Air gap measuring and adjusting on AD retarder range

OC441697 – 01/2021

Air gap measurement and adjustment on Axial retarders BC/BD/BE/BG/BH/BK/BQxxxxxx

1. TELMA GENUINE SPARE PARTS NEEDED

For any spare parts order, it is necessary to specify the part number of the retarder, which is engraved on top of the stator housing.

You will find the necessary information on spare parts for this equipment in the following spare parts catalogue:

OC443014 Spare Parts AD Telma Retarder

For more information about your TELMA product, please contact your TELMA dealer or the TELMA technical department.

2. SAFETY PRECAUTIONS

Before repairing your retarder, you must have read this maintenance manual thoroughly.

All operations and interventions for repairing this retarder will be carried out by qualified personnel.

Our technical support is available for all the information you may need.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to the risk of accidents. You must understand and respect the following warnings below.

Using and safety warning symbol, for an operation capable of damaging or destroying the retarder or surrounding equipment. The no respect of these warnings can cause injuries from mild to severe.

Safety warning symbol for an immediate danger to personnel. The no respect of this warning can cause serious injuries.

Safety warning symbol for an electrical danger to personnel. The no respect of this warning can cause serious injuries.

The repair methods described by TELMA SA, in this document, are based on the technical specifications in effect at the date of writing. They are subject to modifications in case of changes done by TELMA SA to manufacture the various component units and complete products.

The TELMA SA company reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document are subject to change without notice.

- We would like to draw your attention to the contents of this maintenance manual. Indeed, following the respect of important points during installation, use and maintenance of your retarder will ensure trouble-free operation for many years.
- When using lifting equipment, do not walk or stand under suspended loads.
- For information, a complete AD retarder weights between 125 kg (273 lb) and 255 kg (562 lb), a rotor with coupling flange weights between 22 kg (50 lb) and 42 kg (92 lb) and a hub assembly weights between 11 kg (24 lb) and 24 kg (53 lb).
- Put the retarder on a solid table, with the handling safety tool.
- Pay attention to the heavy parts of the retarder which can cause serious personal injury.

3. REQUIRED TOOLS

- Protective glasses and gloves
- Handling safety tools for retarder
- Flat screwdriver
- Click-type wrench
- 10 mm long socket (for retarders AD5 and AD6)
- 12 mm long socket (for retarders AD7)
- Torque wrench (range up to 100Nm)
- AD5-AD6 or AD7 lock tab driver to be made locally (See chapter 7 - Annex)
- Hammer
- Long feeler gauge (150mm such as FACOM 804L or equivalent)
- Dial gauge with magnetic base (Mitutoyo brand or equivalent)
- Ink marker

4. PARTS TO BE REPLACED SYSTEMATICALLY

When they have been removed the following parts need to be replaced:

- shaft end screws, washers
- lock tabs
- air gap adjusting shims

Note:

Some parts handled during the maintenance operations are covered with a special product against corrosion. Take precautions when handling to prevent damage to these protections.
For ease and given the diversity of installations on vehicles, this procedure has been done with the retarder removed from the vehicle and its accessories (retarder brackets) removed from the retarder.

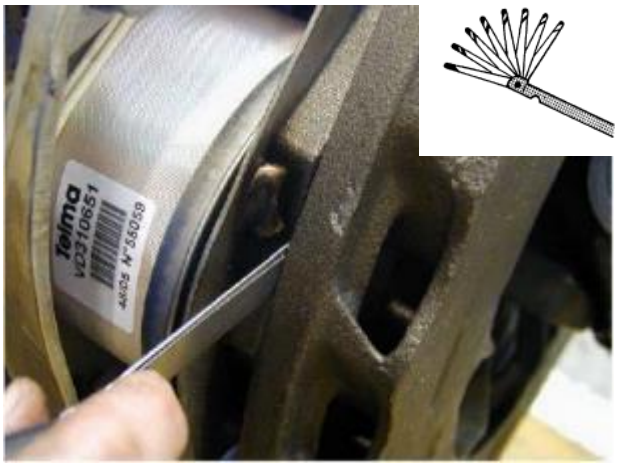
To remove the retarder brackets, please refer to the appropriate procedures.

The different pictures on this procedure are generic views and are not contractual.

5. AIR GAP MEASUREMENT

These instructions define how to measure and verify the Axial retarder air gaps.
The measurement will be done on a static basis, with the rotors at the same angular orientation all the time during the operations. The required tools are:

Long feeler gauges



Dial gauge with magnetic base

A. CHART OF SPECIFICATIONS

Retarder type	Retarder part number	Theoretical air gap value (E)	Rotor axial runout max. value (R)	Minimum air gap allowed on one single pole shoe (go gauge)	Maximum air gap allowed on one single pole shoe (no go gauge)
AD50-55	BFxxxxxx	1.00mm (0 - 0.20mm)	0.22mm	0.55mm	1.20mm
AD50-80	BJxxxxxx	1.60mm (0 - 0.20mm)	0.22mm	1.15mm	1.80mm
AD50-90	BBxxxxxx	1.00mm (0 - 0.20mm)	0.22mm	0.60mm	1.20mm
AD60-90	BQxxxxxx	1.30mm (0 - 0.20mm)	0.22mm	0.85mm	1.50mm
AD61-30	BCxxxxxx	1.00mm (0 - 0.20mm)	0.22mm	0.55mm	1.20mm
AD61-55	BDxxxxxx	1.30mm (0 - 0.20mm)	0.22mm	0.85mm	1.50mm
AD71-30	BKxxxxxx	1.40mm (0 - 0.20mm)	0.22mm	0.95mm	1.60mm
AD72-00	BExxxxxx	1.40mm (0 - 0.20mm)	0.22mm	0.95mm	1.60mm
AD72-45	BHxxxxxx	1.40mm (0 - 0.20mm)	0.22mm	0.95mm	1.60mm
AD72-60	BGxxxxxx	1.40mm (0 - 0.20mm)	0.22mm	0.95mm	1.60mm

The operations are the following:

B. ROTORS RUNOUT MEASUREMENT

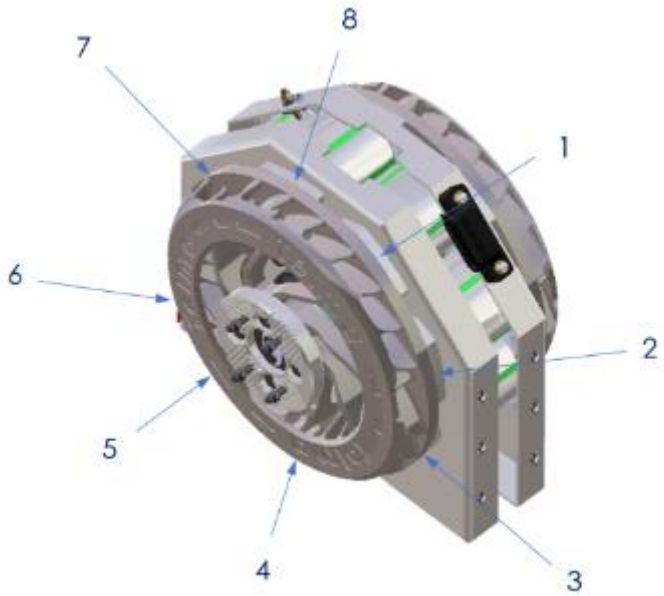
5A-1	5A-2
Measure and note the axial runout "R" of the first rotor (gearbox side) by using the dial gauge. Ensure that the maximum value is below the specification (see table above).	Still on the first rotor, draw a mark on its side where the minimum runout value is (where the rotor is the closest to the pole shoes).

Note: if the measured value is higher than the maximum allowed, please contact the technical department at TELMA SA.

C. ROTORS-POLE SHOES DISTANCE MEASUREMENT

- Insert the gauge on the ¾ of its length and measure the distance between the mark done on the first rotor (step **5A-2**) and the pole shoe in front of it. Then turn the rotor to the next pole shoe and repeat the measuring operation for each pole shoe.

- Note all the measurements are done at the centre of each of the pole shoes.



- For each pole shoe measurements, please see values specified (table page 6). It is to be ensured that those are:

- above the specification "Pole shoe gap min. value" (go gauge)
- below the specification "Pole shoe gap max. value" (no go gauge)

- Calculate the mean value based on the 8 measured gaps and add the half of maximum runout value

- Compare the resulting mean value X with the value of the theoretical air gap "E" (table page 6).

- If the mean value X is lower than E, the difference e corresponds to the thickness of the shims to be added (please refer to the chapter "6. Air-gap adjustment"):

  E – X = e to be added

- If the mean value X is higher than E, the difference e corresponds to the thickness of the shims to be removed (please refer to the chapter "6. Air-gap adjustment"):

  X – E = e to be removed

- If the mean value X is equal to E, then the air gap adjusting is correct.

- Repeat the same operations for the second rotor (drive axle side).

D. MEASUREMENT EXAMPLE

The theoretical air gap and axial runout of the Axial AD61-55 retarder are:

E = 1.30mm (with tolerances of 0 to -0.20 mm, 1.10mm < E < 1.30mm)

Air gap measurements per pole shoe MIN / MAX = 0.85mm / 1.50mm

R = 0.22mm

The measured values are for example:

- Maximum rotor runout: 0.20mm

- Pole shoe 1: 0.91mm
- Pole shoe 2: 0.93 mm
- Pole shoe 3: 0.94 mm
- Pole shoe 4: 0.95 mm
- Pole shoe 5: 0.95 mm
- Pole shoe 6: 0.94 mm
- Pole shoe 7: 0.94 mm
- Pole shoe 8: 0.92 mm

Maximum rotor runout is in conformity, as the measured value of 0.20mm is below 0.22mm

Air gap measurements per pole shoe are correct as the values are between min/max specifications (between 0.85mm and 1.50mm)

The mean value will be:

X = ((0.91 + 0.93 + 0.94 + 0.95 + 0.95 + 0.94 + 0.94 + 0.92) / 8) + (0,20 / 2) = 1.03mm

The X value of the average air gap is lower than the theoretical value E: 1.10mm < E < 1.30mm, so shims needs to be added.

To define the thickness of the shims "e" to add:

E – X = e = 1.30 – 1.03 = 0.27mm

A shim thickness of e = 0.27 mm needs to be added on the gearbox side rotor.
As the set of adjusting shims only contains parts of 0.25mm, 0.30mm, 0.40mm, 0.50mm and 0.70mm, it will be necessary

- to remove for example one shim of 0.25mm from the retarder
- and to add one of 0.50mm.

1.03mm - 0.25mm + 0.50mm = 1.28mm

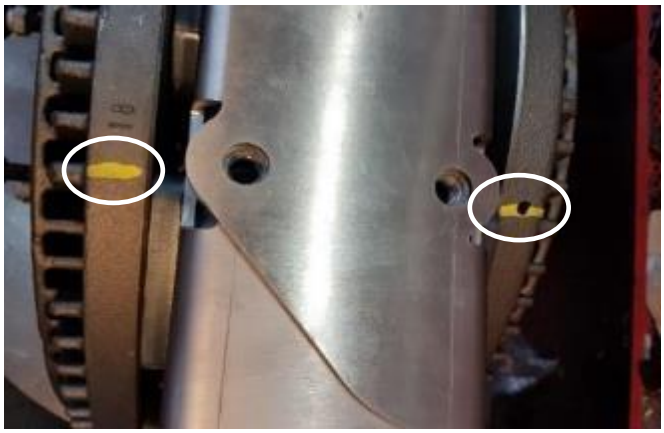
The average air gap value would then be 1.28mm instead of 1.30mm which is within the tolerance (1.10mm < E < 1.30mm)

6. AIR GAP ADJUSTEMENT

A. DISASSEMBLING THE ROTORS

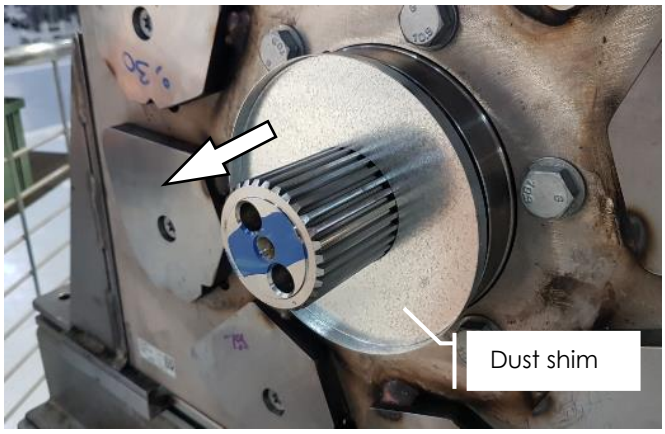
IMPORTANT: identify all parts before dismantling to find their initial orientations and location during the re-assembly.

6A-1	6A-2
Draw a mark on each rotor outer edge with an ink marker, the two marks must be aligned to find again the initial angular orientation during re-assembly. This is essential to maintain proper balancing.	On the first retarder side (for instance here the gearbox side, with the engraved part and serial numbers), remove the lock tab by using a flat screwdriver and a hammer. Caution: to reduce the spring effect, suppress the stress in the tab by hitting on one side and by removing the other).

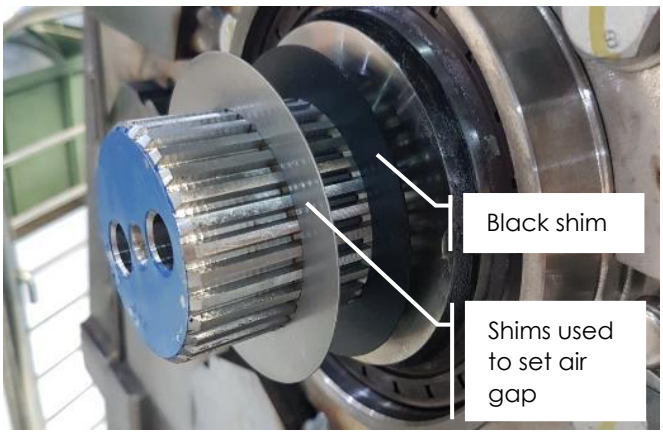


6A-3	6A-4
Unscrew the 2 shaft end screws to remove them. Use relevant socket (see chapter 3 "required tools") and a bar to lock the rotation of the rotor.	Draw a mark on both shaft and coupling flange with an ink marker, to find again the initial position, as well as the vehicle side to where flange is screwed (gearbox or driveshaft).

6A-5	6A-6
Insert a lifting hook between 2 cooling fins on the frontal face of the rotor to facilitate pull off of the rotor and coupling flange assembly.	Remove the dust shield from the shaft.

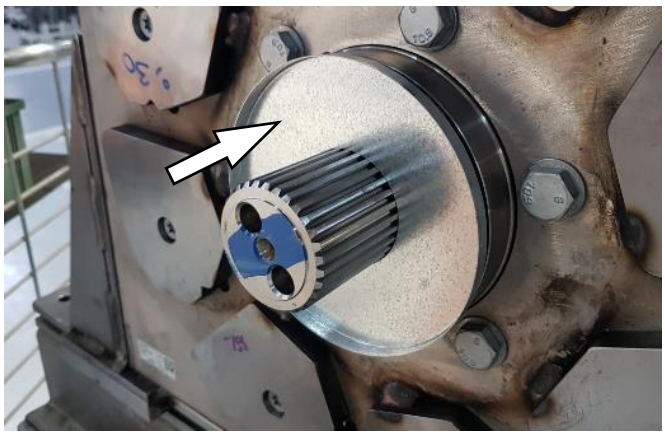


6A-7
Following the calculation result of paragraph 5, add or remove air gap adjusting shims. Important! Leave the black shim (Nuflon) on the shaft splines against the bearing.



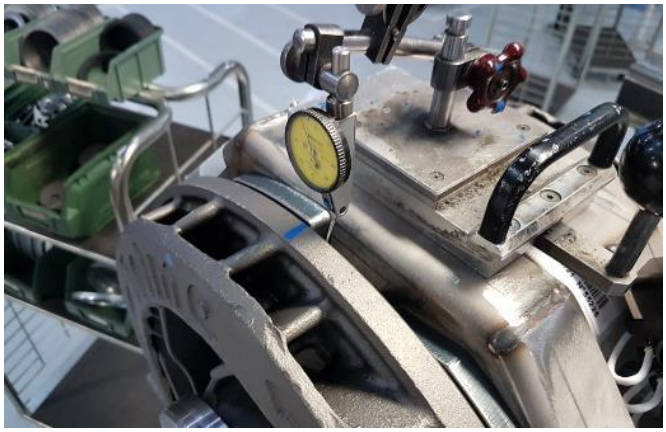
B. INSTALLATION OF THE ROTORS

6B-1	6B-2
Put new dust shields on both shaft ends.	Re-install both rotor with coupling flange assemblies on the shaft, ensuring that the marks painted on the shaft splines and on the coupling flange splines (refer to picture 6A-4) are aligned.

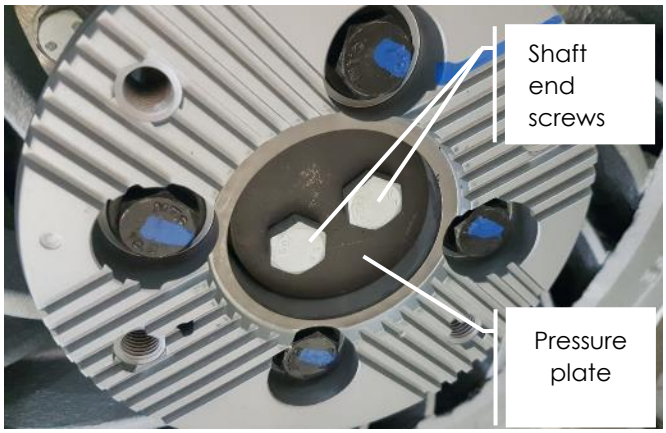


6B-3	6B-4
When fitting the second rotor, ensure that both marks painted on the outer edges of the rotors are aligned.	Re-install both removed shaft end screws with the removed pressure plates, on both retarder sides. Do not install lock tabs yet.

6B-5	6B-6
With a manual torque wrench apply a tightening torque value: - for AD5-AD6 retarder: 30 Nm ± 20% (22 lb.ft ± 20%) - for AD7 retarder: 60 Nm ± 20% (44 lb.ft ± 20%) this alternately on both screws. Use relevant socket and a locking bar to be inserted inside a rotor cooling canal for preventing rotor rotation.	Check the axial runout of the rotors by using a dial gauge with magnetic base. Maximum allowed value: see chapter 5 - chart of specifications Note: should the measured value be higher than the specified value, please contact the technical department at TELMA SA.



6B-7	6B-8
Measure the air gaps by using a feeler gauge. Do not turn the rotors and measure the air gap between the rotor and each pole shoe. These 8 values must be conform with values mentioned in retarder technical specifications: see chapter 5 - chart of specifications.	After having adjusted the air gaps, on each retarder side, unscrew the removed shaft end screws and the removed pressure plate. Install 2 new shaft end screws and a new pressure plate supplied with the replacement hub assembly.



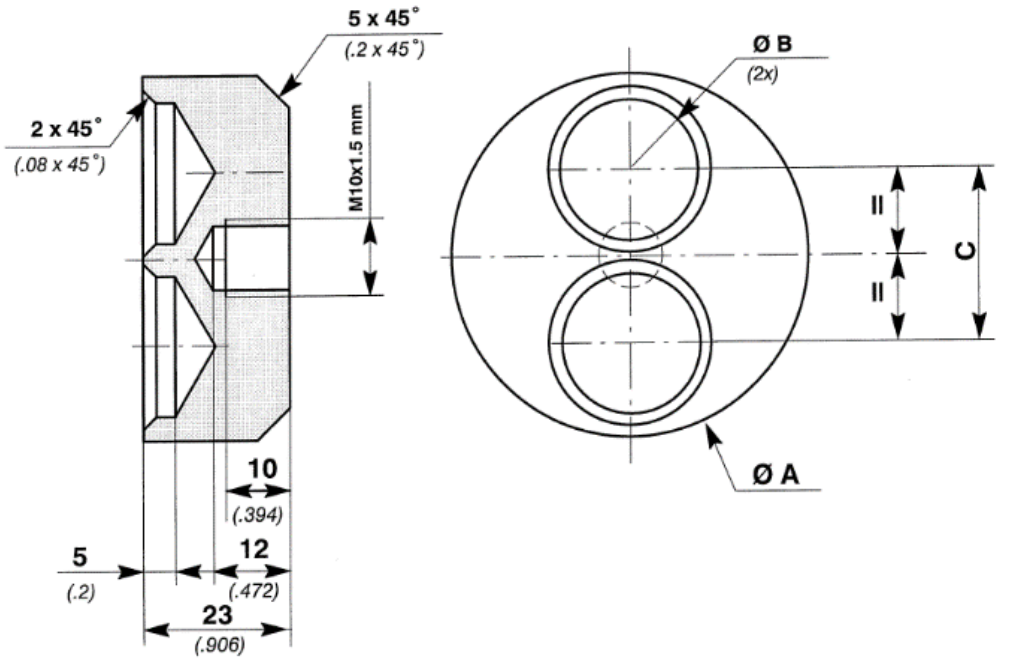
6B-9	6B-10
With a manual torque wrench, apply a tightening torque value: - for AD5-AD6 retarder: 30 Nm ± 20% (22 lb.ft ± 20%) - for AD7 retarder: 60 Nm ± 20% (44 lb.ft ± 20%) this alternately on both screws. Use a locking bar to be inserted inside a rotor cooling canal for preventing the rotation of the rotor.	Insert a new lock tab in the retaining tab driver. On each retarder side, put in place the lock tab over the screw heads and hit with a hammer.

6B-11
Check that the lock tabs are well bottomed over the shaft end screw heads.

7. ANNEXES

A. LOCK TAB DRIVER to be made locally

dimensions : mm *(inch)*



Retarder	Ø A		Ø B		C	
	mm	inch	mm +0.1 0	inch	mm ±0.1	inch
AD5 / AD6	57	2.244	22	0.866/0.870	27	1.059/1.067
AD7	75	2.953	24	0.945/0.949	40	1.570/1.579

Material : XC 48F (Rm = 630 N/mm² mini) (HB 230 to 280)

General machining : $\sqrt{}^{6.3}$ except $\sqrt{}^{3.2}$

Protection : Oil burnishing

General tolerance : ± 0.5mm *(± .019 inch)*

Break sharp edges to have a 1 mm *(.039 inch)* chamfer at 45°.

B. CHART TO BE COMPLETED WITH THE MEASURED VALUES FOR CALCULATING THE AVERAGE AIR GAP ON EACH ROTOR

Retarder type: _____ Vehicle brand: _____

Retarder part number: _____ Vehicle type: _____

Retarder serial number: _____ km: _____

Retarder latest maintenance date: ___ /___ /___ at km: _____

Rotor 1			Rotor 2		
Pole shoe number	Measured air gap	Inside go - no go tolerance yes - no	Pole shoe number	Measured air gap	Inside go – no go tolerance yes - no
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
Calculated average:		/	Calculated average:		/
Half axial run out:		/	Half axial run out:		/
Average air gap:		/	Average air gap:		/

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