. C-27 Blade angular play

C 12.6 **Weighing of propeller**

1) Propeller weight in kilograms with double decimal precision is determined using scale with valid calibration.
2) Propeller is weighed as completely accessorized final product, including mounting hardware (bushings, nuts, spacer. etc.), and its weight is recorded into assembly and measurement protocol.

C13. Application of identification labels

Propeller type label is applied onto root of blade No. 1.

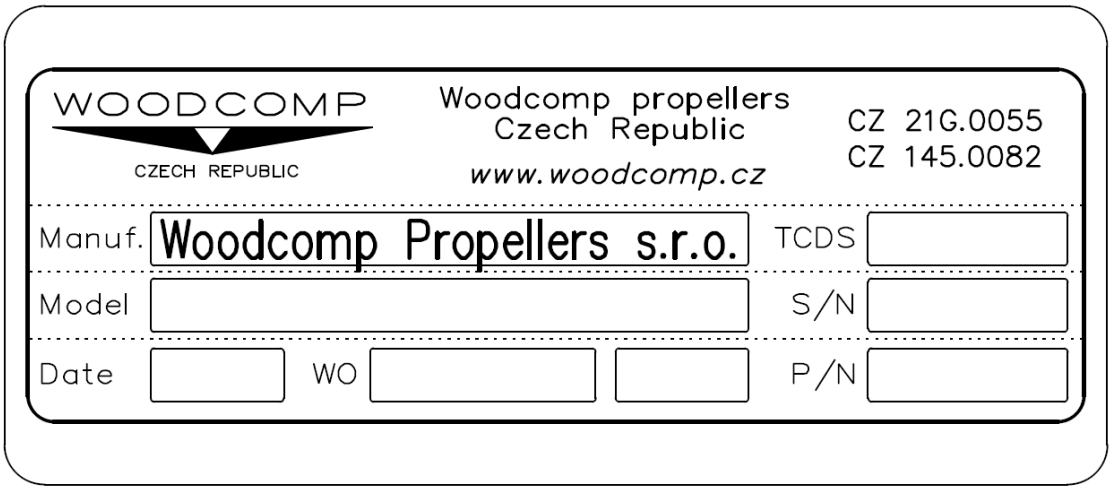

Fig. C-28 Propeller label

Where:

TCDS – Type certificate designation (EASA.P.177)
Model – Propeller model KW-30
S/N – Propeller serial number
Date – Date of manufacture or repair
WO – Work order number
– Abbrev.: OH – overhauled; REP – repaired; INSP – inspected; MOD – modified
P/N – Part number of propeller variant

Blade type label is applied onto blade root close to ferrule. Each installed propeller blade bear mfg. label, containing the following information:

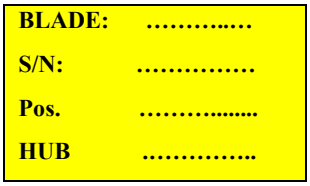

Fig. C-29 Blade label

Where:
BLADE – Blade part number
Pos. – Position of propeller blade in propeller hub
S/N – Propeller blade serial number
HUB – Propeller serial number

Company signage and labels
Company signage and labels are applied to front side of each propeller blade, onto rear edge of propeller spinner, backplate, and inside surface of fillets.

Label application
Surface to which label will be applied must be degreased using methyletylketone (MEK). Labels must attach to product surface without signs of major damage (cuts, cracks, missing parts, curled or folded parts, air bubbles, etc.)

C14. Overview of tightening torques

Torques listed below are for clean, dry, and undamaged thread. Application of these torques to lubricated threads may lead to damage.

Position	Part name	Part number	Torque
44	Screw	B–1014–01	4Nm
59	Screw	A–1001–00	6Nm
3	Screw	A–1001–02	6Nm
8	Screw	A–1005–01	20Nm
9	Piston rod 1	B–1001–01	15Nm
14	Piston rod 2	B–1002–00	15Nm
22	Screw	B–1010–00	15Nm
28	Screw	B–1011–00	10Nm
48	Nut (M8)	A-1008-01	22Nm
48	Nut (M10)	A-1011-01	43Nm
35	Blade retention nut	B–1017–00	14Nm*
37	Screw	B–1019–00	50Nm
59	Screw	A–1001–00	6Nm

Tab. C-8 Tightening torque values

*Torque applied to P-303 wrench

C15. Overview of marked places.

Marking of specified places – links by TORQUE SEAL marking paint is carrying out for marking of integrity original assembly during production or authorised service centre. Damage of this designation is evidence of intervention by an unauthorized person to assembled and adjusted propeller.

Position	Part name	Part number	Note
44	Screw	B-1014-01	Heads of screws tightening the backplate
1	Self-locking nut	A-1009-05	Marking of nut position after adjustment
3	Screw	A-1001-02	Heads of screws tightening the spring housing
28	Screw	B-1011-00	Heads of screws locking the retention nut
48	Self-locking nut	A-1008-01	Nuts tightening the spacer

Tab. C-9Marked places

D. CERTIFICATE OF RELEASE BY AUTHORIZED PERSON

Propellers type-certified by European Aviation Safety Agency (EASA) or national Aviation Authority (ÚCL, LÚ SR) are released by authorized person, using product release procedure and issuing F1 EASA form to certify that the product was manufactured in line with approved or applicable documentation, and that it is suitable for safe operation.

E. STORAGE AND PACKAGING OF COMPLETE PROPELLERS

E1. Storage

1) Propeller must be stored in a way which prevents damage. If stored in vertical position, is it advisable to thread six screws **(8)** on rear face of propeller into mock-up engine flange fastened to a stand secured against overturning. Use at least two nuts **(48)** threaded on protruding ends of screws in rear face of propeller hub to prevent fall.
2) Propeller may also be stored in special racks or on flat plate, so that it stands on six screws **(8)** on rear face of propeller. When storing propeller in this way, it is necessary to support blades with three shaped inserts with soft cushion inside, located at approx. 1/3 of blade length. Use at least two nuts **(48)** threaded on studs **(8)** in propeller hub. This will prevent turning of propeller on its side, and resulting damage. When storing propeller in horizontal position, it must not be supported by backplate edge nor by propeller spinner!!
3) In cold weather, it is prohibited to store propeller near heat sources and radiating heat.
4) Propeller should be stored in normal climate under standard conditions (temperature +15°C and relative humidity 40% to 70%).

! CAUTION !
It is prohibited to store propeller – lay down – prop against objects – so that it would rest on blade tips. Risk of damage to propeller.

E2. Packing of propeller – dispatching

1) Propeller is dispatched from mfg. plant in special carton package. Blade tips and trailing edges must be sufficiently protected; if possible, use bubble foil. Propeller accessories – plastic bags with mounting hardware – must be packed in bubble foil. Bags must be fastened so that they cannot damage propeller during transport.
2) Carton package must have strong enough handles. Its surface must bear caution markings– symbols of proper position and methods for handling and transport.
3) If wooden crate is used for transport, propeller must be fitted using six screws **(8)** on rear side of propeller hub into strong bed securely attached to the crate. Nuts on screws **(8)** must be secured against loosening and falling out. Blade tips and trailing edges must be sufficiently protected; if possible, use bubble foil. Propeller accessories – plastic bags with mounting hardware – must be packed in bubble foil. Bags must be fastened so that they cannot damage propeller during transport.
4) Crate must have strong enough handles. Its surface must bear caution markings– symbols of proper position and methods for handling and transport.

F. WORK SAFETY, ECOLOGY

F1. Work safety

1) Each maintenance person bears responsibility for observing safety rules and working procedures at workplace.
2) Some operations performed during propeller repairs require use of PPE and safe working procedures. Therefore, it is mandatory to respect the following:

- Fire safety rules;
- Prohibition of smoking and open fires;
- When handling cleaning fluids and chemicals, use protective gloves, goggles, and/or other PPE;
- At locations where cleaning and penetration agents are used (non-destructive penetration tests);
- Do not use flammable inspection materials and aerosol cans with flammable driving gases at locations where these could contact open flame, sparks, or other sources of ignition;

3) Any work injury must be immediately reported to direct supervisor.

F2. Handling of waste, waste disposal

1) When repairing and overhauling propellers, waste from certain operations can be generated. This includes, primarily: hydraulic propeller fluids, cleaning rags and fluids used to degrease, clean, and wash (benzine, acetone, MEK, etc.), residues from non-destructive penetration tests (penetrant, developer), etc.
2) Waste from propeller repairs and overhauls must be handled according to the Law on Waste 185/2001 Coll. and applicable Decrees in current versions.
3) All waste must be disposed of in line with current version of the Law.
4) In case of overhauls performed outside the territory of the Czech Republic, handling of waste and waste disposal are subject to legislation of the respective country.

G. LIST OF PROPELLER PARTS

G1. Illustrated part list

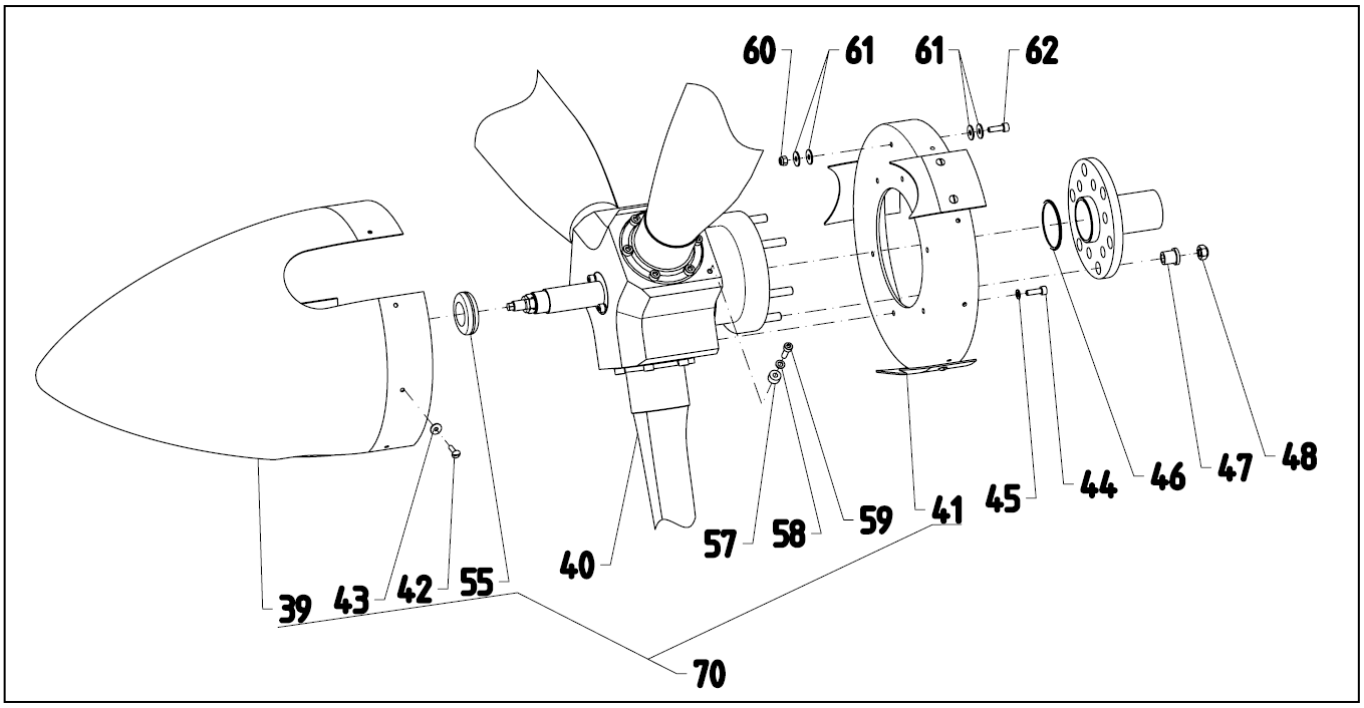

Fig. G-1 Propeller Assembly Part 1.

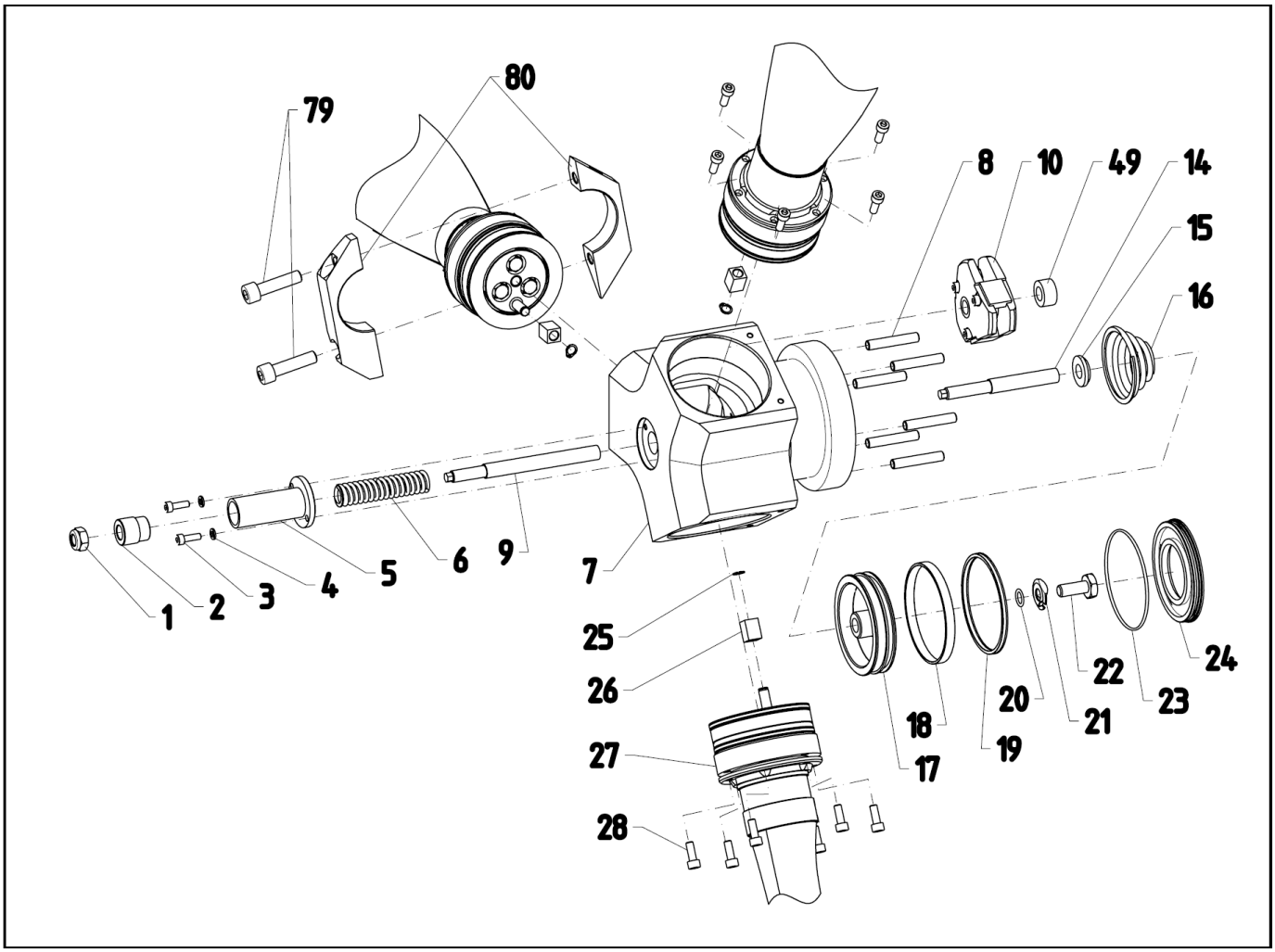

Fig. G-2 Propeller Assembly Part 2

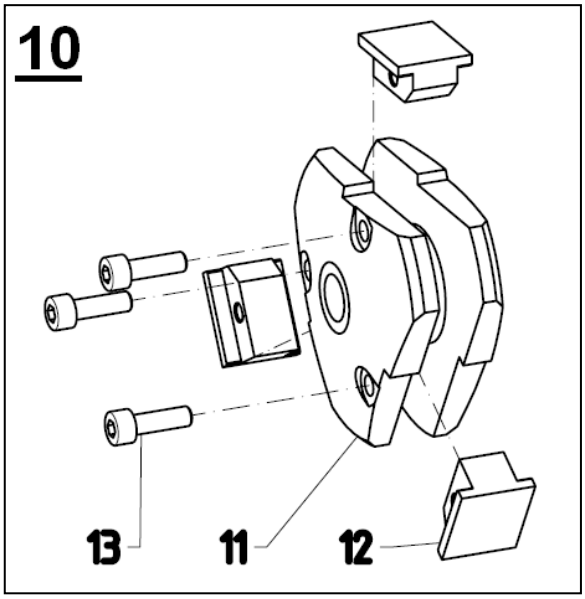

Fig. G-3 Propeller Assembly Part 3

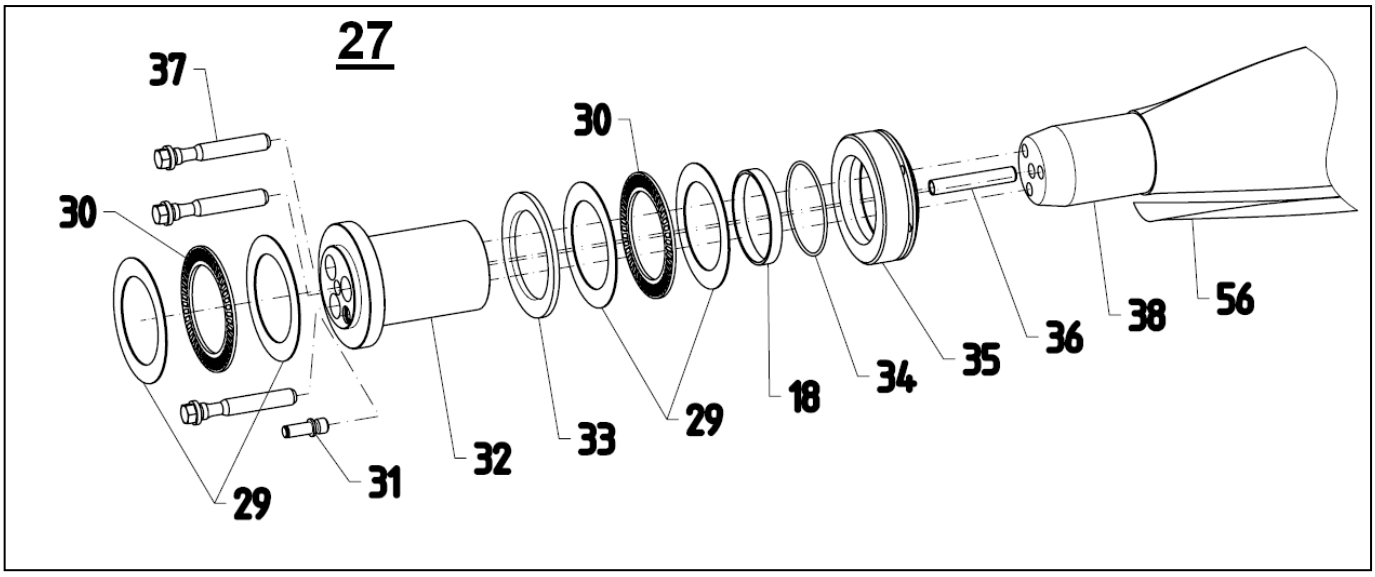

Fig. G-4 Propeller Assembly Part 4 - blade C, W before change Z-KW-3(x)-03.

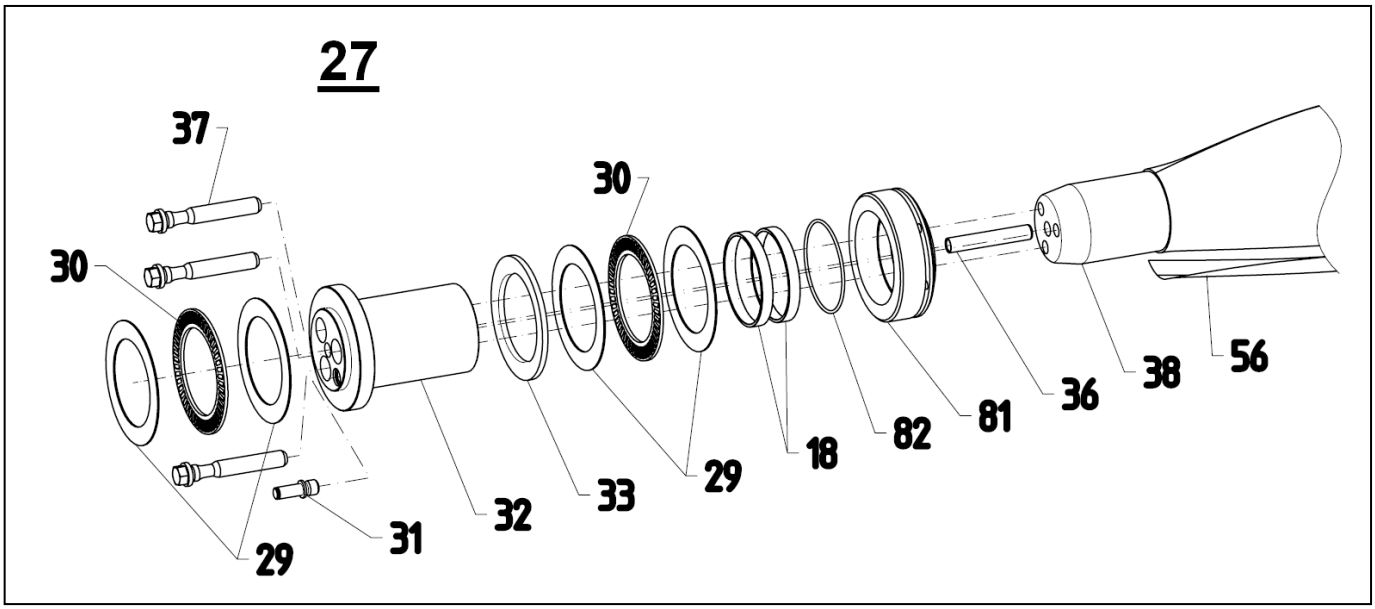

Fig. *G-5 Propeller Assembly Part 5 - blade C, W after change Z-KW-3(x)-03 and G after change Z-KW-3(x)-07.*

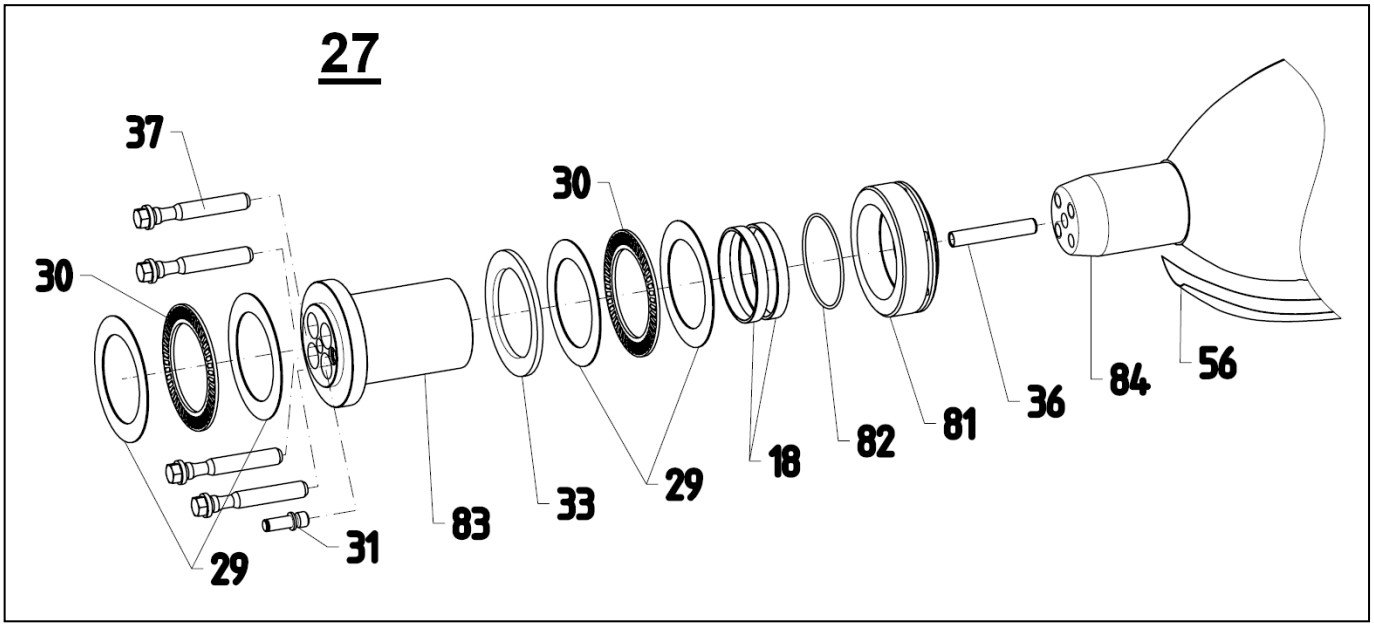

Fig. G-6 Propeller Assembly Part 6 - blade B, WA.

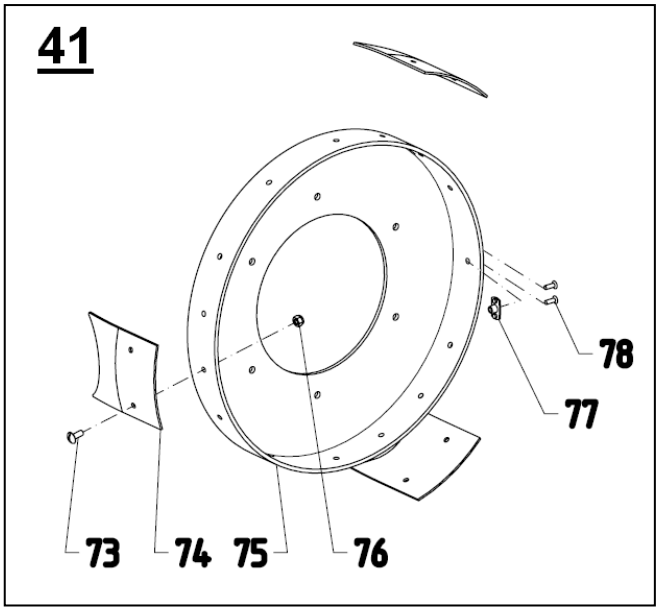

Fig. G-7 Propeller Assembly Part 7

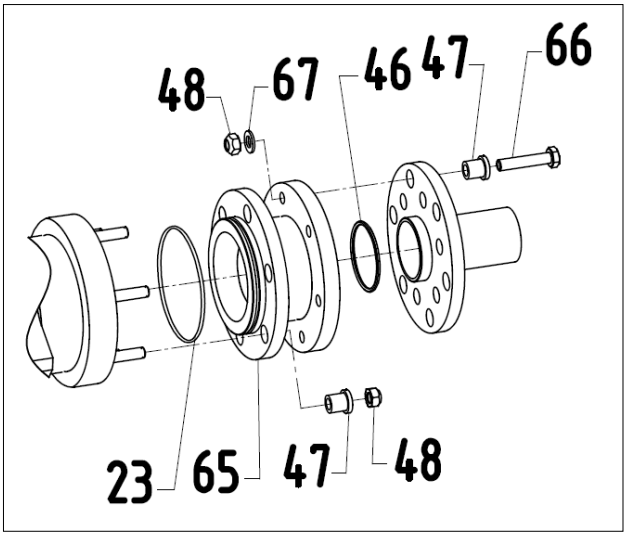

Fig. G-8 Propeller Assembly Part 8 - spacer (optional)

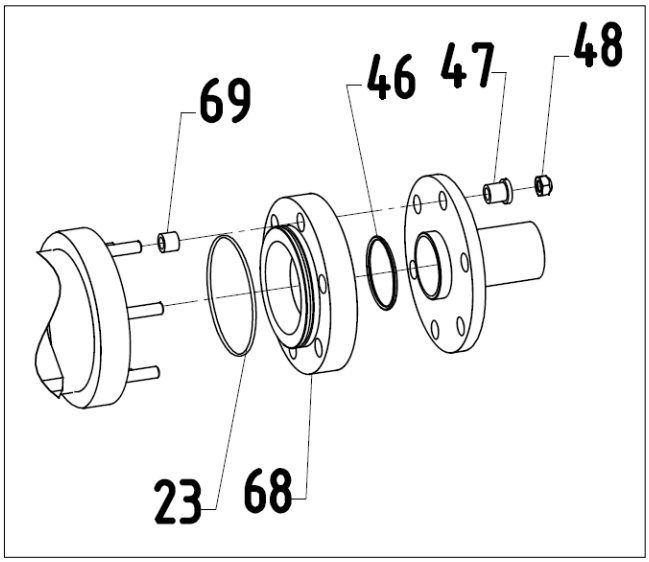

Fig. G-9 Propeller Assembly Part 9 - spacer (optional)

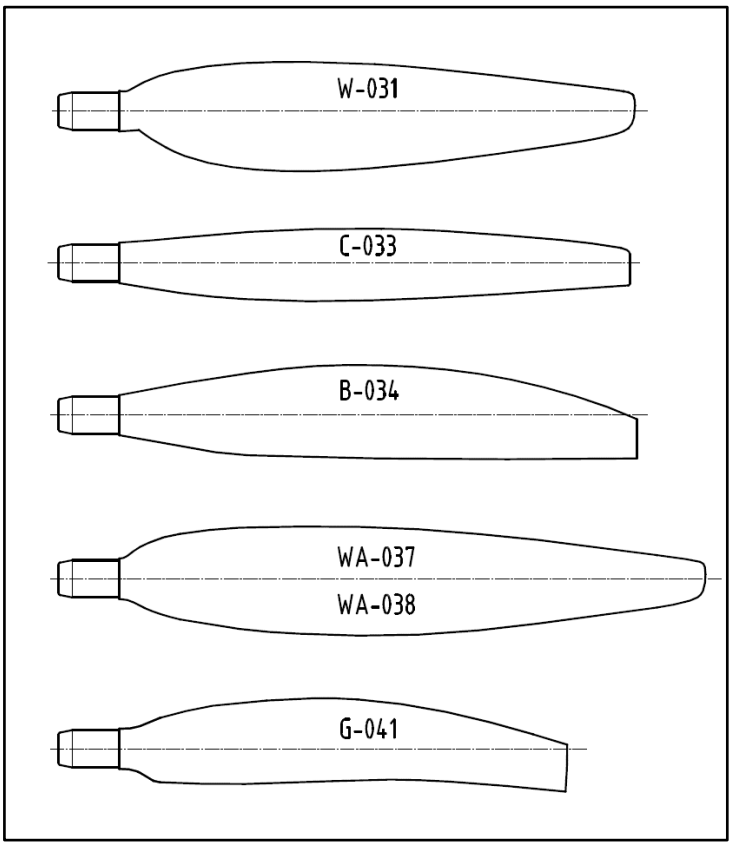

Fig. G-10 Blade type identification

G2. **Part list**

The complete list of parts is contained in the illustrated catalog IPC KW-30 as amended. The numbering of the positions of the individual parts is the same as in this catalog.

H. PARTS DUE TO MANDATORY REPLACEMENT

Index	Part number	Part name	Ks
1	A-1009-05	Self-locking nut	1
3	A-1001-02	Screw	2
4	A-1025-02	Spring washer	2
8	A-1005-01	Screw	6
8	A-1005-02	Screw	6
8	A-1005-03	Screw	6
8	A-1005-04	Screw	6
8	A-1005-05	Screw	6
8	A-1005-06	Screw	6
8	A-1005-07	Screw	6
18	A-1020-01	Sliding insert	AR*
19	A-2000-01	Piston seal	1
19	A-1015-07	O-ring	1
20	A-1015-02	O–ring	1
21	A-1014-01	Locking washer	1
23	A-1015-04	O–ring	1
25	A-1017-01	Retaining ring	3
28	B-1011-00	Screw	18
34	A-1015-03	O–ring	3*
37	B-1019-00	Blade retention screw	9/12
42	A-1003-02	Screw	9
43	A-1013-02	Washer	9
44	B-1014-01	Screw	6
45	A-1013-03	Washer	6
46	A-1015-01	O–ring	1
48	A-1008-01	Nut	6
48	A-1011-01	Self locking nut	6
55	A-1022-01	Grommet	1
56	B-1223-00	Blade protection tape	3
56	B-1225-00	Blade protection tape (for blade WA)	3
66	A-1000-02	Screw	6
67	A-1012-02	Washer	6
79	A-1001-15	Screw	6
82	A-1015-08	O-ring	3*

Tab. H-1 Parts due to mandatory replacement

* Mandatory replacement only when the blades are completely dismantled.

I. LIST OF SPECIAL TOOLS

Number	Name	Note
P-07	Inspection fixture	
P-47	Pressure test fixture	
P-54	Assembly fixture stand	
P-285	Blade gauge W (170 mm)	
P-286	Blade gauge C (210 mm)	
P-287	Blade gauge B (170 mm)	
P-288	Thread gauge for M87.5x2 female thread	
P-289	Thread gauge for M87.5x2 male thread	
P-293	Blade balancing machine	Blade replacement only
P-294	Fixture to hold propeller blade	Overhaul (removal of blade ferrule) only
P-297	Puller for blade ferrule	Overhaul (removal of blade ferrule) only
P-301	Piston assembly tool	
P-303	Wrench for blade retention nut	
P-304	Mock-up blade ferrule (3pcs)	
P-306	Assembly support (tube)	
P-307	Pitch angle laser indicator	
P-370	Adjustable angle scale	
P-371	Fixture to fasten propeller hub into lathe	
P-481	Bushing removal fixture	
P-488	Blade gauge G (188 mm)	
ZZ-01	Propeller balancing machine	

Tab. I-1 List of special tools

J. MATERIAL USED

Materials not mentioned in part list, whose consumption is not precisely specified.

Equivalents may be used if listed materials are not available. In such cases, equivalence must be demonstrated and approved.

0.6mm stainless locking wire
Loctite 272 (red) locking fluid
Loctite 243 (blue) locking fluid, possible replacement Flegboltfix II
AeroShell Grease 5
UNIFLEG Fleggrease –R
Engine oil API SF or SG
CHS EPOXY 324 epoxy resin with P11 hardener
Lepox Metal epoxy resin
White gel resin ENGUARD GE WHITE
Black gel resin VEGEL 9005 VH
Transparent gel resin VEGEL NATURAL
Bufa Arctic Isogel-H RAL 7001
AC 03-23 2K acrylic paint
Fiber glass fabric Aeroglass 110g/m2
Marking paint TORQUE SEAL (Anti-sabotage innspector´s lacquer)
Benzine (for general degreasing), possible replacement Stoddard solvent or degreasing solvent per MIL-PRF-680
Methylethylketone (MEK)

Tab. J-1 List of consumable material

K. MEDIUM REPAIR

K1. Time before medium repair

Medium repair is periodical disassembly, inspection, refurbishment, and reassembly of complete propeller, which is carried out in the event that the maintenance of the propeller is carried out by a maintenance system with medium repair as allowed by SB 01 in the current wording.

Medium repair is performed when half of the established operational hours or calendar interval of Overhaul (TBO) is met –whichever occurs first.

K2. Performing medium repair

Medium repair of propeller is performed according to this technological instruction (manual), only in reduced scope. Differences from performing overhaul are listed in Chapters below.

K3. Definition of operations performed during medium repair

K 3.1 Parts due to mandatory replacement at medium repair

Mandatory replacement is required only for parts included in Tab. K-1. Other parts replace according to their condition and wear.

Index	Part number	Part name	Qty
1	A-1009-05	Self-locking nut	1
4	A-1025-02	Spring washer	2
18	A-1020-01	Sliding insert (on piston only)	1
19	A-2000-01	Piston seal	1
19	A-1015-07	O-ring	1
20	A–1015–02	O–ring	1
21	A–1014–01	Locking washer	1
23	A–1015–04	O–ring	1
25	A–1017–01	Retaining ring	3
43	A-1013-02	Washer	9
46	A–1015–01	O–ring	1
48	A–1008–01	Nut	6
55	A-1022-01	Grommet	1

Tab. K-1 Parts due to mandatory replacement at medium repair

K 3.2 Propeller hub disassembly

Do not remove hub mounting screws **(8)**, if they meet criteria described below.

Screws **(8)** must not be bent or corroded. Threads must not be elongated, stripped, or damaged in any other way. Screws must not be loosened, or wiggle in the hub. Check stability of screws by threading two nuts onto each screw, locking them together by tightening using two open end wrenches, and checking that screws will not come loose when 19,5Nm torque is applied to nuts using torque wrench.

K 3.3 **Blade disassembly**

Do not remove screws **(37)**, blade ferrule and subsequent parts threaded onto blade ferrule. Full scope of disassembly is due only when excess free play of blades in propeller hub is discovered.

Perform only visual inspection of parts threaded onto blade ferrule – no corrosion is allowed.

Perform non-destructive test of blade ferrule after moving parts threaded onto blade ferrule towards blade, and degreasing of uncovered part of ferrule. During non-destructive test, focus on the area in corner of diameter change.

ANNEX 1: FINDINGS SHEET EXAMPLE

Propeller designation		Work order		Serial number	
Type of maintenance					

PARTS IDENTIFICATION			
	Type	P/N	S/N
Blade No.1			
Blade No.2			
Blade No.3			
Hub			
Spacer			
Spinner			

MEASUREMENTS			
		Nominal value	**Measured value**
Propeller diameter (± 4 mm)			
Blade angular play	Blade No. 1	Max. 1,5°	
	Blade No. 2	Max. 1,5°	
	Blade No. 3	Max. 1,5°	
Difference in axial blade tip (to the blade tip nearest to the spinner tip)	Blade No. 1	Max. 5 mm	
	Blade No. 2	Max. 5 mm	
	Blade No. 3	Max. 5 mm	
Propeller weight			
		Low pitch	**Coarse pitch**
Blade angle	Blade No.1		
	Blade No.2		
	Blade No.3		

Notes:

	Date	Name	Signature
Elaborated by:			

ANNEX 2: ASSEMBLY AND MEASUREMET SHEET EXAMPLE

Propeller designation		Work order		Serial number	

ASSEMBLY SHEET			
	Type	P/N	S/N
Blade No.1			
Blade No.2			
Blade No.3			
Hub			
Spacer			
Spinner			

MEASUREMENT SHEET			
		Nominal value	**Measured value**
Propeller diameter (± 4 mm)			
Blade angular play	Blade No. 1	Max. 1,5°	
	Blade No. 2	Max. 1,5°	
	Blade No. 3	Max. 1,5°	
Angle between individual blades	Blades No.1-2	120° ± 0,5°	
	Blades No. 2-3	120° ± 0,5°	
	Blades No. 3-1	120° ± 0,5°	
Difference in radial blade tip position (to the longest blade)	Blade No. 1	Max. 4 mm	
	Blade No. 2	Max. 4 mm	
	Blade No. 3	Max. 4 mm	
Difference in axial blade tip (to the blade tip nearest to the spinner tip)	Blade No. 1	Max. 5 mm	
	Blade No. 2	Max. 5 mm	
	Blade No. 3	Max. 5 mm	
Balancing weights		On hub:	On backplate:
Propeller weight			
		Low pitch	**Coarse pitch**
Pitch angle at reference radius (±0° 15′)	Nominal		
	Blade No.1		
	Blade No.2		
	Blade No.3		

	Date	Name	Signature
Elaborated by:			