CLUTCH

DESCRIPTION OF THE CLUTCH

General

A dry single plate clutch is incorporated in the flywheel between engine and transmission. The spring cushioned clutch disc has friction linings on both sides. It rides in the splined input shaft and has axial freedom of movement.
The diaphragm spring, together with the clutch assembly, is centrally mounted in the flywheel. In engaged condition, the clutch disc is held against the flywheel by the pressure plate upon which the diaphragm spring acts, thus providing a mechanical lock between the engine and transmission.

The clutch control fork, mounted in the transmission housing, carries the throwout bearing. The throwout bearing is permanently lubricated and requires no maintenance.

Clutch actuation at disengagement is by way of the clutch pedal, clutch cable, control fork, and throwout bearing. The throwout bearing exerts pressure upon the segments of the diaphragm spring, displacing it axially. The resulting deflection of the diaphragm spring relieves pressure from the pressure plate and, thus, from the clutch disc, resulting in disengagement of engine from the transmission.

Clutch maintenance is limited to adjustment of the clutch pedal clearance of 20-25 mm (3/4 to 1 in.) in the course of normal clutch lining wear, and also to the adjustment of the clutch pedal travel limiter.

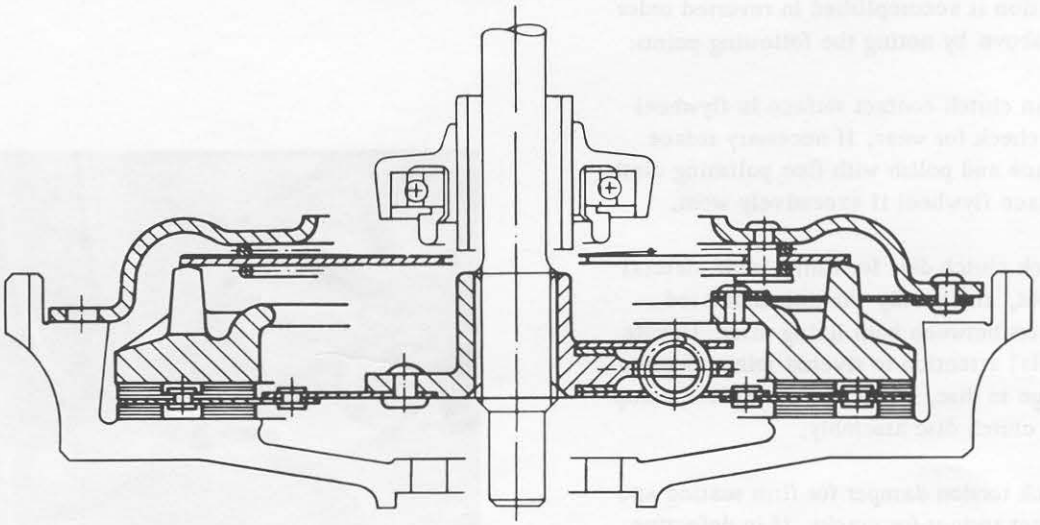


Fig. 173

Removal

1. Remove engine and detach from transmission.

2. Evenly loosen clutch retaining bolts, slackening each by one or two turns at a time and switching in a cross sequence until the spring pressure is relieved, to avoid distortion of spring housing.

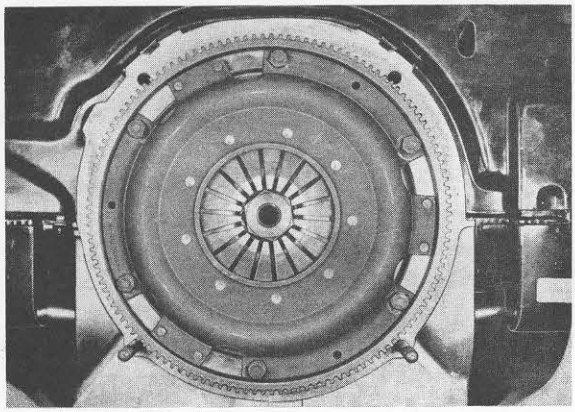


Fig. 174

3. Withdraw clutch assembly.

4. Withdraw clutch disc.

Installation

Installation is accomplished in reversed order of the above by noting the following points:

1. Clean clutch contact surface in flywheel and check for wear. If necessary reface surface and polish with fine polishing cloth. Replace flywheel if excessively worn.

2. Check clutch disc for lining wear, lateral runout, and evenly working undulated spacers between both lining discs. Devote special attention to riveted joints securing flange to disc. If necessary, replace complete clutch disc assembly.

3. Check torsion damper for firm seating and inspect springs for cracks. If in defective condition, replace clutch disc assembly.

4. Inspect clutch assembly.

5. Check throwout bearing for wear and smooth rotation, replace if necessary.

6. Check control fork seat in transmission housing for wear and good seating, repair if defective.

7. Fill bushing in gland nut at flywheel with approx. 2 cc (.12 cu. in.) graphite grease or MoS_2 compound.

8. Install clutch disc with the aid of an arbor or a shortened transmission input shaft.

9. Push clutch assembly onto aligning dowels in flywheel. If the flywheel is not provided with dowel pins, align clutch assembly with the help of P 219 locating arbor.

10. Evenly tighten clutch retaining bolts, turning each by one or two turns at a time in a cross sequence to avoid distortion of spring housing.

    Use only 10 K hex bolts with lock washers. Torque bolts to 3.5 mkp (25.3 lbs/ft).

11. With transmission attached to the engine pull clutch control lever in direction of arrow. The distance between the lever and transmission housing should still be not less than 20 mm (4/5 in.).

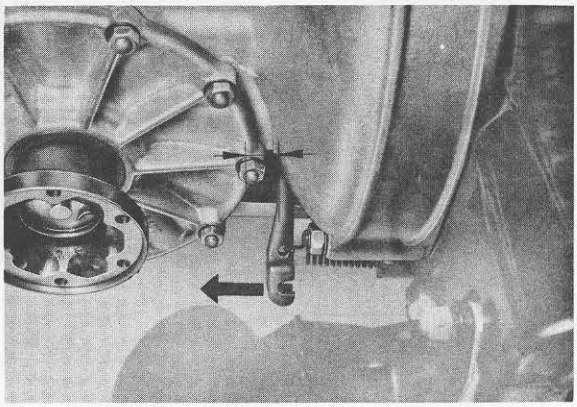


Fig. 175

INSPECTING CLUTCH DISC

1. The clutch linings are riveted to undulated spring segments which curve from side to side and provide a cushioning effect in the clutch disc. It is essential for proper functioning of the clutch that the cushioning action of individual segments is equal in all sections of the clutch disc.

2. The clutch disc should slide freely on the splined input shaft but it must not show evidence of radial play.

3. Inspect clutch linings.
   If the linings are oiled, scorched, torn, or worn considerably, install a new clutch disc.

   Visible formation of cracks in the lining surface between the rivets can be disregarded.

Clutch disc with riveted linings:

Compressed thickness = 9,2 $\pm$ 0,2 mm
(.362" $\pm$ .008")

Wear limit = 8 - 7,8 mm
(.315" - .307")

Measurements are taken between both friction surfaces of the clutch disc.

Thickness A, decompressed = 10,1 - 0.4 mm
(.398" - .016")

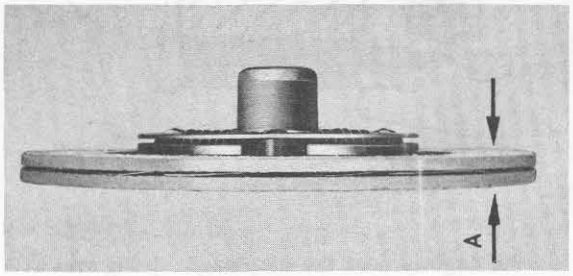


Fig. 176

4. Check clutch disc for runout at linings:
   Permissible runout is 0,6 mm (.024 ").

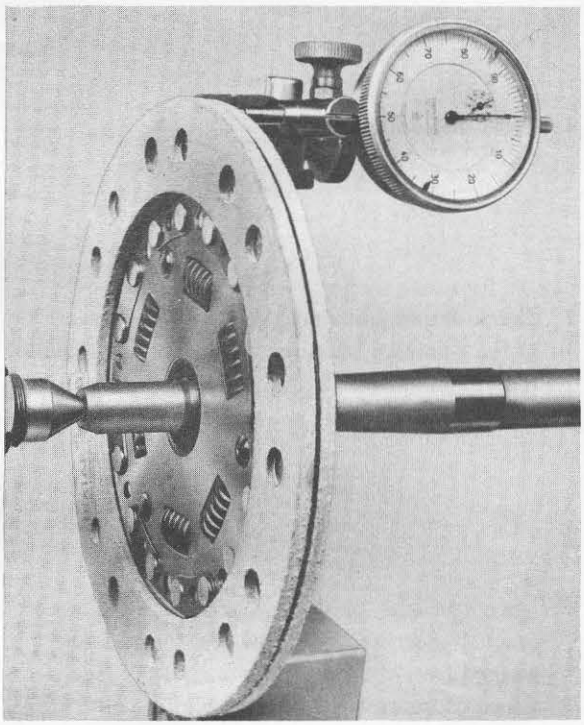


Fig. 177

5. Check torsion damper for firm seating and inspect spring supporting plates for cracks. Replace clutch disc if detective.

Note:

Replacement of clutch linings should not be undertaken; if worn, install a new clutch disc.

Second Edition of this page, March 1967

INSPECTING CLUTCH ASSEMBLY

The Fichtel-Sachs MX 200 K clutch has been designed without provision for repair or overhaul. The clutch inspection is, therefore, limited to a thorough visual examination of the component parts.

1. Clean the clutch.

2. Check diaphragm spring segments for wear in the throwout bearing contact area. Groove formation up to a depth of 0.3 mm (.012") may be disregarded.

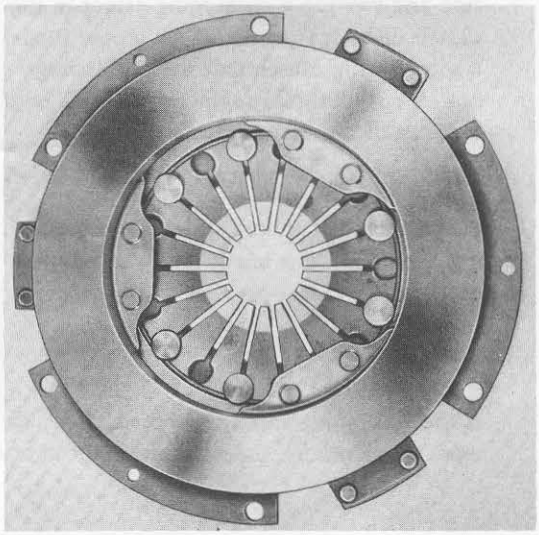


Fig. 179

3. Check pressure plate contact surface for cracks, scorching, or wear. Pressure plates warped inward up to 0,3 mm (.012") (see illustration) are still serviceable.

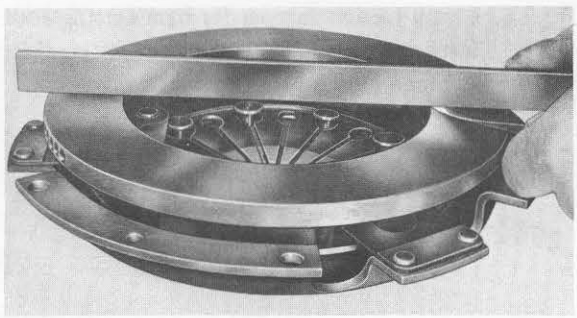


Fig. 178

4. Check attachment points of diaphragm spring and spring housing for cracks. Check rivets for firm seating.
   Clutch assemblies with damaged or loose rivet connections must be replaced.

5. The diaphragm spring is riveted to the spring housing with two wire ring spacers inbetween.

   Clutch assemblies showing visible wear at the rivet heads or at the wire ring spacers should be replaced.

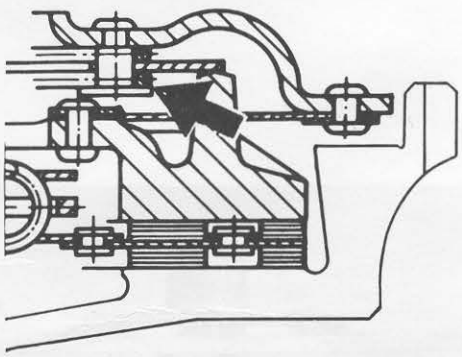


Fig. 180

6. Lightly coat the diaphragm spring seat at the wire ring seating area with MoS_2 paste prior to installation.

ADJUSTING CLUTCH

60 EN

General

Both ends of the clutch cable have threads and may be adjusted at either the clutch control lever in transmission housing or at the clutch pedal. The clutch is correctly adjusted when clutch pedal free travel is 20 - 25 mm (3/4 to 1 in.).

The adjustment should be made with care since insufficient clearance will result in clutch slippage followed by burnt linings.

ADJUSTING CLUTCH FREE-PLAY AT CONTROL LEVER

61 EN

1. With car on stands, loosen lock nut at clutch lever clevis.
2. Adjust clutch free travel (20-25 mm or 3/4 to 1 in.) by turning the adjusting nut.
3. Tighten lock nut when adjustment is made.

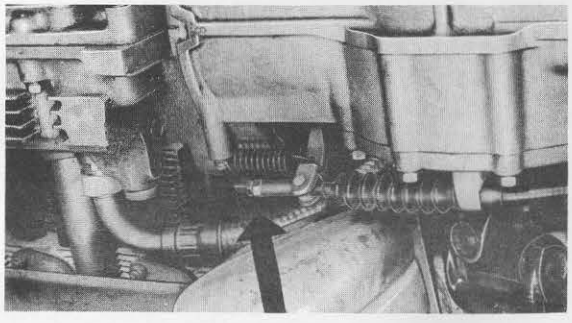


Fig. 181

ADJUSTING CLUTCH FREE - PLAY AT CLUTCH PEDAL

62 EN

1. Remove rubber mat located in front of passenger seat.
2. Raise rubber cover from center tunnel and fold back.
3. Loosen lock nut in threaded part of cable at clevis. Pull retaining spring off clevis pin and withdraw pin.
4. Adjust by turning the clevis. The clevis may be turned only until it is flush with the cable bolt.
5. Tighten lock nut when adjustment is completed check clevis pin retaining spring for proper seating. Thoroughly lubricate threaded part of cable end.

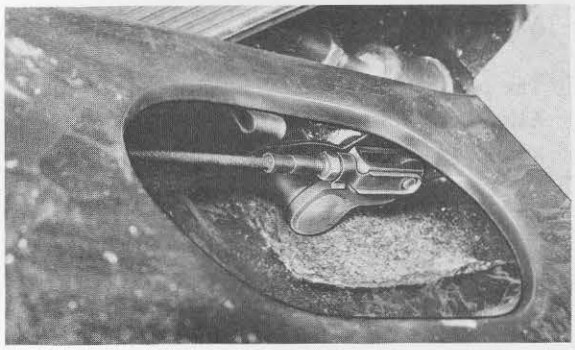


Fig. 182

Second Edition of this page, March 1967

63 EN

Note:

The diaphragm spring clutch requires an exactly limited clutch pedal travel. Whenever work has been performed on the clutch, check and correctly adjust the clutch pedal travel.

Checking

a) Bring transmission to operating temperature.

b) Depress clutch pedal to stop. At this point the reverse gear should silently engage, allowing a quick moment of pause between pedal depression and gearshift movement.

Adjusting

The pedal limiter is secured with two 3 mm Allen head bolts nested in slot holes to permit adjustment.

1. Remove rubber mat.

2. Loosen both limiter retaining bolts with a 3 mm Allen-head wrench.

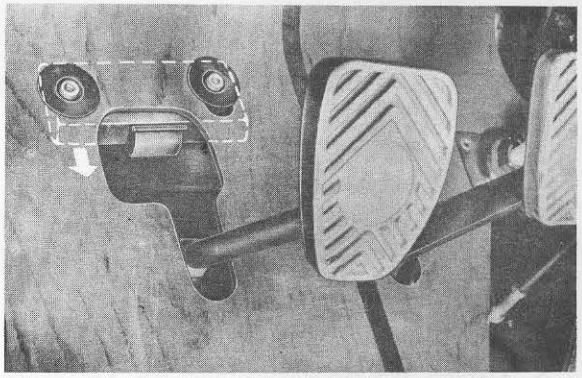


Fig. 183

3. Slide the limiter up or down, as required.

4. Tighten limiter retaining bolts.

5. Check clutch pedal travel as outlined in Point b, above.

REMOVING AND INSTALLING CLUTCH CABLE

Removal

1. Fold back rubber mats in forward leg area.
2. Raise rubber cover from center tunnel and fold back.
3. Loosen lock nut in threaded part of cable at clevis. Pull retaining spring off clevis pin and withdraw pin.

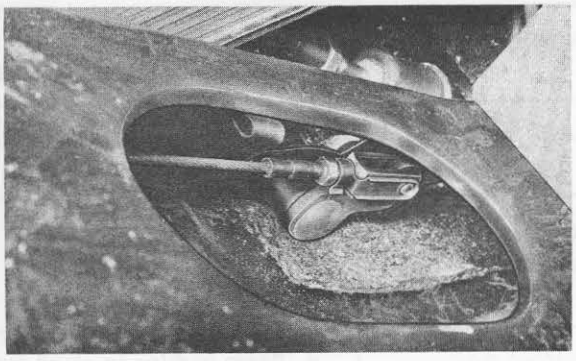


Fig. 184

4. Remove clevis and lock nut from threaded cable end.
5. Pull clutch cable rearward and out.
6. Remove lock nut and adjusting nut from threaded rear part of cable.

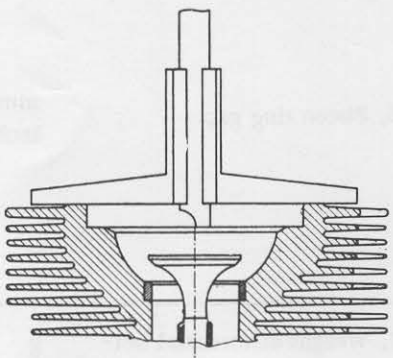
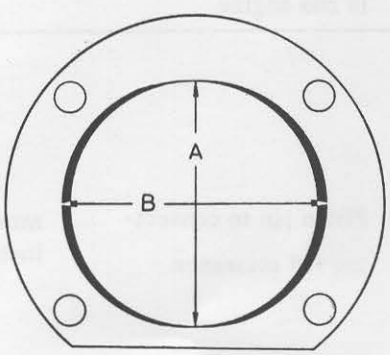
Installation

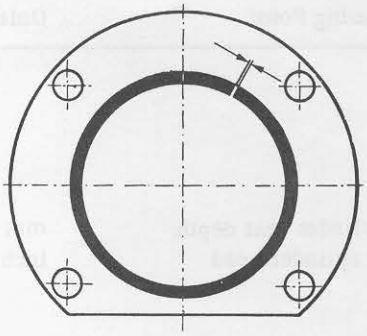
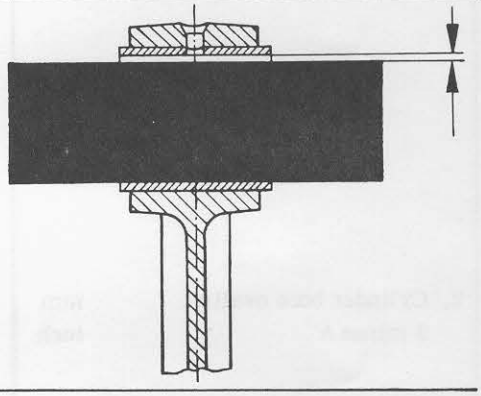
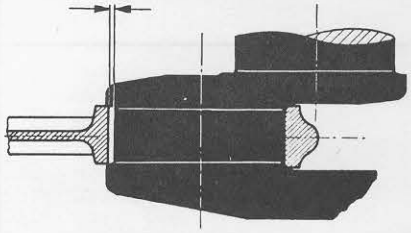
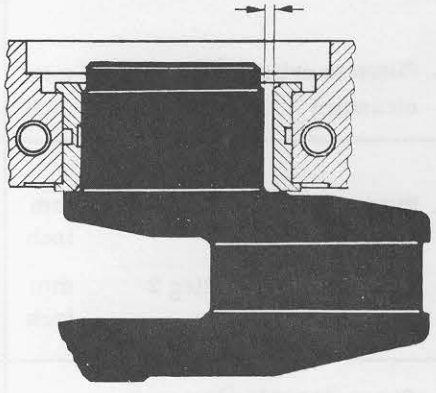
Prior to installation of cable check cable conduit tube and rubber bellows for good condition, replace if defective.

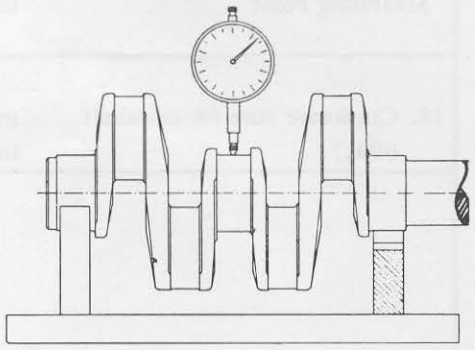
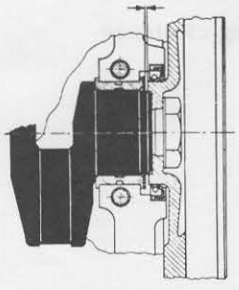
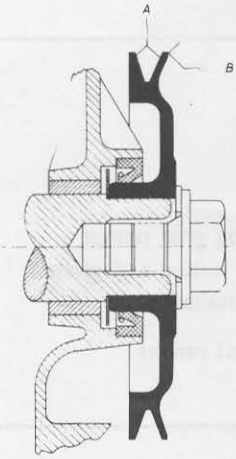
1. Coat cable with grease and guide into cable conduit tube from the rear.
2. Readjust clutch free play.

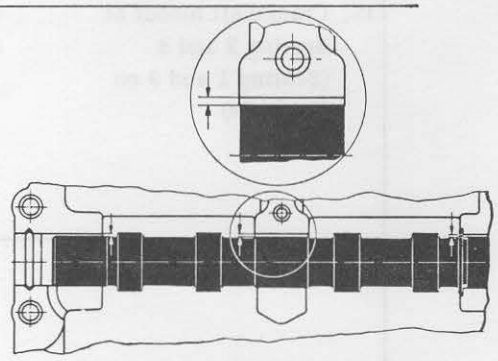
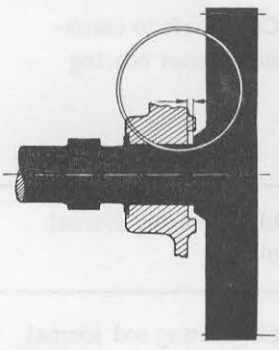
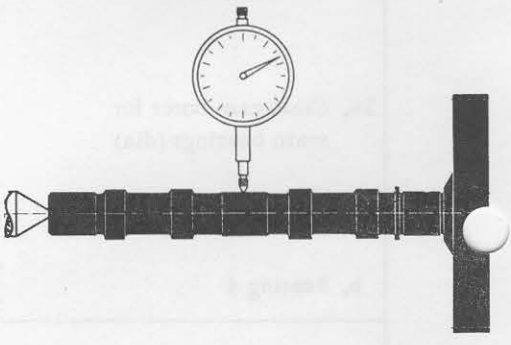
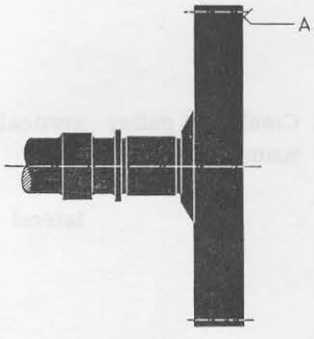
Malfunction	Possible Cause	Remedy
1. Noisy clutch: when disengaging and driving away	a. Worn bushing in flywheel gland nut	a. Install new bushing and fill with 2 cc graphite grease
when disengaging	b. Excessively worn throwout bearing	b. Install new throwout bearing, ensure proper clutch free play
at acceleration or decleration	c. Loose or damaged torsion damper in clutch disc	c. Install new clutch disc
2. Clutch chatters:	a. Loose cable conduit	a. Preload cable conduit
	b. Unsatisfactory action of undulated cushioning segments between disc linings	b. Install new clutch disc
	c. Transmission and engine not firm in support	c. Tighten attaching bolts and nuts. Replace engine and transmission support if damaged
3. Clutch drags:	a. Excessive clutch free play	a. Adjust clutch free play to 20-25 mm pedal travel
	b. Whipping clutch plate or transmission input shaft	b. Straighten or replace clutch disc or input shaft
	c. Clutch disc cushioning segments excessively tensioned	c. Install new clutch disc
	d. Transmission input shaft too tight in flywheel gland nut	d. Ream bushing in gland nut to specifications
	e. Insufficient clutch pedal travel	e. Check clutch pedal travel and adjust travel limiter.
4. Clutch slips:	a. Clutch free play too small, diminishing with clutch disc wear	a. Adjust clutch free play to 20-25 mm at clutch pedal
	b. Oiled or worn clutch disc linings	b. Install new clutch disc, if necessary replace oil seals at transmission or engine
	c. Weak diaphragm spring	c. Install new clutch assembly

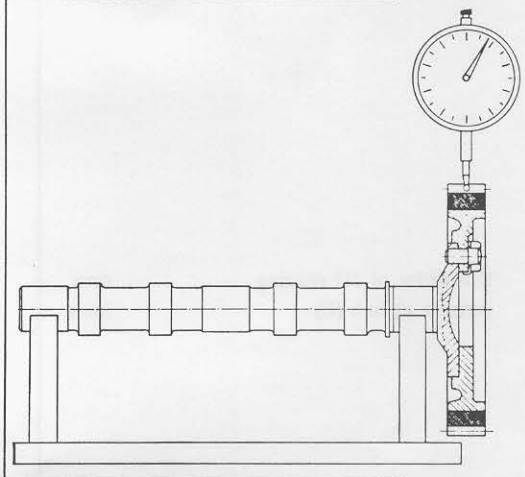
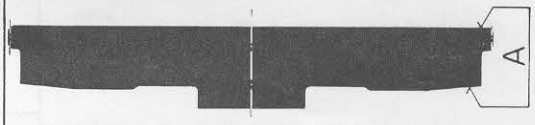
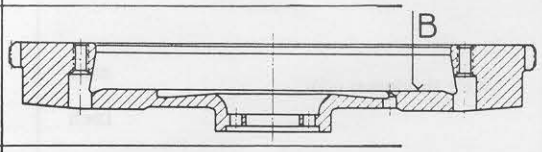
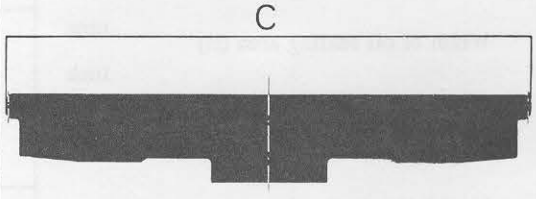
ENGINE

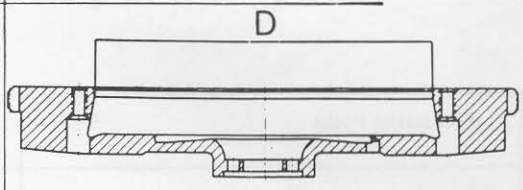
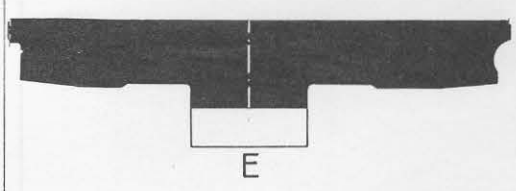
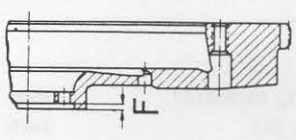
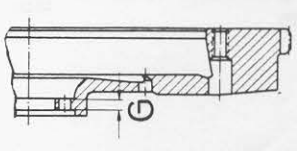
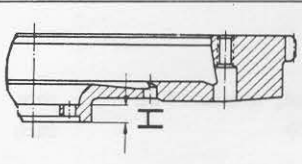
Measuring Point		Unit	Tolerance (new)	Wear Limit	
1. Cylinder seat depth in cylinder head		mm inch	9.500 - 9.600 .374 - .378	10.000 .3937	
2. Cylinder bore ovality, B minus A		mm inch	n/a n/a	0.020 .0008	
3. Piston to cylinder clearance		mm inch	0.041 - 0.059 .0016 - .0023	0.20 .008	
4. Piston ring side clearance	Ring 1	mm inch	0.075 - 0.107 .0030 - .0042	0.25 - 0.30 .0098 - .0118	
	Ring 2	mm inch	0.045 - 0.072 .0018 - .0028	0.25 - 0.30 .0098 - .0118	
5. Piston ring side clearance Oil ring		mm inch	0.025 - 0.052 .0010 - .0020	0.25 - 0.30 .0098 - .0118	

Measuring Point	Unit	Tolerance (new)	Wear Limit	
6. Piston ring gap	mm inch	0.15 - 0.30 .0059 - .0118	0.95 .0374	
7. Weight differential between pistons in one engine	g oz.	5 .176	n/a n/a	
8. Weight differential between connecting rods in one engine	g oz.	6 211	n/a n/a	
9. Piston pin to connecting rod clearance	mm inch	0.012 - 0.028 .0005 - .0011	0.042 .0017	
10. Crank pin to connecting rod clearance	mm inch	0.040 - 0.092 .0016 - .0036	0.130 .0051	
11. Crankshaft to main bearing clearance (bearings installed)				
a. Bearing 1	mm inch	0.028 - 0.078 .0011 - .0031	0.170 .0067	
b. Bearing 2 and 3	mm inch	0.046 - 0.100 .0018 - .0039	0.170 .0067	
c. Bearing 4	mm inch	0.040 - 0.104 .0016 - .0041	0.170 .0067	

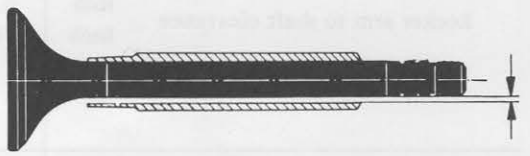
Measuring Point	Unit	Tolerance (new)	Wear Limit	
12. Crankshaft runout at Bearing 2 and 4 (Bearing 1 and 3 on V-blocks)	mm inch	max. 0.020 max. .0008	0.030 .0012	
13. Crankshaft to crankshaft thrust bearing	mm inch	0.13 - 0.18 .0051 - .0071	0.3 .0118	
14. Main bearing journal ovality	mm inch	n/a n/a	0.020 .0008	
15. Connecting rod journal ovality	mm inch	n/a n/a	0.020 .0008	
16. Crankcase bores for main bearings (dia)				
a. Bearing 1 - 3	mm inch	60.235-60.245 2.3715-2.3718	n/a n/a	See page E 83
b. Bearing 4	mm inch	50.000-50.025 1.9685-1.9695	n/a n/a	
17. Crankshaft pulley vertical runout	mm inch	A max. 0.250 A max. .0098	n/a n/a	
lateral	mm inch	B max. 0.250 B max. .0098	n/a n/a	

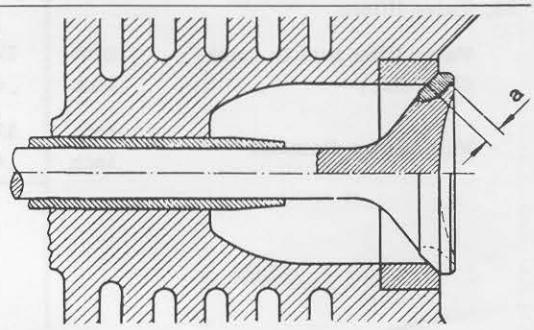
Measuring Point	Unit	Tolerance (new)	Wear Limit	
18. Crankcase bore for camshaft (dia,)	mm inch	24.020 - 24.041 .9457 - .9465	24.070 .9476	
19. Camshaft:				
Bearing clearance	mm inch	0.020 - 0.054 .0008 - .0021	0.120 .0047	
				
End play, at thrust end	mm inch	0.040 - 0.080 .0016 - .0031	0.100 .0039	
				
Center bearing runout (camshaft mounted on centers)	mm inch	0.020 .0008	0.025 .0010	
20. Timing gear runout (gear bolted and pinned to camshaft):				
Lateral runout	mm inch	max. 0.100 max. .0039	n/a n/a	

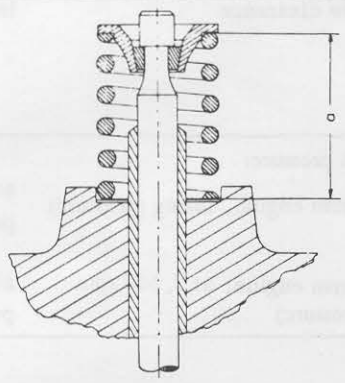
Measuring Point	Unit	Tolerance (new)	Wear Limit	
Timing gear runout (gear bolted and pinned to camshaft-- continued from preceding page)				
Gear blacklash	mm inch	0.015 - 0.040 .0006 - .0016	n/a n/a	
Vertical runout	mm inch	0.025 .0010	0.040 .0016	
21. Flywheel:				
Lateral runout, measured at starter ring (A)	mm inch	max. 0.300 max. .0118	n/a n/a	
Lateral runout, measured in clutch plate recess (B)	mm inch	max. 0.040 max. .0016	n/a n/a	
Vertical runout, measured at starter ring (C)	mm inch	max. 0.20 max. 0.0008	n/a n/a	

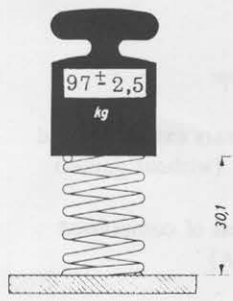
Measuring Point	Unit	Tolerance (new)	Wear Limit	
Vertical runout, measured in clutch disc recess (D)	mm inch	max. 0.100 max. .0039	n/a	
Unbalance, measured with crankshaft	cmg oz/in.	max. 5 max. .069	n/a n/a	
Diameter of oil sealing surface at hub (E)	mm inch	59.900 - 60.100 2.3583 - 2.3661	59.700 2.3504	
Depth of recess to web (F)	mm inch	3.10 - 3.15 .1220 - .1240	n/a n/a	
Web thickness (G)	mm inch	6.3 - 6.85 .2480 - .2697	min. 4.800 min. .1890	
Width of oil sealing area (H)	mm inch	9.250 - 10.250 .3642 - .4035	n/a n/a	
Machining starter ring gear teeth	mm inch	n/a n/a	max. 2.000 max. .0787	
22. Valve stem diameter: Intake valve	mm inch	9.990 - 9.978 .3933 - .3928	9.940 .3701	
Exhaust valve	mm inch	9.970 - 9.958 .3925 - .3920	9.940 .3701	

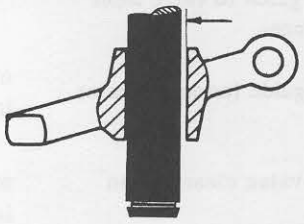
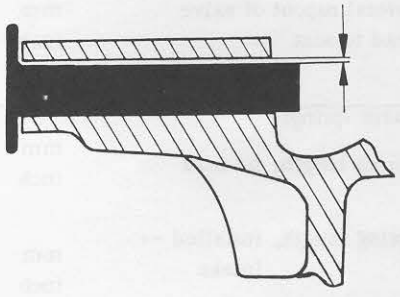
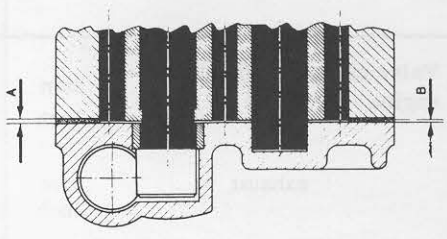
Measuring Point	Unit	Tolerance (new)	Wear Limit
23. Valve guide to valve stem clearance:			
a) Valve guide inside diameter	mm inch	10.025 - 10.040 .3947 - .3953	10.070 .3965
b) Intake valve clearance in bore	mm inch	0.035 - 0.060 .0014 - .0024	0.120 .0047
c) Exhaust valve clearance in bore	mm inch	0.055 - 0.080 .0022 - .0031	0.120 .0047
24. Valve seat:			
Intake seat width (a)	mm inch	1.25 ± 0.15 .0492 ± .0059	n/a n/a
Exhaust seat width (a)	mm inch	1.55 ± 0.15 .0610 ± .0059	n/a n/a
Lateral runout of valve head to seat	mm inch	0.010 .0004	n/a n/a
25. Valve springs:			
Spring length, no load	mm inch	47 1.85	n/a n/a
Spring length, installed -- intake	mm inch	41 1,61	n/a n/a
exhaust	mm inch	40,5 1,59	n/a n/a
Spring force when compressed to 41 mm length	kg lbs	36 ± 1,5 kg 79 ± 3,3	n/a n/a
Spring force when compressed to 30.1 mm length	kg	97 ± 2,5	n/a
	lbs	213 ± 5,5	n/a
26. Valve clearance in cold engine --- intake	mm inch	0.10 .004	n/a n/a
exhaust	mm inch	0.15 .006	n/a n/a

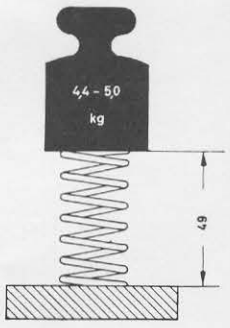








Measuring Point	Unit	Tolerance (new)	Wear Limit	
27. Rocker arm, inside diameter	mm inch	16.000 - 16.018 .6299 - .6306	16.035 .6313	
Rocker arm shaft, outside diameter	mm inch	15.984 - 15.973 .6293 -.6289	15.965 .6285	
Rocker arm to shaft clearance	mm inch	0.016 - 0.045 .0006 - .0018	0.070 .0028	
28. Valve lifters:				
Valve lifter bore in crankcase (dia.)	mm inch	12.000 - 12.018 .4724 - .4731	12.060 .4748	
Valve lifter diameter	mm inch	11.966 - 11.984 .4711 - .4718	11.945 .4703	
Valve lifter to crankcase bore clearance	mm inch	0.016 - 0.052 .0006 - .0020	0.100 .0039	
29. Oil pressure:				
Warm engine, idling (pressure)	atm psi	0.5 minimum 7.3 minimum	-- --	
Warm engine, at 2.500 rpm (pressure)	atm psi	3.0 minimum 44 minimum	2,0 29	
30. Oil pump:				
Pump gears extend beyond housing (without gasket)	mm inch	0.06 - 0.125 .0024 - .0049	n/a n/a	
Thickness of compressed gasket (A)	mm inch	0.16 .0063	n/a n/a	
Gear end play, with gasket and cover installed (B)	mm inch	0.035 - 0.10 .0014 - .0039	0.20 .0079	
Gear backlash	mm inch	0.030 - 0.080 .0012 - .0031	n/a n/a	

Measuring Point	Unit	Tolerance (new)	Wear Limit	
31. Spring for pressure relief valve spring in crankcase, and Spring for bypass valve in timing gear cover:				
Free length	mm	66	n/a	
	inch	2.6	n/a	
Spring pressure when compressed to 49 mm length	kp	4.7 ± 7 %	n/a	
	lbs	10.4 ± 7 %	n/a	
Spring wire cross-section (diameter)	mm	1.4	n/a	
	inch	.055	n/a	
32. Oil pressure switch opens at pressure of	atm	0.3 - 0.6	n/a	
	psi	4.4 - 8.8	n/a	

TORQUE VALUES FOR BOLTS AND NUTS

(1 mkp = 7.233 lbs/ft)

	mkp	lbs/ft
Crankcase bolts	2.5	18
Timing gear cover nuts	2.0	14.5
Connecting rod nuts (without safety plates)	4.5	32.5
Cap nuts for through - bolts	4.0	28.9
Cylinder head nuts	3.0	21.7
Rocker arm carrier retaining bolts	5.0	36.2
Camshaft gear retaining nuts	2.5	18
Rocker arm shaft retaining nuts	2-2.5	14.5 - 18
Blower impeller retaining nut	10.0	72.3
Flywheel gland nut	35-37	253 - 268