Installation- and Operating Manual

for

Tost Aircraft Wheel NG

Penta 5“

0.1 Amendments

All changes to this operating manual must be recorded in the table below.

New or amended sections are identified by a vertical black line in the margin. The revision number and the date are printed at the bottom left of the page.

Revision number	Section Pages	Revision Date	Reference	Approval Date	Publication Date	Reference/ Signed
1	9.2	30.03.2016				

0.2 Contents

Caution

Tost aircraft wheels must only be used in accordance with the instructions and operating limits set out in this manual.

Once the wheel has been installed in the aircraft, this manual must be added to the aircraft operating manual.

1 General

1.1 Introduction

This operating manual is intended to provide pilots, aircraft owners and workshop managers with the information needed for safe operation.
The manual includes all data that must be made available according to the technical specifications. Furthermore it lists additional information and recommendations that in the view of the manufacturer may be useful.

1.2 Warnings, cautions, notes

Important sections of the manual for the operating safety are emphasized with one of the following terms:

Warning
Ignoring an instruction of this type results in either immediate danger, or considerable risk, to flight safety.

Caution
Ignoring an instruction of this type leads to a minor or a more or less long-term reduction of flight safety.

Note
This heading draws attention to an item which is important or unusual, although it may not be directly related to safety.

2 Design

Tost aircraft wheels of the new generation are build up by two asymmetric halves to ensure an easy assembly. The wheel hubs are produced as CNC-turning work pieces which allow a reduction of weight at same strength.
As mentioned above the asymmetric split ensures an easy assembly and there is no risk to clamp the tube between the wheel halves during mounting.
The ball bearings with sealing rings are maintenance free. A deforming of the ball bearings is prevented through the use of a spacer bushing.
Each wheel is embossed with the manufacturer logo, serial number, specification and part number.

3 Operating limits

See table in the annex.

4 Installation notes

Tost aircraft wheels are all installed without axial tension. The hollow axle is simple pushed through the bore: it is impossible to putt the bearings under strain by over tightening (see section 2.).

Note
The spacer bushing is visible through the bearing bore. When you replace a wheel, e.g., after changing a tire, the bushing should not be able to move. If it can move, this could mean that the inner tube is pinched or the wheel halves have not been put together correctly!

5 Operating notes

5.1 Landing wheels, valid for all wheels

For all two-part rims, the two wheel halves are connected with high tensile DIN912-M6-12.9 bolts.
Tighten bolts with a calibrated torque wrench: **9-10 Nm**

Warning
Do not use bolts of lower strength!
Always use a torque wrench!

5.2 Disk brake wheels

Tost disk brake wheels are a combination of the proven landing wheels and brake disks turned from heat-treated steel. The special heat treatment ensures that these wheels achieve very high braking deceleration, outstanding strength and minimal tendency to scoring.

Caution
Modern gliders are no longer equipped with skids:
Applying full brake capacity could cause the aircraft's nose to make ground contact and damage the underside of the aircraft.

As brake assembly there are different floating-yoke disk brake assemblies from Cleveland and Tost available.

Caution
Floating yoke disk brake assemblies must move freely in order to operate correctly:
Check bolts regularly for corrosion and contamination.

The brake callipers are fastened to a torque plate and back plate, or a combination of both (type-dependent).

For pressure transfer use either hydraulic fluid (MIL H 5606) or DOT 4 brake fluid (in Cleveland brake assemblies identified by Ø).

Caution
Use only the fluid approved for your aircraft's brake system!

DOT 4 brake fluid is strongly hygroscopic, i.e., it absorbs water. This is the reason why old brake fluid has a corrosive effect. Replace fluid once a year according to the manufacturer's instructions!

5.2.1 Brake disks

Brake disks are given application-specific surface-treatment, so they will be subjected to varying amounts of rust. Rust dust is removed from the disk by one or two parking brake operations. In the event of more serious rusting, it may be necessary to remove the disk from the wheel and to clean both brake surfaces properly. First clean the disk with a wire brush, and then rub it off with sandpaper (220 grain). Finally polish with fine sandpaper (400 grain). This treatment may make it possible to continue using the brake disk.
Replace the brake disk if wear has progressed beyond the permissible limit. Measure the minimum thickness at least at two or three places. Also replace the brake disk if the wobble is ≥ 0.2 mm.

Disk thickness	Wear limit	Application
5 mm	4.3 mm	Cleveland 30-9, BZT, BZT2 5L, BZT2 5R
6 mm	5.2 mm	Cleveland 30-63A, BZT2 6L, BZT2 6R

Check brake disks regularly for fracture, excessive wear, grooves, corrosion and deformation.

5.2.2 Brake linings

Brake linings are made of asbestos-free, organic material. For top performance and long service life this material must be correctly conditioned:

Powered aircraft:

Roll aircraft over a distance of 500 m braked down to 10 to 20 km/h.

Allow brakes to cool down for 10 to 15 min.

Apply brakes and check whether the aircraft can be held with normal brake force when it has developed standing thrust at high engine rpm. If yes, the brake lining is conditioned (run in). If the aircraft cannot be held against the standing thrust, repeat the procedure.

Gliders:

It takes 5 to 10 normally braked landings to condition the linings. If you need maximum brake performance from the start, brake the glider uniformly while towing it at 10 to 20 km/h for about 500 m (grass).

Wear limits:

The total thickness of brake linings at any point must not be less than 2.5 mm for Cleveland brake assembly and 0.7 mm for BZT and BZT2 brake assemblies.

5.2.3 Hydraulic hoses

Do not install hydraulic hoses twisted as this may weaken them. Twisted hydraulic hoses that are under pressure can work loose from their fittings.
When laying hydraulic hoses, allow for sufficiently large bends to prevent pinching of the hose. Pinching reduces the cross-sectional area and impairs braking performance.
The life expectancy of a hydraulic hose is reduced significantly by small hose radii. Use hoses made of steel flex, if you cannot avoid tight bends.

Caution
Hydraulic hoses laid horizontally should be inclined towards the rolling axis.

6 Maintenance instructions

Clean wheels regularly to ensure that all parts can move freely and to inhibit corrosion.

At the same time, check wheels for corrosion, cracks and visible damage; also check the brake lining or disk for minimum thickness.

Take the wheel out of service, if visible damage appears.

During operation in salted atmosphere corrosion can develop. Clean the brake wheel regularly. For applications in aggressive environment special versions with improved corrosion protection are available.

7 Sources of defects and remediation

After a hard landing check wheel for damage. Replace the ball bearings if you notice ball-bearing noise.

Caution
Also check the axis: even 0.1 to 0.2 mm wobble can cause the brake to block and destroy the wheel.

Caution
Landing with a blocked wheel (e.g., actuation by airbrake lever) damages the brake and can destroy the brake plate.

Problem:	Possible cause	Remedy
Insufficient brake pressure or excessive travel of brake lever	Air in the hydraulic system	Locate error, bleed air
	Leaky system	Locate and fix
	Defective master cylinder	Repair or replace
Brakes lock	Piston jammed in cylinder	Repair or replace
	Foreign object	Remove
	Water in hydraulic system	Evacuate and purge
	Piston does not return	Evacuate, remove piston and inspect for damage
	Rigid hoses inhibit free movement	Use flexible hoses
	Corroded brake plate bolts	Clean and grease or replace
	Bent, cracked brake plate	Replace
High wear of disk and lining	Locked brakes	See above
	Poor conditioning	See page 5
	Excessive rust, grooves or holes in brake disk	Clean and grease or replace
	Incorrect linings or disk	Replace by originals parts
Brake slips	Contaminated or scorched linings	Clean, see page 5 or replace
	Poor conditioning	See page 5
	Lining or disk less than minimum thickness	Replace, see page 5
	Insufficient brake pressure	See above
	New linings installed on used disk	Replace disk

8 Overhaul and inspection

An overhaul is not stipulated. Accomplish annual check before airworthiness review (see section 6). Check function and condition during annual check.

9 Tire installation and removal

9.1 Removal

1. Jack up aircraft at specified point.
2. Deflate tire completely before removing the wheel unit.
3. **Do not unscrew the valve insert until the tire pressure has dropped to 0.2 bar.**
4. Remove wheel from axis.
5. Loosen wheel bead from the hub shoulder with a rubber or plastic hammer.
6. Undo wheel bolts (with 5 mm hexagon key), remove bolts and split hub halves.

9.2 Installation

1. Tires and wheel hubs must be clean and dry.
2. Do not apply excessive force when replacing a wheel.
3. Apply a tire bead lubricant (or talcum powder) to the hub shoulder.
4. Remove dirt, sand, labels, etc., from the tire. Apply a moderate amount of talcum powder to reduce friction between tube and tire.
   Caution: Too much talcum has the opposite effect.
5. If using a tube type tire fill air into tube (tube placed in the tire) until it is evenly round. Remove nut and washer from valve. If using a tubeless tire mount the valve in the valve hole and place the greased sealer in the seat. Pay attention to the correct orientation of the valve.
6. Place tire (red mark at valve hole) and if necessary the tube on the wheel half with disk brake.
7. Position other wheel part onto tire, push the valve through the valve hole, and match bolt holes with centring shaft.
8. Insert wheel bolts and tighten to the correct torque (10 Nm). Tighten bolts diagonally.
9. Place the tire in a safety cage, when inflating it to mounting pressure for the first time. If you do not have a safety cage, take great care when inflating the tire. Inflate the tire to mounting pressure. The mounting pressure is 10% more than the specified operating pressure. Check carefully for leaks. Leave to adjust at this pressure for 12 to 24 hours. Once the tire shows no leaks and is at operating pressure, the wheel unit can be mounted on the aircraft.
10. Make sure that the wheel unit is mounted perfectly balanced to avoid vibration and excessive wear.

9.3 Maintenance notes for tires

1. Maintain stipulated air pressure, check at regular intervals! Underpressure results in reduced load capacity and shortens service life.
2. Inspect tires at regular intervals for damage, shredding, flat areas and foreign objects.
3. Wheel unit must be mounted perfectly balanced. Wheel imbalance can result in damage to bearings.
4. Keep tires free of oil, grease, brake fluid and tar. Clean tires with rag soaked with petrol, then wash off with soap and water.

Caution

Note on used inner tubes:

Aircraft tubes are made of natural rubber and they are slightly under dimensioned making them easier to install in new tires. The layers of an aircraft tire are made of nylon and tend to stretch slightly with use. The inner tube also increases in size, adapting to the larger inside diameter of the tire. If a tube enlarged in this way is later fitted in a new tire, it may be too big for the tire, with the result that the tube may wrinkle. The wrinkles may rub through during operation, causing the tube to lose pressure. Rubbing through slowly results in gradual pressure loss – the pilot is thus warned before a dangerous situation arises. If the tube tears during a start, the pilot will fail to notice that he is flying with a flat tire. This can result in extremely hazardous landing situations.

In view of the considerable risks involved in fitting an old tube into a new tire, you are advised always to fit new inner tubes in new tube type tires.

Annex

Operating limits and related tires (corresponding to section 3):

Type	Size	Part Number	Tost reference	Bearing inner diameter	max. static load	max. limit load	Kinetic brake energy	Fitting tires
Landing Wheel	5”	010-5L0-055-30	035530	30 mm	10 kN 2248,1 lbs	30 kN 6744,3 lbs	159,464 kJ 117.614,8 ft lbs	5.00-5 336x115-5 380x150 350x150
Landing Wheel	5”	010-5L0-077-32	035531	1 ¼”				
Landing Wheel	5”	010-5L0-099-30	035590	30 mm				
Disk Brake Wheel	5”	010-5SD-055-30	055530	30 mm				
Disk Brake Wheel	5”	010-5SE-055-30	055531	30 mm				
Disk Brake Wheel	5”	010-5SC-055-30	055535	30 mm				
Disk Brake Wheel	5”	010-5SC-075-30	055536	30 mm				
Disk Brake Wheel	5”	010-5SE-075-30	055538	30 mm				
Disk Brake Wheel	5”	010-5SH-755-30	055544	30 mm				
Disk Brake Wheel	5”	010-5SK-110-30	055500	30 mm				
Disk Brake Wheel	5”	010-5SF-077-32	055572	1 ¼”				