39-52

Ring gear, adjusting

(Adjusting differential)

Repairs after which the ring gear must be adjusted ⇒ Page 39-37 .

Special tools, testers and auxiliary items

- Drift VW 295
- Dial gauge extension VW 382/10
- Measuring plate VW 385/17
- Universal dial gauge bracket VW 387
- Measuring lever VW 388
- Press plate VW 402
- Installing tool VW 459/2
- Ring gear adjusting device VW 521/4
- Attachment for adjusting device VW 521/8

39-53

- Thrust pad 3062
- Thrust plate 30-205
- Mandrel 30-505
- Torque gauge 0-600 Ncm
- Dial gauge
- Dial gauge extension

39-54

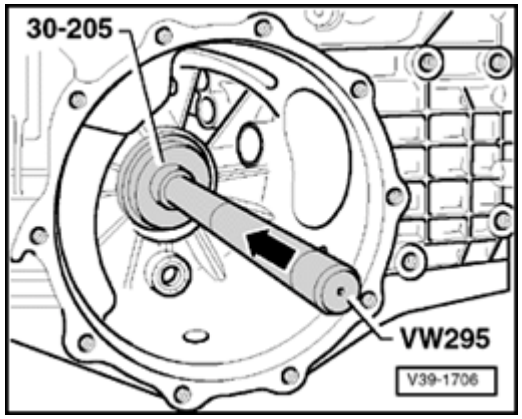
Determining total shim thickness "S_{total}" for shims "S1" + "S2"

(Setting preload of tapered roller bearing for differential)

- Drive pinion removed

- Remove seal and outer races of both tapered roller bearings for differential.

- Remove shims ⇒ Page 39-18 .

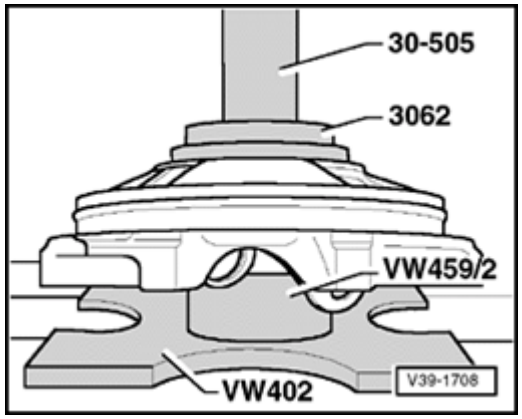


- Drive outer race for tapered roller bearing with shim "S2" into transmission housing. For measurement purposes an "S2*" shim 1.20 mm thick (2 shims of 0.60 mm) is used.

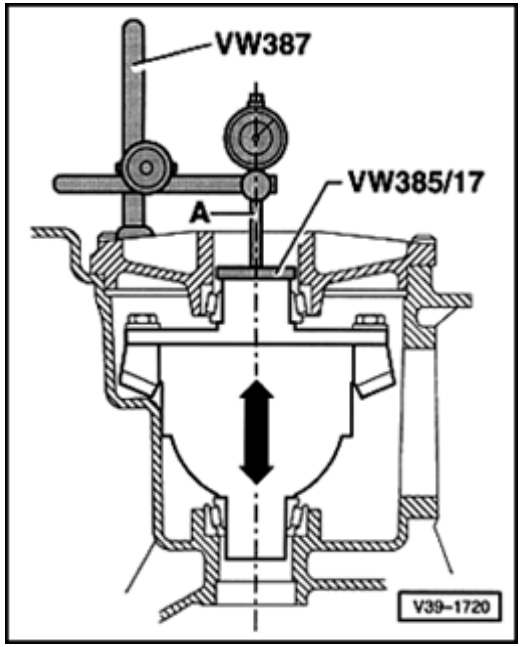
Note:

For measurement purposes a shim "S2" of 1.20 mm is initially inserted which is designated "S2" in the following. After determining backlash, "S2*" will be replaced by the correct shim "S2."*

39-55



- Press outer race for tapered roller bearing without shim "S1" into cover for differential.
- Insert differential without drive wheel for speedometer sender -G22 into transmission housing. Ring gear is positioned on left-hand side (same side as cover for final drive).
- Install cover for differential with 4 bolts (25 Nm).
- Position transmission so that cover for differential faces up.
- Turn differential 5 turns in both directions so that tapered roller bearings settle.



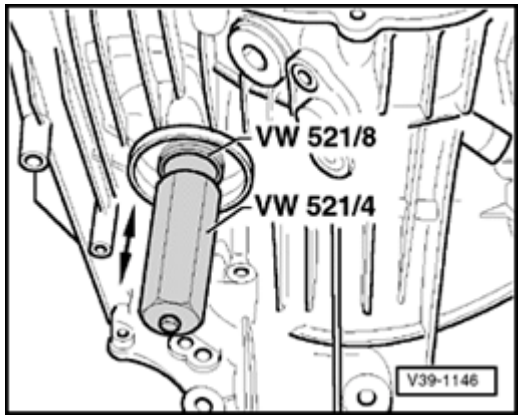
- Assemble measuring equipment, use a 30 mm dial gauge extension.
- Set dial gauge (3 mm measuring range) -A- to "0" with 2 mm preload.

Note:

The tip of the dial gauge must be positioned on center of differential.

- Lift differential, without turning, and read off play on dial gauge.

• Measurement in following example: 0.62 mm.



Note:

- *Secure special tools VW 521/4 and VW 521/8 on right of differential (transmission side) to lift differential.*
- *If the measurement has to be repeated, the differential must again be turned 5 turns in each direction to settle the tapered roller bearing.*

Formula:

"S_{total}" = "S2*" + measurement + bearing preload

Example:

	Inserted shim(s) "S2*"	1.20 mm
+	Measured value	0.62 mm
+	Bearing preload (constant)	0.25 mm
=	Total shim thickness "S_{total}"	
	for "S1" + "S2"	2.07 mm

39-57

Determining thickness of shim "S1*"

Note:

- *The preliminary adjustment shim "S1*" will be replaced with the final shim "S1" after determining the backlash.*

- *The total shim thickness "S_{total}" remains unchanged.*

Formula:

"S1*" = "S_{total}" - "S2*"

Example:

	Total shim thickness "S_{total}"	
	for "S1" + "S2"	2.07 mm
-	Inserted shim(s) "S2*"	1.20 mm
=	Thickness of shim "S1*"	0.87 mm

39-58

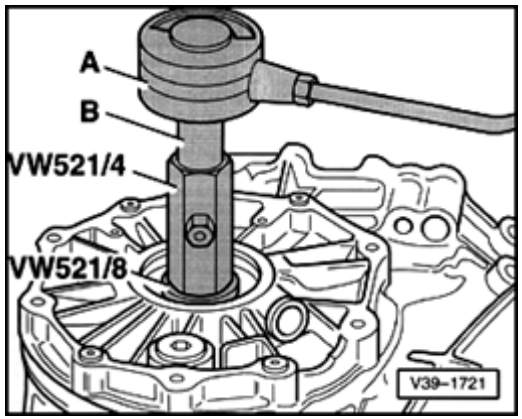
Measuring friction torque (check)

Note:

- *Differential tapered roller bearings are low friction bearings. Therefore the friction torque only has a limited use as a check. Correct adjustment is only possible by determining the total shim thickness "S_{total}."*

- *Do not additionally oil new tapered roller bearings for friction torque measurement. The bearings have already been treated with a special oil by the manufacturer.*

- Drive pinion removed



- Fit torque gauge 0-600 Ncm -A- onto differential.

B - Socket

- Read off frictional torque.

Frictional torque specifications:

New bearings	Used bearings
200-350 Ncm	30-50 Ncm

Note:

If the final drive set (drive pinion and ring gear) is being adjusted, perform the adjustment of the drive pinion now and check the adjustment ⇒ Page 39-39 .

39-59

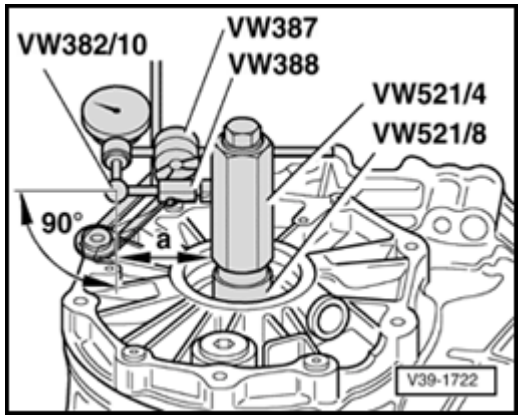
Measuring backlash

(Position of ring gear in transmission housing)

- Drive pinion with shims "S3" and "S4" installed

- Install differential.

- Turn differential 5 turns in each direction to settle tapered roller bearings.



- Secure dial gauge retainer VW 387 onto housing.
- Insert adjustment device VW 521/4 and VW 521/8 for ring gear.
- Fit dial gauge with dial gauge extension VW 382/10 (6 mm flat).
- Set measuring lever VW 388 to dimension a = 79 mm.
- Determine play between the teeth flanks as follows:
  - Turn ring gear until it makes contact with a tooth flank (end of backlash travel).
  - Set dial gauge to "0" with 2 mm preload.
  - Turn ring gear back until lying against an opposite tooth flank (backlash).

- Read off backlash and note value.

- Turn ring gear through 90° and repeat measurements a further 3 times.

Note:

If the individual measurements differ by more than 0.06 mm from each other, the installation of the ring gear or the final drive set itself is not correct. Check installation, replace final drive set if necessary.

Determining average backlash

- Add the four measurements together and divide by four.

Example:

	1st measurement	0.49 mm
+	2nd measurement	0.48 mm
+	3rd measurement	0.50 mm
+	4th measurement	0.49 mm
=	Sum of measured values	1.96 mm

- Result: The average backlash is 1.96 ÷ 4 = 0.49 mm

39-61

Determining thickness of shim"S2"

Formula:

"S2" = "S2*" - backlash + lift

Example:

	Inserted shim "S2*"	1.20 mm
-	Average backlash	0.49 mm
+	Lift (constant)	0.15 mm
=	Thickness of shim "S2"	0.86 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

The following shims are available for "S2"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	
0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

39-62

Determining thickness of shim "S1"

Formula:

"S1" = "S_{total}" - "S2"

Example:

	Total shim thickness "S_{total}" for "S1" + "S2"	2.07 mm
-	Thickness of shim "S2"	0.86 mm
=	Thickness of shim "S1"	1.21 mm

- Determine shim(s) from table.

⇒ *Parts catalog*

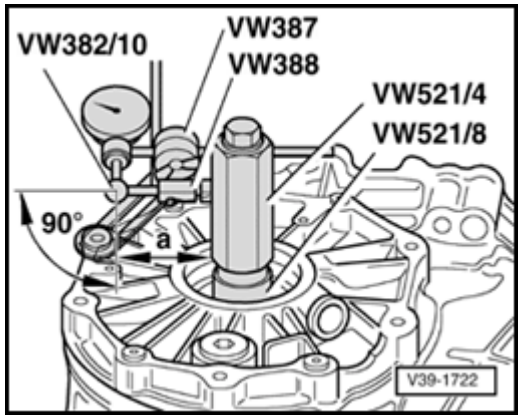
The following shims are available for "S1"

Shim thickness (mm) 1)		
0.45	0.65	0.85
0.50	0.70	0.90
0.55	0.75	

0.60	0.80	

1) Using the shim tolerance variations it is possible to find the exact shim thickness required, insert two shims if necessary.

39-63



Performing check measurement

- After installing shims "S1" and "S2," turn differential 5 turns in both directions so that the tapered roller bearings settle.
- Measure backlash four times on circumference.

  Specifications: 0.12-0.22 mm

Note:

- *If the backlash lies outside the tolerances, the adjustments must be repeated. But the total shim thickness "S_{total}" must remain the same.*
- *The individual measurements must not differ by more than 0.06 mm from each other.*