

5 – Speed Motorcycle Gearbox and Clutch

Documentation for the BMW Service Training School

BMW Motorrad GmbH + Co.
Service Promotion



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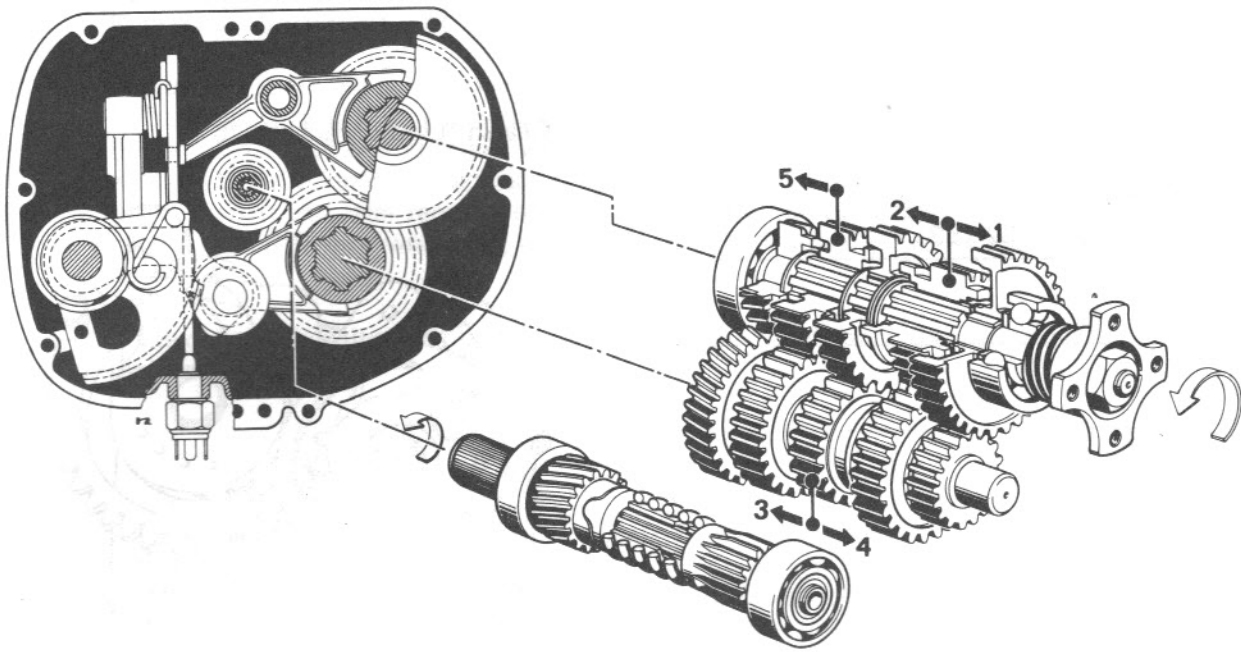
Gearbox

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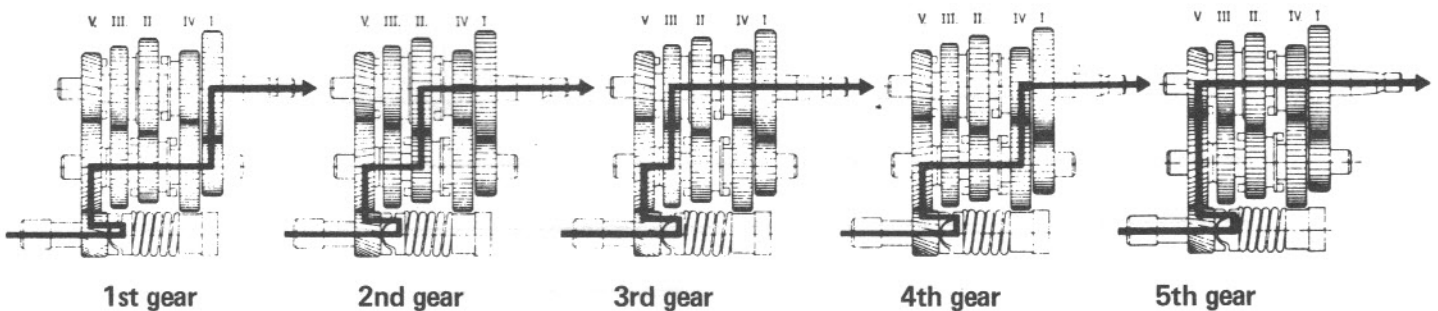
Clutch

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1. Design of 5-speed gearbox



The power is transmitted in the gearbox via the input, auxiliary and output shafts. The drive gear on the input shaft is arranged to turn by one angular displacement, so that the power can be transmitted via a spring-loaded cam and thus dampen driving shocks. The input shaft is hollow drilled to take the clutch pressure rod. Five pairs of gears are arranged on the auxiliary and output shafts, which are in continuous engagement. The auxiliary shaft has one and the output shaft two gears designed as shifting gears, which are moved on the shafts in axial direction. The auxiliary shaft has the 3rd and 4th gears and the output shaft the 1st, 2nd and 5th gears designed as free-running gear wheels. The output and auxiliary shafts are hollow drilled for lubrication of their free-running gear wheels.



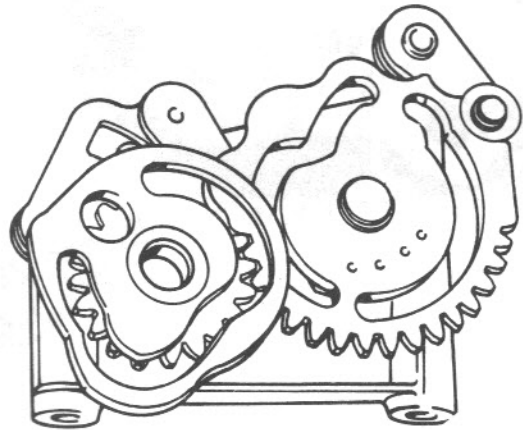
Operation of the foot shift lever will turn two shift cam disks by way of a hooked end lever. The three shift forks engage in the cam paths of the shift discs and move these to the shift gear wheels on the output and auxiliary shafts. The shift gear wheels, which have claws or openings in their faces, engage in the free-running wheels with claws or openings. In this manner the gear of a certain speed selected is connected with the gearbox shaft.

The setting of different gear positions is accomplished with a spring-loaded lever, which by way of a roller engages in the recesses in the shift disk. In neutral position one of both shift disks will close a contact switch, upon which the neutral indicator lamp comes on.

Gearshift lever bracket - /6

Neutral indicator switch

No. 61 31 1 352 153



2. Disassembly

After detachment of the drive flange and removal of the gearbox cover socket head bolts, heat it to about 100°C and pull off the gearbox cover while pressing down the kick starter somewhat. Now loosen both gearshift lever bracket set screws, and remove gearshift lever bracket and both output shaft shift forks from the gearbox case. Knock input shaft out of case by applying light blows with a plastic hammer. Heat gearbox case to about 100 – 120°C* and take output shaft and auxiliary shaft out of case.

* Use a thermochrome pin to check temperature

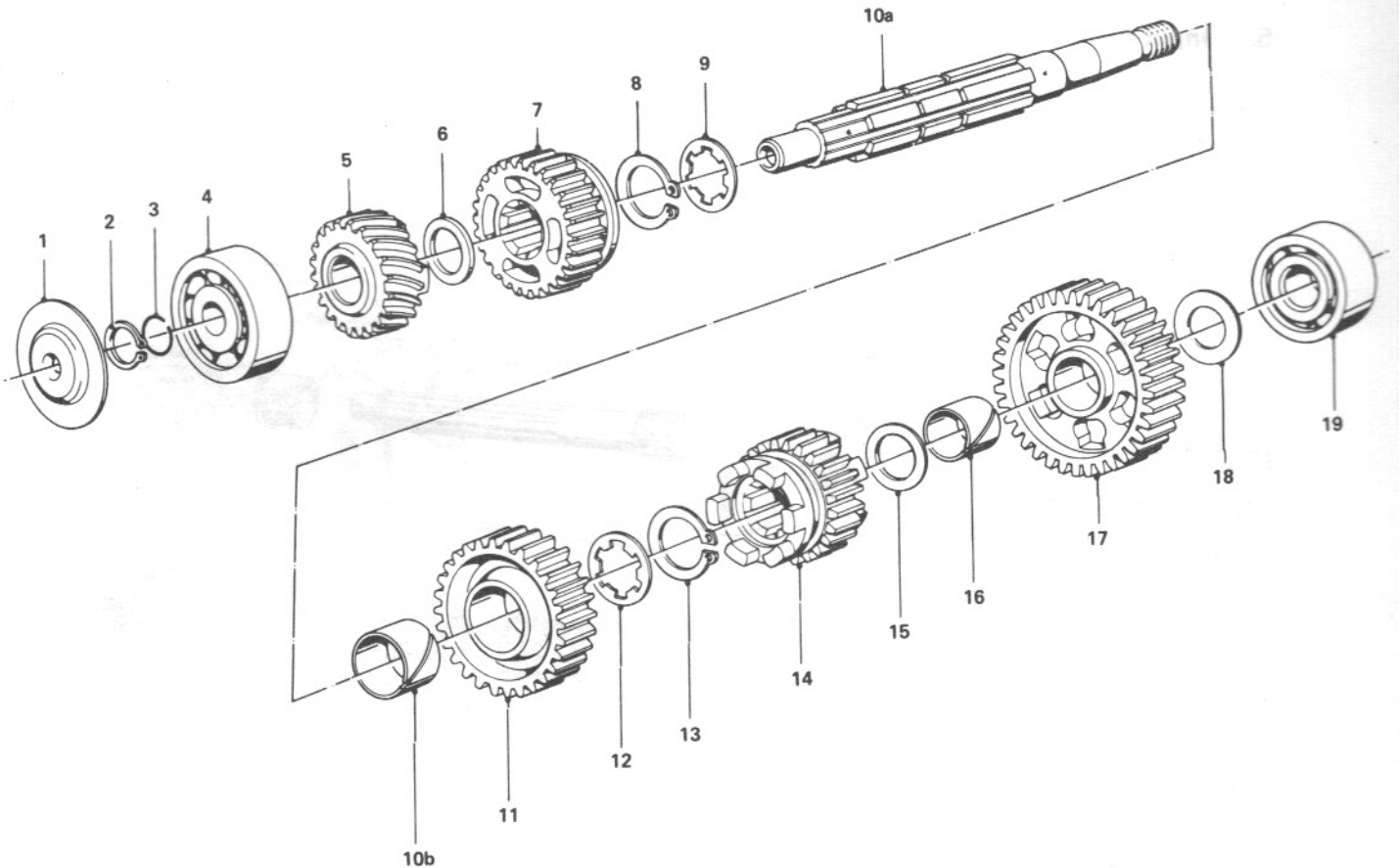
Note: when installing the output and auxiliary shafts make sure that the oil traps are located in the bearing seat.

3. Output shaft

Support under the first speed gear and at the opposite end under the fifth speed gear to press off the output shaft bearings.

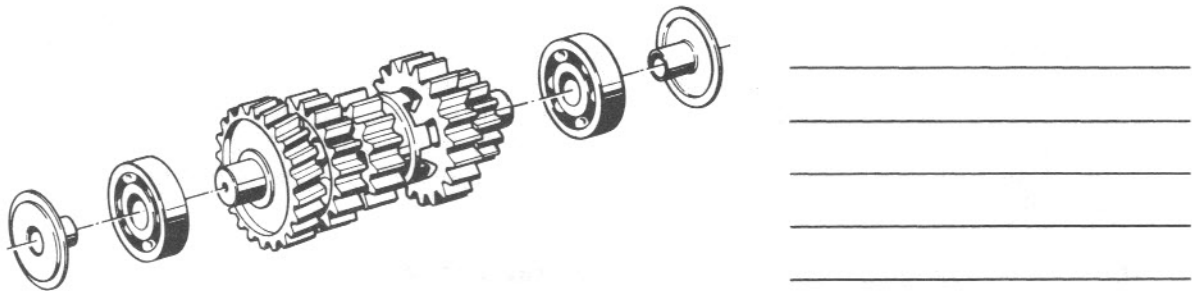
The output shaft can be disassembled after removal of the bearings. Remove bearing (19), thrust washer (18), gear wheel (17) and floating bushing (16), then take off thrust washer (15) and shift gear wheel (14). After removal of circlip (13) the thrust washer (12), the second speed gear wheel (11) and the bushing (10) can be removed. Now turn the shaft and after removal of circlips (2) and (3) and pressing off bearing (4), take off the fifth gear wheel (5), washer (6), shift gear wheel (7) as well as circlip (8) and washer (9).

If the collared bushing (10b) on the shaft's keyway is defective, the shaft must be replaced.



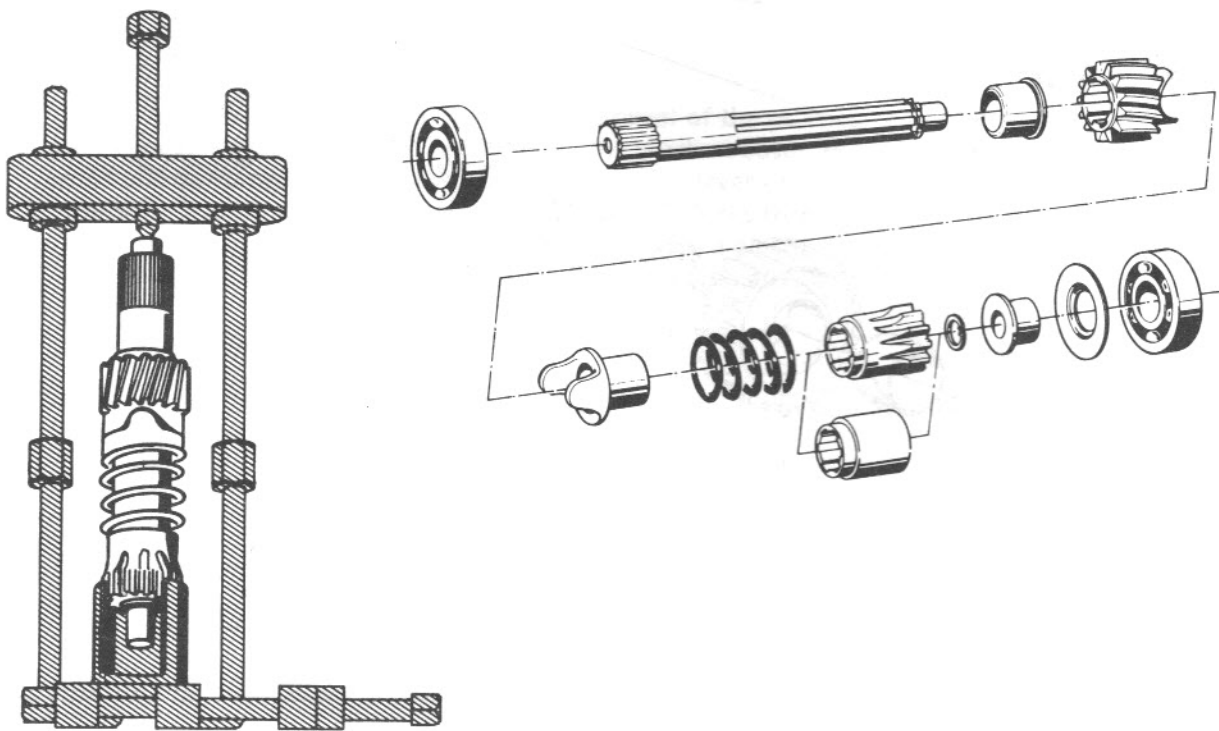
4. Auxiliary shaft

Only the bearings on the auxiliary shaft can be replaced. If gears or the shift wheel on the shaft are defective, the entire shaft must be replaced.



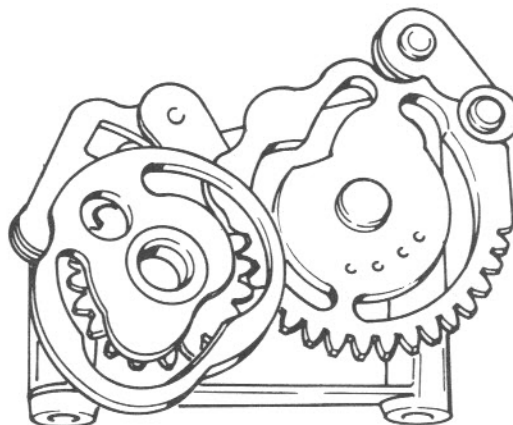
5. Input shaft

Pull off ball bearings together with bushing and end disk with Kukko extractor 17/K. Compress spring with Kukko extractor and special tool 23 2 650, and take circlip out of groove. Now remove spring, pressure pad and drive gear. When assembling the input shaft, compress the spring with Kukko extractor and special tool 23 2 650, then place circlip on guide sleeve of special tool and press circlip into groove with slip sleeve.

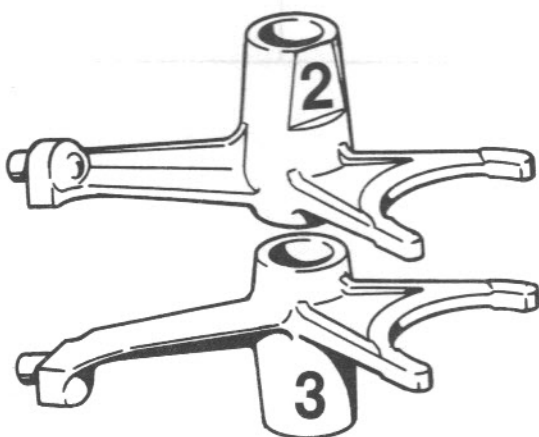


6. Gearshift lever bracket and forks

When assembling the gearshift lever bracket, make sure that the first teeth of the gearshift disks engage with each other.

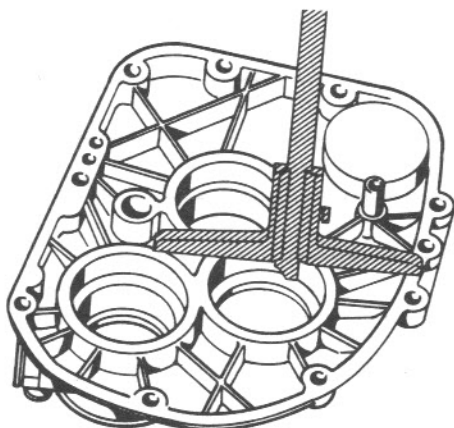


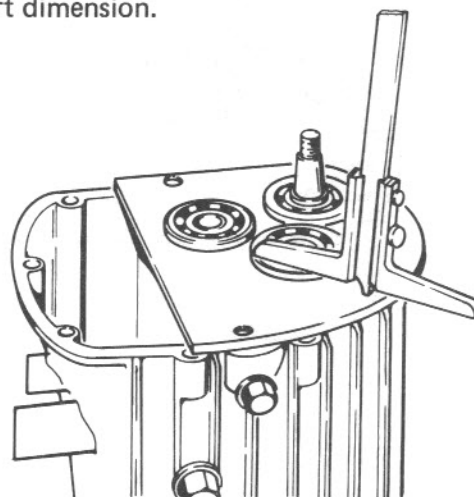
Fork 1 is for 3rd and 4th gear on auxiliary shaft, fork 2 for 1st and 2nd gear and fork 3 for 5th gear on output shaft. When installing fork 1 make sure that the short end of the guide faces up; for forks 2 and 3 make sure that the short ends of the guide face each other.



7. Checking axial play of gearbox shafts

Install gearbox measuring plate 23 3 650 (with or without gasket) and screw down firmly. Use a depth gauge to measure the distance between the ball bearing outer race and the measuring plate. Add the thickness of the plate to this reading. Next, measure from the joint line for the gearbox cover to the bottom of the bearing seats in the cover and take up the difference with shims, leaving app. 0.05 mm play. Warning: cover dimension must always be greater than shaft dimension.





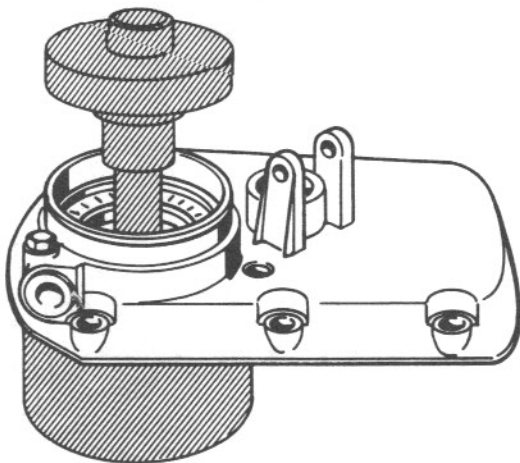
Shimming table

	Cover	Case	Difference	Tolerance	Shim thickness
Input shaft				0.05 mm	
Auxiliary shaft				0.05 mm	
Output shaft				0.05 mm	

Measure each shim washer individually.

8. Replacing shaft seal in gearbox cover

Drive in the shaft seal with special tool 23 1 750 and make sure that the open end of the seal faces the output flange.

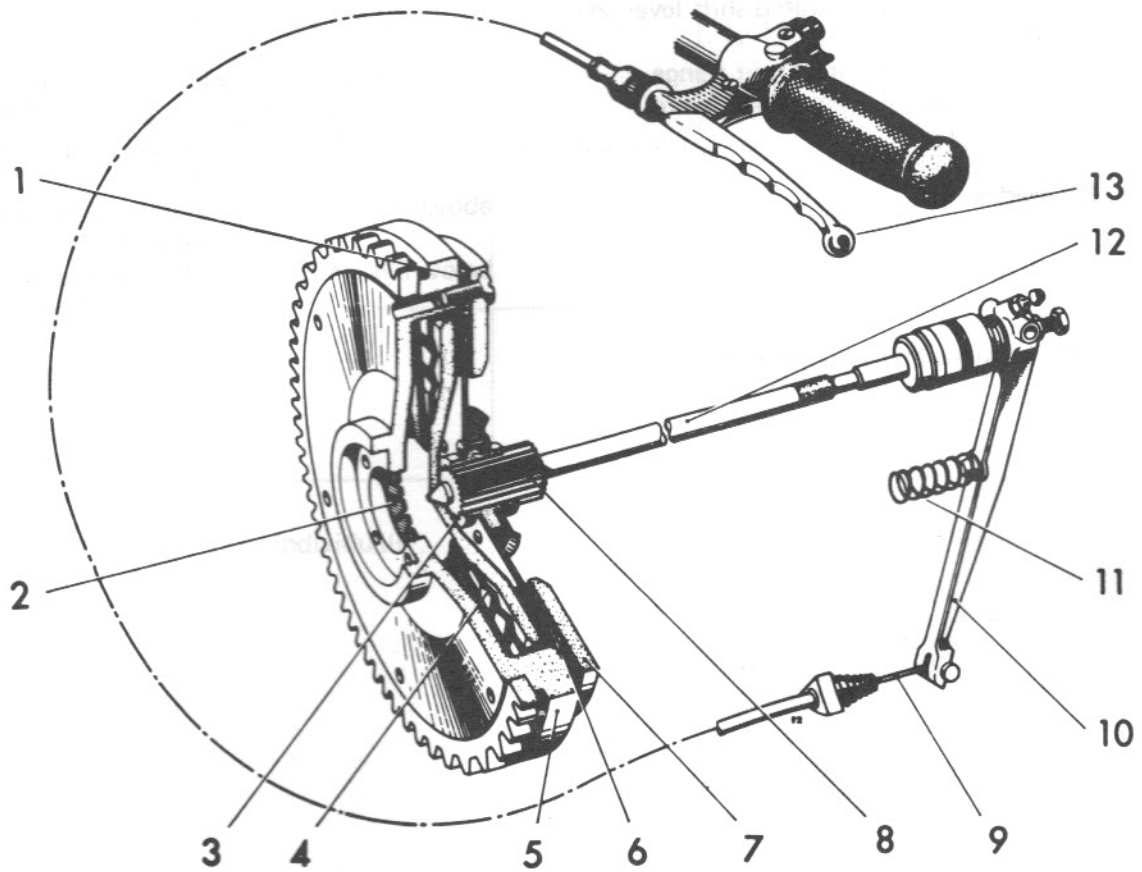


9. Specifications

Axial play of gearbox shafts	0 - 0.1 mm (0 - 0.004 in)
Axial play of free-running wheels on shaft	0.15 - 0.3 mm (0.006 - 0.012 in)
Axial play of foot-operated shift lever shaft	0.1 mm (0.004 in)
Tightening torque for output flange	20 - 22 mkp (145 - 160 ft.lb)
Gearbox case installing temperature	app. 100 - 120°C * (210 - 250°F) *
Oil capacity	0.8 liter (0.85 US quart, 1.4 Imp. pints)
Oil grades	above 5°C (40°F) brand name hypoid gear lube, SAE 90 below 5°C (40°F) brand name hypoid gear lube, SAE 80

* Check with thermochrome pin

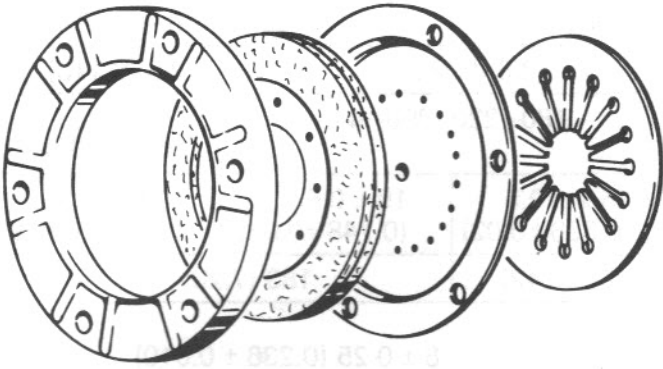
1. Design of single dry plate clutch



When the clutch is engaged, a diaphragm spring presses the driven plate and the thrust disk against the thrust ring, which is screwed to the flywheel. A diaphragm is spot welded to the driven plate between the flywheel and the thrust ring. This diaphragm provides the driven plate with freedom of axial movement.

To interrupt the driveline between engine and gearbox, the clutch is disengaged by pulling the clutch lever. This forces the withdrawal or throwout arm against the driven plate by way of a thrust bearing and thrust rod, until the contact pressure of the diaphragm spring is overcome and the friction drive between the clutch plates is interrupted.

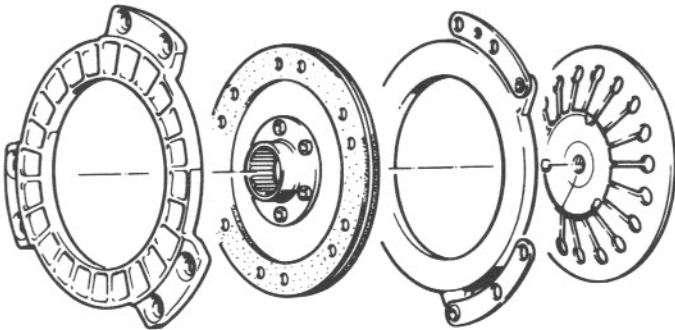
2. Components — up to 1980 model



Order of installation up to 1980 models

Use BMW centering arbor 21 2 650
when assembling.
Note balancing mark.

3. Components — from 1981 model on



Order of installation for 1981 models on

Use centering arbor with BMW No.
21 2 660 when assembling.
Note balancing mark.

**4. Specifications
(up to 1980 model)**

Model	R 45/R 65	R 50 - R 80	R 90 - R 100
Thickness of material (diaphragm spring) mm (in)	2.6 (0.102)		2.8 (0.110)
Diaphragm spring pressure, installed kp (lb)	180-220 (396-485)		202 - 220 (445-485)
Height of diaphragm spring, relaxed mm (in)	15.2 ± 0.5 (0.598 ± 0.02)	19 ± 0.5 (0.748 ± 0.02)	17.4 ± 0.3 (0.685 ± 0.019)
Diaphragm spring diameter, pressed flat mm (in)	163 (6.42)	183 (7.20)	
Total thickness of clutch plate (with lining material) mm (in)	6 ± 0.25 (0.236 ± 0.010)		
Minimum clutch plate thickness mm (in)	4.5 (0.177)		
Extl. dia. of clutch plate mm (in)	160 (6.3)	180 (7.09)	
Max. lateral runout of clutch plate at periphery mm (in)	0.15 (0.006)		
Max. vertical runout of clutch plate mm (in)	0.3 (0.012)		
Max. imbalance in clutch plate cmg	6		
Operating clearance, measured at lever (cable) mm (in)	2 (0.08)		

Test procedure for diaphragm spring	When edge of spring is touching measuring plate, difference in height at spring tongues must not exceed 0.3 mm (0.012 in); when spring tongues are touching plate, vertical runout at edge of spring must be max. 0.8 mm (0.031 in)
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