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English

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SERVICE

without guesswork

Dick Van Lier

Valid for:

Standard Sedan

De Luxe Sedan, VW Convertible,

Karmann Ghia Models .. up to Chassis No. 3 192 906 (July 1960)

VW Transporter ..... up to Chassis No. 614 455 (May 1960)

VW Industrial Motor .... up to Engine No. 122-073 000 (July 1960)

SERVICE DATA AND SPECIFICATIONS

VW Passenger Cars
VW Transporters
VW Industrial Engine
(All models and versions)

This compact volume presents in ready reference form all specifications and limits for fitting or adjusting parts or units of the VW models.
It is a pocket reference book designed for the assistance of VW specialists.

VOLKSWAGENWERK AG · WOLFSBURG

CONTENTS

ENGINE

I. Tolerances and Wear Limits

The term Wear Limit means that parts which approach, or have already reached, the limit given should not be re-used when carrying out an overhaul. When deciding the wear limit of pistons and cylinders, due consideration should also be given to the oil consumption of the respective engine.

a – 25 b.h.p, 30 b.h.p. engines and Industrial engine	Tolerance Limits (new parts)	Wear Limits
Engine		
1 – Cylinder seating depth in cylinder head	12.90–13.00 mm (.508"–.512")	14.50 mm (.571")
2 – Cylinder ..... out of round		0.01 mm (.0004")
3 – Piston / cylinder ..... clearance	0.036–0.055 mm (.0014"–.0022")	0.20 mm (.008")
4 – Upper and lower compression ring		
30 b.h.p. ..... side clearance	0.045–0.072 mm (.0018"–.0028")	0.10 mm (.004")
25 b.h.p. ..... side clearance	0.035–0.062 mm (.0014"–.0024")	0.10 mm (.004")
5 – Oil scraper ring ..... side clearance	0.025–0.052 mm (.001"–.002")	0.10 mm (.004")
6 – Both compression rings		
30 b.h.p. ..... gap	0.30–0.45 mm (.012"–.018")	0.95 mm (.037")
Oil scraper ring 30 b.h.p. .... gap	0.25–0.40 mm (.010"–.016")	0.95 mm (.037")
All three piston rings 25 b.h.p. ..... gap	0.30–0.45 mm (.012"–.018")	0.95 mm (.037")
7 – Difference in weights of pistons in one engine		
30 b.h.p.	max. 5 grams (2.8 drams)	
25 b.h.p.	max. 10 grams (5.6 drams)	
8 – Difference in weights of con. rods in one engine	max. 5 grams (2.8 drams)	
9 – Piston pin / bearing ..... clearance	0.005–0.026 mm (.0002"–.001")	0.05 mm (.002")
10 – Connecting rod bearing ..... clearance	0.019–0.074 mm (.0007"–.003")	0.15 mm (.006")
end play	0.170–0.395 mm (.0070"–.0156")	0.70 mm (.03")

		Tolerance Limits (new parts)	Wear Limits
11 – Crankshaft main bearing (Consideration being paid to a preload of 0.025 mm / 0.001" exerted by the crankcase)			
Bearings 1 to 4	clearance	0.047–0.102 mm (.0019"–.004")	0.19 mm (.007")
12 – Crankshaft at 2nd and 4th main bearing journals (1st and 3rd bearing journals on V-blocks) -	run-out		0.03 mm (.0012")
13 – Crankshaft / main bearing 1 (fitted with three shims)	end play	0.070–0.120 mm (.003"–.005")	0.15 mm (.006")
14 – Crankshaft, 30 b.h.p. only	unbalance	max. 8 cmg (.11 oz. in.)	
15 – Main bearing journal	out of round		0.03 mm (.0012")
16 – Crank pins	out of round		0.03 mm (.0012")
17 – Crankshaft bore in crankcase			
a – Bearings 1 to 3	diameter	60.000–60.019 mm (2.3622"–2.3630")	
b – Bearing 4	diameter	50.000–50.025 mm (1.9685"–1.9695")	
18 – Fan pulley, 30 H.P.	radial run-out	max. 0.8 mm (.031")	
	lateral run-out	max. 0.3 mm (.012")	
25 H.P.	radial run-out	max. 1.0 mm (.039")	
	lateral run-out	max. 1.0 mm (.039")	
19 – Camshaft bore in crankcase ...	diameter	24.020–24.041 mm (.9457"–.9465")	24.070 mm (.9476")
20 – Camshaft	clearance	0.020–0.054 mm (.0008"–.0021")	0.12 mm (.005")
	end play	0.020–0.074 mm (.0008"–.0029")	0.10 mm (.004")
(between two points, measured at intermediate bearing)	run-out	0.02 mm (.0008")	0.04 mm (.0016")
21 – Camshaft timing gear	lateral run-out	0.10 mm (.004")	
	backlash	0.00–0.052 mm (.002")	

		Tolerance Limits (new parts)	Wear Limits
22 – Flywheel	lateral run-out	max. 0.30 mm (.012")	
(at gear ring)	radial run-out	max. 0.40 mm (.016")	
	unbalance	max. 5 cmg	
Flange	outer diameter	59.90–60.10 mm (2.3583"–2.3661")	59.70 mm (2.3504")
	height	min. 12.5 mm (.4921")	
	crankshaft seating depth	3.22–3.25 mm (.1268"–.1280")	
	thickness of collar in flange	6.3–6.7 mm (.25"–.26")	min. 4.8 mm (.189")
providing flywheel face with recess of 110 mm (4.33") around flange	wall thickness		min. 4.4 mm (.173")
removing metal from gear ring			max. 2.0 mm (.079")
23 – Valve stem: intake	diameter	6.956–6.955 mm (.2742"–.2738")	6.920 mm (.2724")
exhaust	diameter	6.955–6.945 mm ⌀ (.2738"–.2734")	6.920 mm (.2724")
	out of round	0.01 mm (.0004")	

24 – Valve guides:			
30 H.P. intake	inside dia.	7.008–7.023 mm (.2759"–.2765")	7.070 mm (.2783")
exhaust	inside dia.	7.023–7.038 mm (.2765"–.2767")	7.080 mm (.2787")
25 H.P. intake and exhaust	inside dia.	7.000–7.015 mm ⌀ (.2756"–.2762")	7.070 mm (.2783")
25 – Valve guide / valve stem:			
30 H.P. intake	clearance	0.043–0.068 mm (.0017"–.0027")	0.15 mm (.006")
exhaust	clearance	0.068–0.093 mm (.0027"–.0037")	0.16 mm (.0063")
25 H.P. intake	clearance	0.035–0.060 mm (.0014"–.0024")	0.15 mm (.006")
exhaust	clearance	0.045–0.070 mm (.0018"–.0028")	0.15 mm (.006")
26 – Valve seat:			
intake	width	1.3–1.6 mm (.051"–.063")	
exhaust	width	1.7–2.0 mm (.067"–.079")	
valve seating face	run-out	0.01 mm (.0004")	
27 – Valve springs:			
free length 43 mm (1.7") loaded length 28 mm (1.1")	load	33.4 kg ± 1.7 kg (73.6 ± 3.7 lbs.)	28 kg (61.6 lbs.)

	Tolerance Limits (new parts)	Wear Limits
28 – Valve clearance (with engine cold) intake and exhaust ..... adjustment	0.10 mm (.004")	
29 – a) Rocker arm ..... inside dia.	15.990–16.018 mm (.6295"–.6306")	16.035 mm (.6313")
b) Rocker arm shaft ..... dia.	15.984–15.966 mm (.6293"–.6285")	15.935 mm (.6281")
c) Rocker arm / rocker arm shaft clearance	0.006–0.052 mm (.0002"–.0020")	0.080 mm (.0031")
30 – a) Valve push rod bore in crankcase ..... dia.	15.000–15.018 mm (.5905"–.5912")	15.060 mm (.5932")
b) Valve push rod ..... dia.	14.984–14.966 mm (.5899"–.5892")	14.955 mm (.5888")
c) Bore / valve push rod ..... clearance	0.016–0.052 mm (.0006"–.0020")	0.120 mm (.0047")
31 – Valve push rod / guide plate .. clearance	The valve push rod should glide through the guide by its own weight at the lowest possible clearance	0.02 mm (.0008")

32 – Compression (To be checked with the throttle open and the engine having attained operating temperature, all spark plugs removed, pressure gauge in spark plug seat and the engine turned over by the starter motor)		
30 b.h.p. ..... pressure	7.0–8.5 kg./sq.cm. (100–121 lbs./ sq. in.)	4.5 kg./ sq.cm. (64 lbs./ sq. in.)
25 b.h.p. ..... pressure	6.0–7.5 kg./sq.cm. (85–107 lbs./ sq. in.)	4.0 kg./ sq.cm. (57 lbs./ sq. in.)
33 – Oil pump:		
End play of gears with cover removed and gasket in situation	0.066–0.183 mm (.0026"–.0072")	0.20 mm (.008")
End play of gears with cover and gasket removed		0.10 mm (.004")
Oil pump gears ..... backlash	0.03–0.08 mm (.0012"–.0031")	

		Tolerance Limits (new parts)	Wear Limits
34 – Oil pressure (only for SAE 20 oil):			
a) with engine having attained operating temperature (at idling speed)	25 and 30 b.h.p.	min. 0.5 kg./sq.cm. (7 lbs. / sq. in.)	
b) at oil temperature of 70 °C (158 °F) and 2500 engine r.p.m.	30 b.h.p.	min. 2.0 kg./sq.cm. (28 lbs. / sq. in.)	
	25 b.h.p.	1.6–1.8 kg./sq.cm. (23–26 lbs. / sq. in).	
35 – Spring for oil pressure relief valve	free length	52–53 mm (2.05"–2.09")	
36 – Oil pressure contact opens	pressure	0.3–0.6 kg./sq.cm. (4.3–8.5 lbs./sq.in.)	
37 – Distance from fan housing to upper edge of throttle ring ...	adjustment	20 mm (.8")	
38 – Thermostat: after a water bath of 75 to 80 °C (170 to 180 °F) ...	length	min. 46 mm (1.81")	

b – Transporter engine from May 1959 (from Chassis No. 469 447) with the following alterations:		Tolerance limits (new parts)	Wear Limits
4 – a) Upper compression ring	side clearance	0.065–0.092 mm (.0026"–.0036")	0.12 mm (.0047")
b) Lower compression ring	side clearance	0.045–0.072 mm (.0018"–.0028")	0.10 mm (.0039")
9 – Piston pin/bearing	clearance	0.003–0.016 mm (.0001"–.0006")	0.04 mm (.0016")
10 – Connecting rod bearing	clearance	0.018–0.076 mm (.0007"–.0030")	0.15 mm (.0059")
11 – Crankshaft main bearing (Consideration being paid to the preload exerted by the crankcase)	end play	0.1–0.4 mm (.004"–.016")	0.7 mm (.028")
a) Bearing 1 to 3	clearance	0.025–0.087 mm (.0010"–.0034")	0.18 mm (.0071")
from Engine No. 3 472 700	clearance	0.035–0.090 mm (0.00137"–0.0035")	0.18 mm (0.0071")
from Engine No. 3 520 333	clearance	0.036–0.098 mm (0.00142"–0.0039")	0.18 mm (0.0071")
b) Bearing 4	clearance	0.047–0.102 mm (.0019"–.0040")	0.19 mm (.0075")
13 – Crankshaft bearing 2	end play	0.064–0.130 mm (.0025"–.0051")	0.15 mm (.0059")
from Engine No. 3 491 700: Crankshaft/crankshaft bearing 1	end play	0.065–0.125 mm (0.0026"–0.0049")	0.15 mm (0.0059")

		Tolerance limits (new parts)	Wear Limits
17 – Crankshaft bore in crankcase a) Bearings 1–3	diameter	60.000–60.019 mm (2.3622"–2.3630")	
from Engine No. 3 520 333	diameter	65.000–65.019 mm (2.5591"–2.5598")	
19 – Camshaft bore in crankcase	diameter	25.020–25.041 mm (.9850"–.9859")	25.070 mm (.9870")
20 – Camshaft	end play	0.030–0.084 mm (.0024"–.0040")	0.10 mm (.0039")
22 – Flywheel: Flange	outer dia.	69.9–70.1 mm (2.75"–2.76")	69.70 mm (2.74")
23 – Valve stem: intake	diameter	7.950–7.940 mm (.3130"–.3126")	7.900 mm (.3110")
exhaust	diameter	7.920–7.910 mm (.3118"–.3114")	7.870 mm (.3098")
24 – Valve guides: intake and exhaust	inner dia.	8.000–8.015 mm (.3150"–.3156")	8.060 mm (.3173")
25 – Valve guide/valve stem: intake	clearance	0.050–0.075 mm (.0020"–.0030")	0.16 mm (.0063")
exhaust	clearance	0.080–0.105 mm (.0031"–.0041")	0.16 mm (.0063")
26 – Valve seat: c) valve seating face	run-out	0.015 mm (.0006")	

27 – Valve springs: free length 47.9 mm (1.96") loaded length 34.3 mm (1.32")	load	46.3 ± 2 kg (102 lbs. ± 4 lbs.)	38 kg (84 lbs.)
29 – a) Rocker arm	inside dia.	18.000–18.018 mm (.7087"–.7094")	18.035 mm (.7100")
b) Rocker arm shaft	diameter	17.984–17.966 mm (.7080"–.7073")	17.955 mm (.7069)
c) Rocker arm/rocker arm shaft	clearance	0.016–0.052 mm (.0006"–.0020")	0.080 mm (.0031")
30 – a) Valve cam follower bore in crankcase	diameter	19.000–19.021 mm (.7480"–.7489")	19.060 mm (.7504")
b) Cam follower	diameter	18.980–18.959 mm (.7472"–.7464")	18.050 mm (.7106")
c) Bore/cam follower	clearance	0.020–0.062 mm (.0008"–.0024")	0.120 mm (.0047")
34 – Spring for oil pressure relief valve, free length	length	63 ± 1 mm (2.48" ± .04")	

Clutch

1 – Clutch driven plate	lateral run-out	max. 0.5 mm (.02")
Transporter engine from May 1959	lateral run-out	max. 0.8 mm (.03")
2 – Clutch thrust spring		

		Tolerance limits (new parts)	Wear Limits
Passenger Cars:			
length, unloaded 51.7 mm (2.04") loaded 29.4 mm (1.16")	load	55–60 kg (121–132 lbs.)	49 kg (108 lbs.)
Transporters:			
a) inner spring ..... length, unloaded 49.5 mm (1.95")	dia.	17.65 mm (.69")	
loaded 26.2 mm (1.03")	load	16–18 kg (35–40 lbs.)	13.6 kg (30 lbs.)
b) outer spring ..... length, unloaded 49.5 mm (1.95")	dia.	25.5 mm (1.0")	
loaded 29.4 mm (1.16")	load	49–52 kg (108–114 lbs.)	44.2 kg (97 lbs.)
3 – Clutch pedal free-play		10–20 mm (.4"–.8")	
4 – Clutch pressure plate	run-out		0.10 mm (.004")
5 – Clutch release plate	run-out		0.30 mm (.012")
6 – Clutch assy	unbalance	max. 15 cmg	

II. Technical Data and Specifications

	1131 c.c.	1192 c.c.
Bore	75 mm dia. (3.0")	77 mm dia. (3.03")
Stroke	64 mm (2.520")	64 mm (2.520")
Piston displacement	1131 c.c. (69.02 cu.ins.)	1192 c.c. (72.74 cu.ins.)
Compression ratio	5.8	6.1 and 6.6
Max horsepower	25 at 3300 r.p.m.	30 at 3400 r.p.m.
Industrial Engine	22 at 3000 r.p.m.	25 at 3000 r.p.m.
Maximum torque	7.0 mkg at 2000 r.p.m. (51 ft. lbs.)	7.7 mkg at 2000 r.p.m. (56 ft. lbs.)
Transporter engine from May 1959	–	8.0 mkg at 2000 r.p.m. (58 ft. lbs.)
Weight	approx. 90 kg (198 lbs.)	approx. 90 kg (198 lbs.)
Industrial engine [1]	approx. 85 kg (187 lbs.)	approx. 85 kg (187 lbs.)
Transporter engine from May 1959	–	approx. 100 kg (220 lbs.)

[1] Standard engine, ready for use.

Amount of cooling air ..... approx. 500 l/sec. at 3300 engine r.p.m. (18 cu. ft./sec.)

Industrial Engine ..... approx. 450 l/sec. at 3000 engine r.p.m. (16 cu. ft./sec.)

Valve timing with a valve clearance of 1 mm (0.04")	1131 and 1192 c.c. 69.02 and 72.74 cu. in.	Transporter engine from May 1959
Intake opens	2.5° before T.D.C.	2° after T.D.C.
Intake closes	37.5° after B.D.C.	24° after B.D.C.
Exhaust opens	37.5° before B.D.C.	32° before B.D.C.
Exhaust closes	2.5° after T.D.C.	9° before T.D.C.

Firing order			1 – 4 – 3 – 2
Spark plug gap:	Battery ignition	0.7 ± 0.1 mm	(.028" ± .004")
	Magneto ignition	0.4–0.5 mm	(.016" to .020")
Breaker point gap:	Battery ignition	0.4 mm	(.016")
	Magneto ignition	0.3–0.4 mm	(.012" to .016")

	1131 c.c.	1192 c.c.
Ignition distributor:		
Passenger cars	Bosch VE 4 BRS 383	Bosch VJU 4 BR 3
from Chassis No. 1-0 707 742	–	Bosch VJU 4 BR 8
from Chassis No. 1 113 449	–	Bosch VJU (R) 4 BR 8
Karmann Ghia Models:		
from Chassis No. 2 533 158	–	Bosch ZV JUR 4 R 1
from Chassis No. 2 849 651	–	Bosch ZV PAU (R) 4 R 1
Transporter	Bosch VE 4 BRS 383	Bosch VJ 4 BR 3
from Chassis No. 20-095 421	–	Bosch VJ 4 BR 8
from Chassis No. 20-144 690	–	VW 211 905 205 B
from Chassis No. approx. 170 000	–	Bosch VJ (R) 4 BR 8
from Chassis No. 469 447	–	Bosch VJ (R) 4 BR 25
from Chassis No. 580 201	–	VW 211 905 205 H

Industrial Engine:		Scintilla OAP 4 L 402 Z 144	
Magneto ignition		400–0° 1500–16°/1900	400–0° 1750–12½°/1900
Battery ignition		Bosch VE 4 BRS 383	Bosch VJ 4 BR 3 and 8
Spark timing		5° before T.D.C.	7.5° before T.D.C.
Spark plugs:			
Thread		14 mm (.6")	14 mm (.6")
Heat range		175	175
Types:	Bosch	W 175 T 1 and T 1 A	W 175 T 1
	Beru	175/14 u 2	175/14
	AC	44	43 L
	Auto-Lite		AE 6 or AER 6
	Champion	L 10 or L 85	L 10 S or L 85
	Firestone		147
	KLG		F 70
	Lodge	HD 14	H 14
Magneto ignition	Bosch	W 175 T 1 EA 0.5 FP	W 175 T 1 EA 0.5 FP
	Beru	175/14 (0.4–0.5)	175/14 (0.4–0.5)

III. Charts

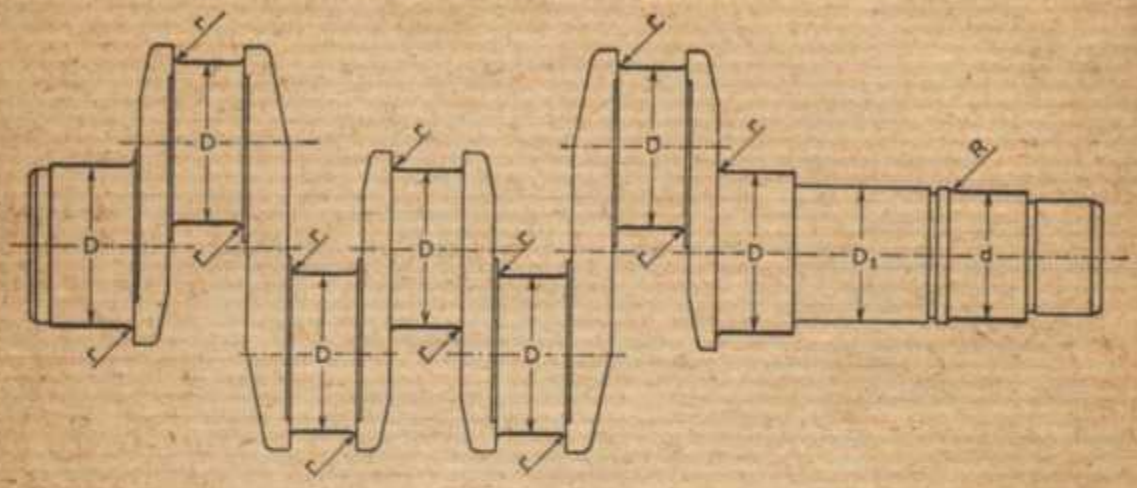
a – Dimensions and Grading Marks of Cylinders and Pistons

Engine		1131 c.c.		1192 c.c.	
	Color	Cylinder mm dia.	Corresponding Piston mm dia.	Cylinder mm dia.	Corresponding Piston mm dia.
Standard Size		Nominal Dimension 75.0 mm dia.		Nominal Dimension 77.0 mm dia.	
	Blue	74.990–74.999	74.95	76.990–76.999	76.95
	Pink	75.000–75.009	74.96	77.000–77.009	76.96
	Green	75.010–75.020	74.97	77.010–77.020	76.97
1st Oversize		Nominal Dimension 75.5 mm dia.		Nominal Dimension 77,5 mm dia.	
	Blue	75.490–75.499	75.45	77.490–77.499	77.45
	Pink	75.500–75.509	75.46	77.500–77.509	77.46
	Green	75.510–75.520	75.47	77.510–77.520	77.47
2nd Oversize		Nominal Dimension 76.0 mm dia.		Nominal Dimension 78.0 mm dia.	
	Blue	75.990–75.999	75.95	77.990–77.999	77.95
	Pink	76.000–76.009	75.96	78.000–78.009	77.96
	Green	76.010–76.020	75.97	78.010–78.020	77.97

Weight Grading

1131 c.c.	Paint Line	Brown Grey	Weight 250–260 grams 260–270 grams
1192 c.c.			Concave-head Pistons / Flat-head Pistons
	Brown (=– weight)		265–270 grams / 275–280 grams
	Grey (=+ weight)		270–275 grams / 280–285 grams
Color	Piston pins mm dia.		Piston pins mm dia.
Black	19.994–19.997		19.996–19.999 (.78724"–.78736")
White	19.997–20.000		19.999–20.001 (.78736"–78744")
Green	20.001–20.004		piston pins only

b – Regrinding Crankshaft
(Not valid for Transporter Engine from May 1959)



$D_1 = \frac{42.006}{41.995}$ mm dia. (1.6538" / 1.6533") $R = \frac{4.0}{3.5}$ mm (0.16" / 0.14")

$r = \frac{2.0}{1.5}$ mm (0.08" / 0.06")

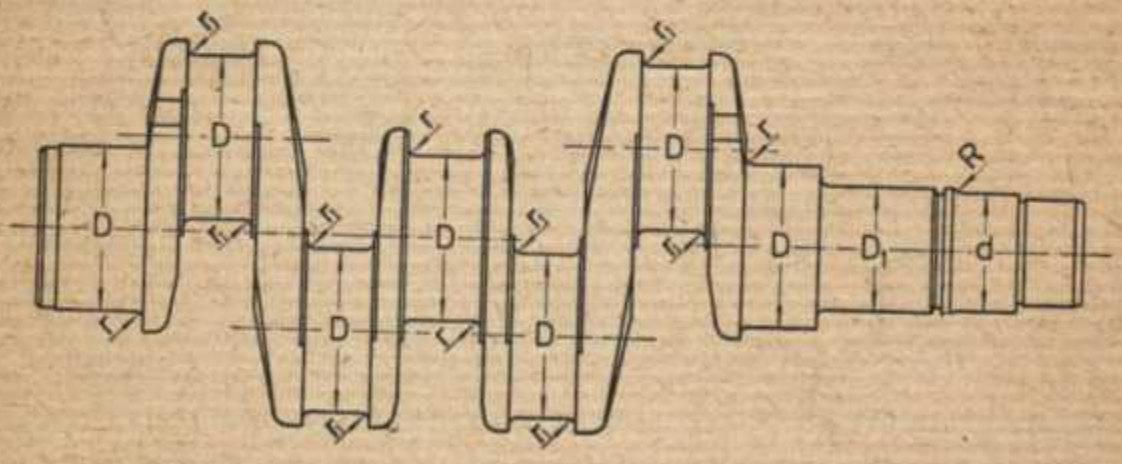
	Bearing Journals 1–3 and Crank Pins D				
	Nominal Dia.	Ground Dia.		Lapped Dia.	
		mm	ins.	mm	ins.
Standard	50.00 mm 1.9685"	–	–	49.991 49.975	1.9681 1.9675
1st Undersize	49.75 mm 1.9586"	49.750 49.741	1.9586 1.9583	49.741 49.725	1.9583 1.9577
2nd Undersize	49.50 mm 1.9488"	49.500 49.491	1.9488 1.9484	49.491 49.475	1.9484 1.9478
3rd Undersize	49.25 mm 1.9390"	49.250 49.241	1.9390 1.9386	49.241 49.225	1.9386 1.9380

The crankshaft is lapped to final size. Strictly keep to the dimensions given.

	Nominal Dia.	Bearing Journals 4 (d) Ground Dia. mm	ins.	Lapped dia. mm	ins.
Standard	40.00 mm 1.5748"	—	—	40.000 39.984	1.5748 1.5742
1st Undersize	39.75 mm 1.5650"	39.760 39.750	1.5633 1.5649	39.750 39.734	1.5650 1.5643
2nd Undersize	39.50 mm 1.5551"	39.510 39.500	1.5555 1.5551	39.500 39.484	1.5551 1.5545
3rd Undersize	39.25 mm 1.5453"	39.260 39.250	1.5457 1.5455	39.250 39.234	1.5453 1.5446

The crankshaft is lapped to final size. Strictly keep to the dimensions given.

Transporter engine from May 1959 (from Chassis No. 469 447)



$D_1 = \frac{42.006}{41.995}$ mm dia. $\frac{1.6538"}{1.6533"}$ $\quad R = \frac{4.0}{3.5}$ mm $\frac{0.16"}{1.15"}$ $\quad r = \frac{2.0}{1.5}$ mm $\frac{0.08"}{0.06"}$

$r_1 = \frac{3.0}{2.5}$ mm $\frac{0.12"}{0.10"}$

	Bearing Journals 1–3 and Crank Pins D				
	Nominal Dia.	Ground Dia.		Lapped Dia.	
		mm	ins.	mm	ins.
Standard	55.00 mm (2.16535")	–	–	54.990 54.971	2.16496 2.16421
1st Undersize	54.75 mm (2.15551")	54.749 54.740	2.15547 2.15511	54.740 54.721	2.15511 2.15437
2nd Undersize	54.50 mm (2.14567")	54.499 54.490	2.14563 2.14527	54.490 54.471	2.14527 2.14453

The crankshaft is lapped to final size. Strictly keep to the dimensions given.

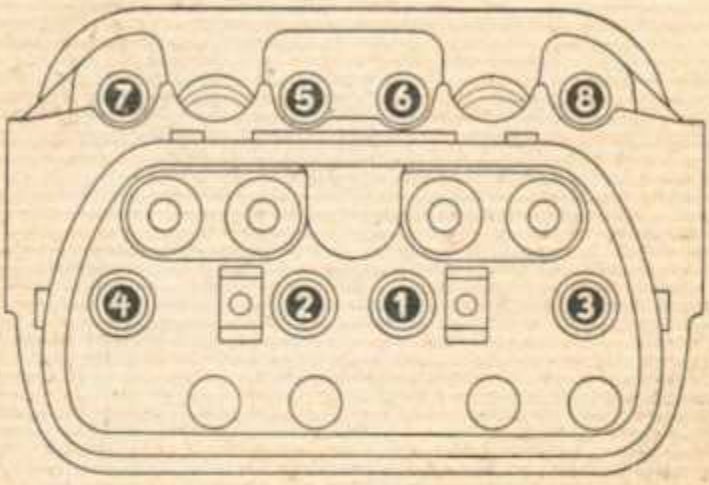
	Bearing Journals 4 (D)				
	Nominal Dia.	Ground Dia.		Lapped Dia.	
		mm	ins.	mm	ins.
Standard	40.00 mm (1.57480")	–	–	40.000 39.984	1.57480 1.57417
1st Undersize	39.75 mm (1.56496")	39.760 39.750	1.56535 1.56496	39.750 39.734	1.56496 1.56433
2nd Undersize	39.50 mm (1.55512")	39.510 39.500	1.55551 1.55512	39.500 39.484	1.55512 1.55449

The crankshaft is lapped to final size. Strictly keep to the dimensions given.

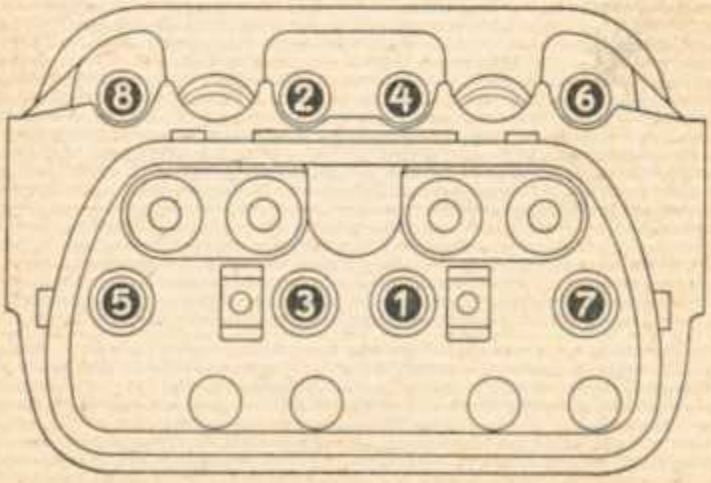
c – Tightening cylinder head nuts

1 – Coat cylinder head nuts with graphite paste and tighten slightly.

2 – Tighten by means of a torque wrench to 1 mkg (7 ft. lbs.) in the following order:



3 – Fully tighten to 3.6-3.8 mkg (26-27 ft.lbs.) in the following order:
Transporter Engine from May 1959: tighten to 3.0 – 3.2 mkg (22 – 23 ft.lbs.)



d – Industrial Engine

Adjustment of Speed Limiter

Identification Figure	9	10	11	12	13	14	15	16	17	18	19
Speed limiter cuts out ignition (r.p.m.)	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800

Permissible departures from the most usual Governor Settings:

1131 c.c.

Nominal speed r.p.m.	Nominal output b.h.p.	r.p.m.	Speed range r.p.m.
1500	13	1500	1480/1555
2000	18.5	2000	1950/2050
2500	21	2500	2440/2565
3000	22	3000	2915/3075
3600	22	3600	3510/3690

Engines without governor are supplied with 24 bhp at 3000 rpm.

1192 c.c.

Nominal speed of governor r.p.m.	Nominal output of engine b.h.p.	at r.p.m.	Permissible r.p.m. with *engine not loaded* r.p.m.
1500	13.5	1500	1590
1500	13.5	1500	1575 with hydraulic damper
1800	16.5	1800	1910
1800	16.5	1800	1890 with hydraulic damper
2000	18.5	2000	2100
2500	22	2500	2625
2650	22	2610	3650
2800	23.5	2800	2940
3000	25	3000	3180
3428	25	3428	3628
3600	25	3600	3815

from April 1958

1 – Engines with governor with 27 bhp at 3000 rpm.
2 – Engines with more accurate governors only up to 25 bhp.
3 – Engines without governors with 28 bhp at 3000 rpm.

Alter the nominal revolutions

Type designation	Nominal speed	Radial springs per side	Axial spring Qty.	Dimension "a" mm	Speed measured at a stroke of 1 mm	5 mm
122.135.021/15 (1:1)	1500	1	1	68.2	1500	1720
122.135.021/15 (1 : 2.33)	1500	2	1	63.0	3500	4000
122.135.021/16	1600	1	1	66.5	1600	1800
122.135.021/17	1700	2	1	65.5	1700	1900
122.135.021/18	1800	2	1	70.5	1800	2000
122.135.021/19	1900	2	1	68.0	1900	2100
122.135.021/20	2000	1	1	69.0	2000	2220
122.135.021/21	2100	2	1	68.5	2100	2310
122.135.021/22	2200	2	1	67.5	2200	2410
122.135.021/23	2300	2	1	69.0	2300	2500
122.135.021/24	2400	2	1	66.5	2400	2600
122.135.021/25	2500	2	1	65.5	2500	2690
122.135.021/26	2600	2	1	67.5	2600	2800
122.135.021/265	2650	2	1	70.0	2650	2850
122.135.021/27	2700	2	1	68.0	2700	2940
122.135.021/28	2800	2	1	67.0	2800	3020
122.135.021/29	2900	1	1	63.5	2900	3120
122.135.021/30	3000	2	1	67.0	3000	3240
122.135.021/31	3100	2	1	64.5	3100	3340
122.135.021/32	3200	2	1	66.5	3200	3450
122.135.021/33	3300	2	1	68.5	3300	3560
122.135.021/34	3400	2	1	67.5	3400	3690
122.135.021/3428	3428	2	1	67.0	3400	3700
122.135.021/35	3500	2	1	66.8	3500	3790
122.135.021/36	3600	2	1	65.8	3550	3820
122.135.043/15	1500–1800	2	1	68.0	3500	3900
					4160	4540
122.135.043/30	3000–3600	2	1	68.5	3000	3250
					3550	3800

Note

When adjusting the radial springs according to the table slight variations can arise. Check the setting afterwards and adjust if necessary.

FUEL SYSTEM

Carburetor Adjustment

VW Engine 1946–1960	Engine	1131 c.c. – 25 b.h.p.		1192 c.c. – 30 b.h.p.			
	Carburetor Type	26 VFI	26 VFIS	28 PCI			
	Up to Eng. No.	194 695	481 712	695 281	849 904	3 919 979 [1] 991 589 [2]	3 919 979 [3] 3 538 143 [3]
Venturi .....mm dia.		21.5	21.5	20.0	21.5	21.5	21.5
Main jet		120	120	105	122.5	117.5	117.5
Air correction jet		170	180	190	200	195	180
Pilot jet		45 g	45 g	50 g	50 g	50 g	50 g
Pilot jet air bleed .....mm dia.		1.5	1.0	0.8	0.8	0.8	0.8
Emulsion tube		0	0	10	29	29	29
Spraying well .....mm dia.		5.3	5.3	5.5	5.0	5.0	5.0
Float needle valve ..... mm		1.2	1.2/1.5	1.5	1.5	1.5	1.5

[1]) Passenger Cars except Karmann Ghia, continues for Standard Sedan.
[2]) Transporter. [3]) Karmann Ghia Models.

VW Industrial Engine 1953–1960	Engine	1131 c.c.	1192 c.c.			1192 c.c. 28 b.h.p.
	Carburetor Type	26 VFIS	26 VFIS			28 PCI
	Up to Eng. No.	122–01985	122–04400	1800–3600 r.p.m.	1500 r.p.m.	122–073 000
Venturi .....mm dia.		21.5	19.0	20.0	18.0	21.5
Main jet		120	100	100	95	122.5/117.5
Air correction jet		180	190	160	190	200/195
Pilot jet		45 g	45 g	45 g	45 g	50 g
Pilot jet air bleed..mm dia.		1.0	1.0	1.0	1.0	0.8
Emulsion tube		0	0	10	10	29
Spraying well .....mm dia.		5.3	5.3	5.3	5.3	5.0
Float needle valve ..... mm		1.5	1.5	1.5	1.5	1.5

Carburetor accelerating pump:
Fuel delivery ..... 0.5 ± 0.1 c.c. per stroke

Fuel pump:

Chassis No.	Pump pressure	Pump delivery via float needle valve 1.5
	0.09–0.13 kg/sq.cm (1.3–1.8 lbs/sq.in.)	min. 10 l/h (2.6 U.S. gals.) at 3000 r.p.m.
from 1 976 996 from 122-45 787 from 394 900	max. 0.18 kg/sq.cm (2.6 lbs./sq.in.)	min. 16 l/h (4.2 U.S. gals.) at 3000–3400 r.p.m.

FRONT AXLE

I. Tolerances and Wear Limits

		Tolerance Limits (new parts)	Wear Limits
Passenger Cars			
1 – Torsion arm	twist	max. 0.2 mm (.008")	
2 – Torsion arm / fiber bush (upper limit should be approached, fiber is apt to swell)	clearance	0.20–0.27 mm (.008"–.010")	0.35 mm (.014")
3 – Torsion arm link pin / sintered iron bush	clearance	0.042–0.087 mm (.0017"–.0034")	0.20 mm (.008")
4 – Torsion arm link pin	diameter	17.940–17.913 mm (.7063"–.7052")	17.800 mm (.7008")
5 – King pin / bush	clearance	0.027–0.034 mm (.0010"–.0013")	0.08 mm (.003")
	end play	0.00–0.04 mm (.0000"–.0016")	
6 – Alignment of front axle tubes, departure from parallelism, measured 200 mm (7.9") from the tube end faces		max. 0.2 mm (.008")	
7 – Front wheel alignment (chassis on level surface):			
King pin inclination		4°20'	
Caster (Axle tubes)		2°30' ± 15'	
from Chassis No. 2 018 789		2° ± 15'	
a) with permissible total weight: from Chassis No. 1 673 351 only	Toe-in	1–3 mm (.04"–.12")	
Camber		0°	
b) with car unladen: Toe-in		1–3 mm (.04"–.12")	
from Chassis No. 1 673 351 ..		2–4 mm (.08"–.16")	
Camber		0°40' ± 30'	
8 – Steering gear			
a) Sector shaft	end play	0.25 mm (.0098")	
	Clearance	0.040–0.082 mm (.0016"–.0032")	
b) Sector shaft spring	free length	23.0–23.8 (.906"–.937")	
Tension of loaded spring	loaded length	20.3 mm (.8")	
		60–75 kg	
c) Sector shaft thrust pin	length	(130–165 lbs.)	
		19.9–20.1 mm	
9 – Steering drop arm / steering gear case	end play	(.7835"–.7913") 0.4–1.0 mm (.016"–.04")	

		Tolerance Limits (new parts)	Wear Limits
Transporters			
1 – Torsion arm	twist	max. 0.2 mm (.008")	
2 – Torsion arm / fiber bush (the upper limit should be approached, fiber is apt to swell)	clearance	0.20–0.27 mm (.008"–.011")	0.35 mm (.0138")
3 – Torsion arm link pin with needle bearing	diameter	19.920–19.910 mm (.7843"–.7839")	
without needle bearing	diameter	19.935–19.902 mm (.7848–.7835")	19.70 mm (.7504")
4 – Needle bearing (removed): inside contact diameter		19.935 + 0.010 mm (.7848" + .0004")	
Torsion arm link pin / brass bush	clearance	0.044–0.098 mm (.0017"–.0039")	0.20 mm (.008")
5 – Steering knuckle pin / bush	clearance	0.020–0.054 mm (.0008"–.0021")	0.10 mm (.004")
6 – Steering knuckle pin / Spacer without rubber seals	end play	max. 0.15 mm (.006")	
7 – Alignment of front axle tubes, departure from parallelism, measured 200 mm (7.9") from the tube end faces		max. 0.2 mm (.008")	
8 – Front wheel alignment (chassis on level surface)			
King pin inclination		4° 20'	
Caster (Axle tubes).....		0°	
a) with permissible total weight: Toe-in (at rim flange)		2–5 mm (.08"–.2")	
Camber		0°	
b) with car unladen: Toe-in (at rim flange)		0 ± 1 mm (.04")	
Camber		0°40' ± 30'	
9 – Swing lever shaft	diameter	23.980–23.967 mm (.9441"–.9436")	
10 – Swing lever shaft bush	ream up to	24.000-24.021 mm dia. (.9450"–.9457")	
11 – Swing lever shaft / bush	clearance	0.020–0.054 mm (.0008"–.0021")	0.12 mm (.0047")
12 – Steering lever shaft bush	ream up to	25.380-25.401 mm dia. (.999"–.1")	
Steering lever shaft / bush	clearance	0.027–0.061 mm (.001"–.002")	0.10 mm (.003")
13 – Steering cam (worm), installed, measured at steering column top end	run-out	max. 0.35 mm (.0138")	
14 – Steering column jacket in steering gear case	seating depth	45–46 mm (1.77"–1.81")	

II. Technical Data and Specifications

a – Steering (VW Passenger Cars):

Overall ratio		14.15
Turns of steering wheel, lock to lock		2.4
Angles of wheels at full lock:		
inside front wheel		32° ± 2°
outside front wheel		26°–1°
Standard Sedan		32° ± 2° / 26°–1°
De Luxe Sedan,	from Chassis No. 1 673 351	34° ± 2° / 28°–1°
VW Convertible,	from Chassis No. 1 665 425	
Karmann Ghia Coupé	from Chassis No. 1 665 213	
Karmann Ghia Convertible		

Smallest turning circle: VW De Luxe and Convertible ..... approx. 11.0 m (36 ft.)
VW Standard ..... approx. 11.5 m (38 ft.)
Karmann Ghia Models ..... approx. 11.25 m (37 ft.)

b – Torsion Bars (VW Passenger Cars):

Up to Chassis No.	Number of leaves	Position	Mounting Angle	Length
1–097 579	5 4	upper lower	26°–27° 32°	913 mm 35.94"
1–0138 834	4 5	upper lower	28°–29° 32°	873 mm 34.37"
1–0397 023	5 5	upper lower	26°–27° 32°	873 mm 34.37"
1–0517 304	6 6	upper lower	45° ± 30' 49°30' ± 30'	873 mm 34.37"
From 1–0517 305	8 8	upper lower	49° ± 1° 53°30' ± 1°	955 mm 37.59"

a – Steering (VW Transporter):

	Up to March 1955	From March 1955
Overall ratio	15.7	15.1
Turns of steering wheel, lock to lock	2.4	2.8
Angle of wheels at full lock:		
inside front wheel	32° ± 30'	34° ± 2°
outside front wheel	approx. 26°	25°–1°
Smallest turning circle	approx. 12.0 m (39 ft. 4 ins.)	approx. 12.0 m (39 ft. 4 ins.)

b – Torsion Bars (VW Transporter):

	Transporter Models	Number of leaves	Position	Mounting Angle
Up to March 1955 (Chassis No. 20–117 901)	VW Delivery Van VW Kombi VW Pick-up	4 5	upper lower	17–18°
	VW Micro Bus VW Ambulance	5 5	upper lower	23–24°
From March 1955 (Chassis No. 20–117 902)	all models	9 9	upper lower	37° ± 30'

III. Arrangement of Shims

Passenger Cars without torsion arm link pin dust excluders and Transporters without Needle Bearings

Offset in mm	Number of Shims for Upper Torsion Arm (A) Inner Shims	(B) Outer Shims	Lower Torsion Arm (C) Inner Shims	(D) Outer Shims
5	3	7	7	3
5.5	4	6	7	3
6	4	6	6	4
6.5	5	5	6	4
7	**5**	**5**	**5**	**5**
7.5	6	4	5	5
8	6	4	4	6
8.5	7	3	4	6
9	7	3	3	7

There must always be 10 shims fitted to one torsion arm link pin.

Passenger Cars with torsion arm link pin dust excluders and Transporters with Needle Bearings

5	1	7	5	3
5.5	2	6	5	3
6	2	6	4	4
6.5	3	5	4	4
7	**3**	**5**	**3**	**5**
7.5	4	4	3	5
8	4	4	2	6
8.5	5	3	2	6
9	5	3	1	7

Each torsion arm link pin must always carry a total of 8 shims and one rubber seal retainer.

IV. Specifications for VW Passenger Cars

1 – 10 angular minutes correspond to:	(with 15" tire)	1.2 mm
	(with 16" tire)	1.3 mm
2 – Toe-in with the wheels pressed inward at the rear and the car unladen:	from Chassis No. 1 673 351	+ 10' ± 10'
	up to Chassis No. 1 673 350	0° ± 10'
3 – Max. permissible difference in the toe-in before and after having forced the wheels inward		max. 25'
4 – Amount of pressure applied to force wheels inward		10 ± 2 kg
5 – Difference in wheel angularity with inside wheel turned 20° toe the left and right		
a) VW Sedan and Convertible **(LHD only)**	from Chassis No. 1 430 498	1°30'–2°30'
VW Sedan and Convertible **(RHD only)**	from Chassis No. 2 256 907	1°30'–2°30'
Karmann Ghia Models	from Chassis No. 1 644 422	1°30'–2°30'
b) VW Sedan and Convertible **(LHD only)**	up to Chassis No. 1 430 497	
	to the left	1°10'–2°10'
	to the right	2°–3°
	max. permissible difference	max. 1°
c) VW Sedan and Convertible **(RHD only)**	up to Chassis No. 2 256 906	1°–3°
d) Karmann Ghia Models	up to Chassis No. 1 644 421	1°–3°
6 – Front wheel camber (straight ahead position, unladen)		0°40' ± 30'
Max. permissible difference between both wheels		30'

7 – Difference in camber of a wheel turned 20° to the left and right		2°15′ ± 40′
8 – Caster angle (axles tubes)	from Chassis No. 2 018 789	2° ± 15′
	up to Chassis No. 2 018 788	2°30′ ± 15′
9 – Rear wheel track with correct spring plate adjustment, and car unladen		– 5′ ± 15′
10 – Max. permissible departure of rear wheel track from perpendicularity to fore and aft axis of the car ..... Evaluation of rear wheel position by means of evaluation diagram on reverse side		max. 10′
11 – Rear wheel camber with correct spring plate adjustment and car unladen		
a) All models	from Chassis No. 2 232 161	3° ± 30′
Spring plate adjustment:		
from Chassis No. 2 528 668		16°30′ + 50′
up to Chassis No. 2 528 667		11° ± 30′
b) All models	from Chassis No. 2 232 160	4° ± 30′
Spring plate adjustment:		
up to Chassis No. 1-0 397 023		8° ± 30′
up to Chassis No. 2 232 160		12° ± 30′
Max. permissible difference between both wheels		20′

All track values preceded by the sign + refer to toe-in — refer to toe-out.
The test conditions have to be complied with.

Specifications for VW Transporter

1 – 10 angular minutes correspond to:	(with 15″ tire)	1.2 mm
	(with 16″ tire)	1.3 mm
2 – Toe-in (vehicle unladen, wheels forced inward at the rear)		– 5′ ± 10′
3 – Max. permissible difference in the toe-in before and after having forced the wheels inward		max. 25′
4 – Amount of pressure applied to force wheels inward		15 ± 3 kg
5 – Difference in wheel angularity with inside wheel turned 20° to the left and right		2°–3°
6 – Front wheel camber (straight ahead position, unladen)		0°40′ ± 30′
Max. permissible difference between both wheels		30′
7 – Difference in camber of a wheel turned 20° to the left and right		–
8 – Caster angle (axle tubes)		0
9 – Rear wheel track with correct spring plate adjustment, and vehicle unladen		– 20′ ± 15′
10 – Max. permissible departure of rear wheel track from perpendicularity to fore and aft axis of the car		max. 10′
11 – Rear wheel camber with correct spring plate adjustment and vehicle unladen		

Passenger Cars and Transporters		Tolerance Limits (new parts)	Wear Limits
7 – Preload of transmission case halves or final drive covers * on the two differential ball bearings		0.10–0.18 mm *) (.004"–.007")	
8 – Differential pinions	Backlash	0.10–0.20 mm (.004"–.008")	
9 – Rear axle shaft			
a) Flat end / fulcrum plates / differential side gear (4 parts)	clearance	0.05–0.23 mm (.002"–.009")	0.30 mm (.012")
from Chassis No. 1 757 471 and 325 101	clearance	0.095–0.302 mm (.0037"–.0119")	
b) Flat end / differential side gear (measured across the convex sides)	clearance	0.03–0.10 mm (.0012"–.004")	0.15 mm (.006")
c) measured between two points at the ball bearing seat	run-out	max. 0.05 mm (.0020")	
10 – Transmission case / rear axle tube / tube retainer	clearance	0.40–0.60 mm (.016"–.024")	0.70 mm (.027")
11 – Rear wheel oil seal	seating depth *	4.7–5.0 mm (.185"–.197")	
12 – Starter shaft bush	inside dia. *)	12.525–12.550 mm (.4931"–.4945")	12.65 mm (.4980")
13 – Starter shaft / bush	clearance *)	0.08–0.14 mm (.0031"–.0055")	0.25 mm (.0098")
14 – Rear axle side gear shaft / gears	Backlash	0.15–0.35 mm (0.006"–.014")	
De Luxe Sedan Only			
15 – Gear for 2nd speed	end play	0.10–0.25 mm (.004"–.0098")	
	clearance	0.04–0.072 mm (.0016"–.0028")	
16 – Gear for 3rd speed	end play	0.10–0.25 mm (.004"–.0098")	
	clearance	0.04–0.068 mm (.0016"–.0027")	
17 – Gear for 4th speed	end play	0.10–0.25 mm (.004"–.0098")	
	clearance	0.04–0.074 mm (.0016"–.0029")	
18 – Selector fork / 1st speed gear	end play	0.5–0.7 mm (.02"–.03")	

*) Valid also for Transporter transmission from Chassis No. 469 447

		Tolerance Limits (new parts)	Wear Limits
19 – Selector shaft / 3rd and 4th speed operating sleeve	end play	0.2–0.4 mm (.008"–.016")	
20 – Selector fork / reverse sliding gear	end play	0.2–0.5 mm (.008"–.02")	
21 – Synchronizer stop rings / gears, clearance between clutch teeth faces		min. 0.8 mm (.03")	0.30 mm (.012")
22 – Bush for reverse sliding gear ..	inside dia.	16.050–16.075 mm (.6319"–.6329")	
23 – Bush, reverse gear sliding shaft	clearance	0.050–0.093 mm (.0020"–.0037")	
Standard Sedan Only			
24 – Gear for 3rd speed	end play	0.20–0.75 mm (.008"–.030")	0.85 mm (.033")
25 – Gear for 4th speed	end play	0.25–0.40 mm (.0098"–.016")	0.50 mm (.02")
26 – Selector fork / selector ring ...	end play	0.23–0.53 mm (.0091"–.0208")	
27 – Bush for reverse sliding gear ..	inside dia.	16.050–16.075 mm (.6319"–.6329")	

b – Transporter transmission from May 1959 (from Chassis No. 469 447) with the following differences:		Tolerance Limits (new part)	Wear Limits
2 – Main drive shaft, front, bearing surface for needle bearing of 3rd gear	run-out	max. 0.015 mm (0.0006")	
9 – Rear axle shaft:			
a) Flat end/fulcrum plates/ differential side gear	clearance	0.035–0.244 mm (.0014"–.0096")	0.30 mm (.0118")
b) Flat end/differential side gear (measured across the convex sides)	clearance	0.03–0.10 mm (.0012"–.0039")	0.15 mm (.0059")
10 – Transmission case/plastic packing/rear axle tube/tube retainer	clearance	0.0–0.2 mm (.0"—.0079")	0.4 mm (.016")
15 – Gear for 1st speed	end play	0.10–0.25 mm (.0039"–.0098")	
19 – Selector forks/operating sleeve for 1st/2nd and 3rd/4th speeds	end play	0.10–0.30 mm (.0039"–.0118")	
21 – Synchronizer stop rings/gears, measured between clutch teeth faces	clearance	0.8 mm (.031")	min. 0.30 mm (.0118")
approx. from Chassis No. 560 700	clearance	1.1 mm (.043")	min. 0.60 mm (.0236")

II. Technical Data and Specifications

a – Gear Ratios:

	Standard Sedan	De Luxe Sedan		Transporter [1] from May 1959
		1952–1953	1954–1959	
1st gear	3.60:1	3.60:1	3.60:1	3.80:1
2nd gear	2.07:1	1.88:1	1.88:1/1.94:1 [2]	2.06:1
3rd gear	1.25:1	1.22:1	1.23:1/1.22:1 [3]	1.32:1
4th gear	0.80:1	0.79:1	0.82:1	0.89:1
reverse gear	6.60:1	4.63:1	4.63:1	3.88:1

[1] From Chassis No. 469 447
[2] For 2nd gear wheels with 17/33 teeth from Chassis No. 2 256 018 and 430 695
[3] For 3rd gear wheels with 23/28 teeth from Chassis No. 1 726 006 and 282 900

Final drive: Gear ratio	4.43:1 (Klingelnberg) 4.37:1 (Gleason)
From Chassis No. 1 338 160, 210 635	4.43:1 (Gleason)
From Chassis No. 469 447:	4.125:1 (Klingelnberg and Gleason)

b – Torsion Bar Adjustment

Spring plates, unloaded

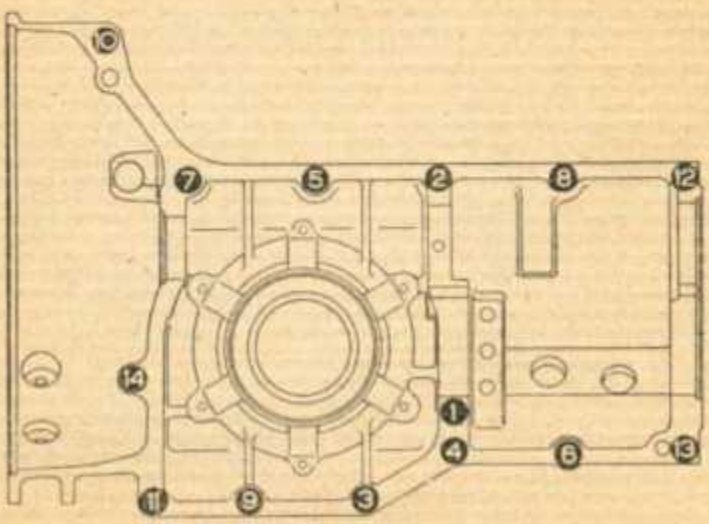
From Chassis No.	Type	Torsion Bar		Adjustment
		Length	Diameter	
	Passenger Cars	553 mm (21.8")	25 mm dia. (.98")	8° ± 30'
1-0 397 023	Passenger Cars	627 mm (24.7")	24 mm dia. (.94")	13° ± 30'
1-0 929 746	Passenger Cars	627 mm (24.7")	24 mm dia. (.94")	12° ± 30'
2 232 161	Passenger Cars	627 mm (24.7")	24 mm dia. (.94")	11° ± 30'
2 528 668	Passenger Cars	553 mm (21.8")	22 mm dia. (.87")	16°30' + 50'
3 067 625	Passenger Cars	552 mm (21.7")	22 mm dia. (.87")	16°30' + 50'
	Transporters	553 mm (21.8")	30 mm dia. (1.18")	4° ± 30'
20–117 902	Transporters	590 mm (23.2")	29 mm dia. (1.14")	20° ± 30'
420 574	VW Ambulance	590 mm (23.2")	29 mm dia. (1.14")	18°40' ± 20'
425 461	Fire Truck	590 mm (23.2")	29 mm dia. (1.14")	21°30' ± 20'

Reduction Gears:

Chassis No.	up to 469 446		from 469 447	
	No. of teeth	Ratio	No. of teeth	Ratio
Reduction driven Gear and shaft	21	1.4	25	1.39
Reduction drive gear	15		18	

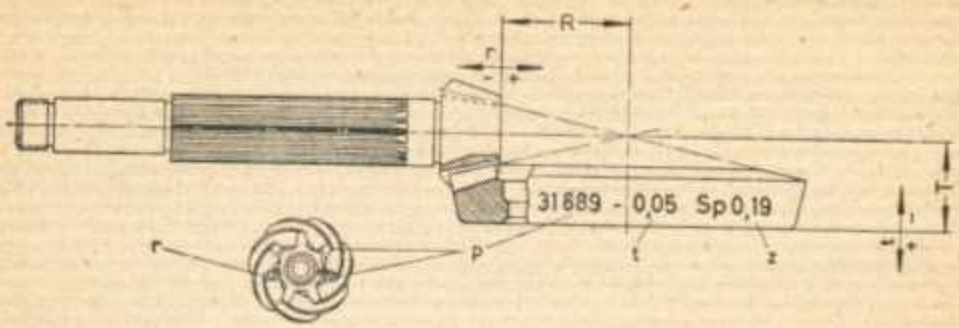
c – Tightening transmission case bolts

Tighten transmission case screws in the order indicated below to a torque of 2 mkg (15 ft. lbs.): (For Transporter up to Chassis No. 469 446 only)



H

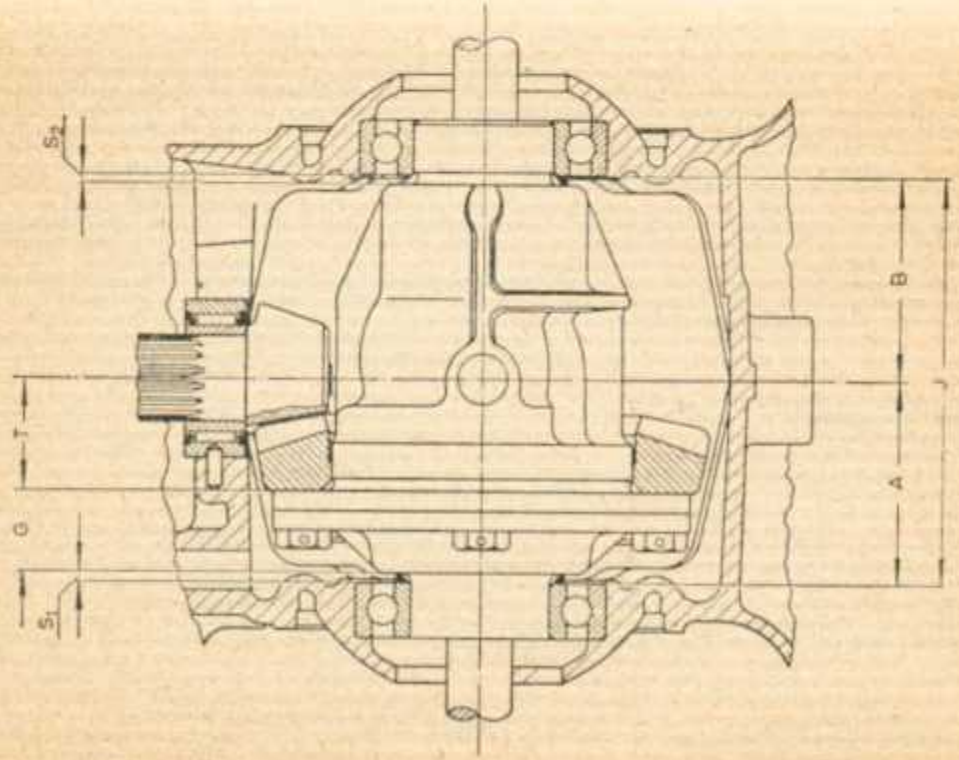
d – Drive Pinion and Ring Gear Adjustmunt:



p = Matching number
T = Distance from drive pinion center line to ring gear back face (constant value 40.00 mm / 1.575")
t = Departure from T

R = Distance from ring gear center line to drive pinion face (See table below)
r = Departure from R
z = Backlash

	Klingelnberg 7 : 31		Gleason	
	m = 3.00	m = 3.25	8 : 35	7 : 31
Mark	Pinion K	Ring Gear V	–	–
R =	59.22 mm (2.3315")	59.22 mm (2.3315")	59.22 mm (2.3315")	55.75 mm (2.1949")



Designation	Measurements	Standard
A	Depth of left transmission case half	72.55 mm (2.8563")
B	Depth of right transmission case half	72.55 mm (2.8563")
J	Total depth of transmission case	145.10 mm (5.7126")
L	Length of differential housing	138.00 mm (5.4331")
G	Distance from ring gear back face to shim contact face	28.95 mm (1.1398")
V	Preload	0.14 ± 0.04 mm (0.0055" ± 0.0016")

Formulae to determine Thickness of Shims S_1 and S_2:

Passenger Car

$S_1 = J - B - (T \pm t) - G + \frac{V}{2}$

$S_2 = J - L + V - S_1$

Transporter

$S_2 = J - A - (T \pm t) - G + \frac{V}{2}$

$S_1 = J - L + V - S_2$

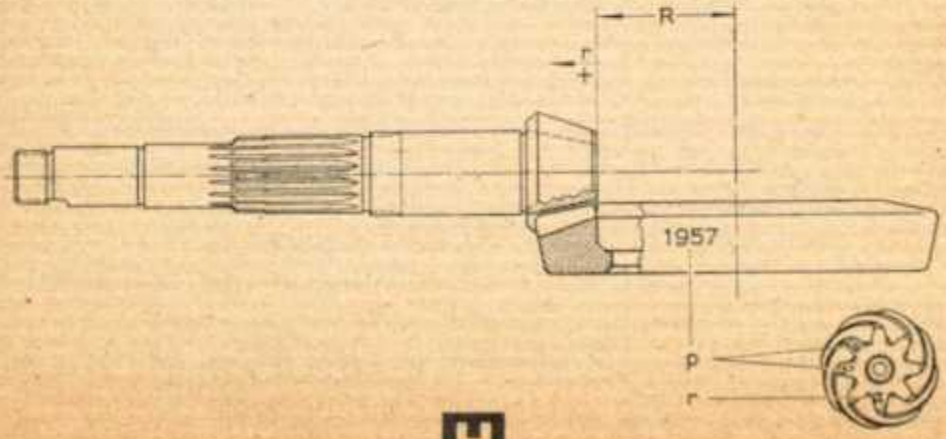
The drawings show the rear axle drive of the VW Passenger Cars; with the Transporters the ring gear (crown wheel) is situated in the right transmission case half.

Transporter transmission from Chassis No. 469 447

R – Standard fitting dimension/ring gear center line to drive pinion face. (See table)
r – Tolerance discrepancy from R (given in hundredths of a millimeter)
Ring gear backlash = 0.17–0.25 mm (0.0067"–0.0098").
P – Matching number of gear set.

Ring gear and pinion:	Klingelnberg 8:33	Gleason 8:33
reinforced version R *) =	58.70 mm	—

*) Designation: from Chassis No. 572 083: "P" on the edge of the ring gear
from Chassis No. 584 927: "K" on the drive pinion face



BRAKES, WHEELS, AND TIRES

I. Tolerances and Wear Limits

		Tolerance Limits (new parts)	Wear Limits
VW Passenger Car			
1 – Brake master cylinder, piston push rod measured from ball-shaped end up to nut			
a) up to Chassis No. 167889: 22.20 mm dia. (0.874")	length	62–63 mm (2.441"–2.480")	
b) from Chassis No. 167890: 19.05 mm dia. (.750")	length	52–53 mm (2.05"–2.09")	
2 – Brake wheel cylinder, front			
a) up to Chassis No. (see *) ..	diameter	19.05 mm (.750")	
b) from Chassis No. (see *)	diameter	22.20 mm (.874")	
rear:			
a) up to Chassis No. 167 889 ..	diameter	19.05 mm (.750")	
b) up to Chassis No. 397 022 ..	diameter	15.87 mm (.625")	
c) up to Chassis No. (see *) ..	diameter	17.46 mm (.687")	
d) from Chassis No. (see *)	diameter	19.05 mm (.750")	
3 – Stop light switch: contacts close at	Pressure	3.5–8.0 kg./sq.cm. (50–114 lbs./sq.in.)	
from about Chassis No. 1 430 000	Pressure	3.5–6.0 kg./sq.cm. (50–85.5 lbs./sq.in.)	
4 – Brake drum	lateral run-out	max. 0.25 mm (.0098")	0.35 mm (.0138")
	radial run-out	max. 0.25 mm (.0098")	0.25 mm (.0098")
	thickness of wall	5.25–4.90 mm (.206"–.193")	4.0 mm (.16")
	inside diameter	230.0 + 0.2 mm (9.05" + .008")	231.5 mm (9.11")
	taper	max. 0.1 mm (.004")	
5 – Brake lining, front:			
a) up to Chassis No. (see *)....	width	30 mm (1.18")	
b) from Chassis No. (see *)	width	40 mm (1.57")	
rear	width	30 mm (1.18")	
front and rear	thickness	4.0–3.8 mm (.157"–1.496")	2.7 mm (.106")
oversize	thickness	4.5–4.3 mm (.177"–.169")	3.2 mm (.126")

		Tolerance Limits (new parts)	Wear Limits
6 – Wheel	radial run-out	max. 1.5 mm (.06")	
	lateral run-out	max. 1.5 mm (.06")	
7 – Rear Wheels (spring plate adjustment according to instructions and vehicle unladen)		toe-in 1 mm (.04") to toe-out 2.5 mm (.098")	
*) De Luxe Sedan, from Chassis No. 1 673 351 VW Convertible, from Chassis No. 1 665 425 Karmann Ghia Coupé from Chassis No. 1 665 213 Karmann Ghia Convertible			
VW Transporter			
1 – Brake master cylinder, piston push rod measured from ball-shaped end up to nut			
a) up to Chassis No. 05 208: 22.20 mm dia. (.874")	length	52–53 mm (2.05"–2.09")	
b) up to Chassis No. 117 901: 19.05 mm dia. (.750")	length	52–53 mm (2.05"–2.09")	
c) from Chassis Nr. 117 902: 22.20 mm dia. (.874")	length	61–62 mm (2.40"–2.44")	
2 – Brake wheel cylinder			
a) up to Chassis No. 117 901: front	diameter	22.20 mm (.874")	
rear	diameter	19.05 mm (.750")	
b) from Chassis No. 117 902: front	diameter	25.4 mm (1")	
rear	diameter	22.2 mm (.874")	
3 – Brake drum	lateral run-out	max. 0.25 mm (.0098")	0.35 mm (.0138")
	radial run-out	max. 0.25 mm (.0098")	0.25 mm (.0098")
a) up to Chassis No. 117 901:	thickness of wall	5.25–4.90 mm (.206"–.193")	4.0 mm (.16")
	inner diameter	230.0 + 0.2 mm (9.05" + .008")	231.5 mm (9.11")
b) from Chassis No. 117 902:	thickness of wall	6.50–6.15 mm (.256"–.242")	
	inner diameter	230.0 + 0.2 mm (9.055" + .008")	231.5 mm (9.11")
	taper	max. 0.1 mm (.004")	
4 – Brake lining			
a) up to Chassis No. 117 901:	thickness	4.0–3.8 mm (.16"–.15")	2.7 mm (.106")

		Tolerance Limits (new parts)	Wear Limits
oversize	thickness	4.5–4.3 mm (.18″–.17″)	3.2 mm (.126″)
front and rear	width	40 mm (1.16″)	
b) from Chassis No. 117 902:	thickness	5.0–4.8 mm (.2″–.19″)	2.5 mm (.098″)
oversize	thickness	5.5–5.3 mm (.217″–.209″)	3.0 mm (.118″)
front	width	50 mm (2″)	
rear	width	40 mm (1.6″)	
5 – Stop light switch: contacts close at	Pressure	3.5–8.0 kg./sq.cm. (50–114 lbs./sq.in.)	
from about chassis no. 231 000	Pressure	3.5–6.0 kg./sq.cm. (50–85.5 lbs./sq.in.)	
6 – Wheel	radial run-out	max. 1.5 mm (.06″)	
	lateral run-out	max. 1.5 mm (.06″)	
7 – Rear wheels (spring plate adjustment according to instructions and vehicle unladen)	toe-out	0.5–4.0 mm (.02″–.157″)	

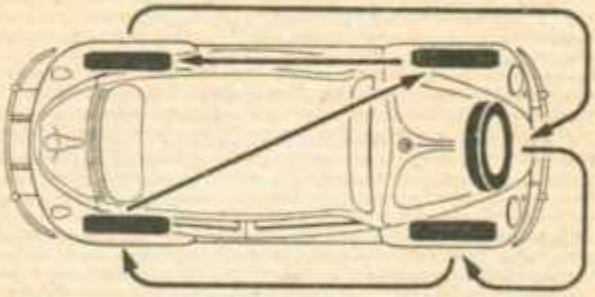
II. Specifications of Tires

Introduction	Tire	Rim	Tire Pressure front	Tire Pressure rear
1 – VW Passenger Car				
Up to September 1952	5.00–16	3.00 D × 16	1.2–1.3 kg./sq.cm. (17–19 lbs./sq. in.)	1.6–1.7 kg./sq.cm. (23–24 lbs./sq. in.)
From October 1952	5.60–15	4 J × 15	1.1–1.2 kg./sq.cm. (16–17 lbs./sq. in.)	1.4–1.6 kg./sq.cm. (20–23 lbs./sq. in.)
From August 1956	tubeless 5.60–15	4 J × 15	1.1–1.2 kg./sq.cm. (16–17 lbs./sq. in.)	1.4–1.6 kg./sq.cm. (20–23 lbs./sq. in.)
2 – VW Transporter				
Up to February 1955				
All Models	5.50–16	3.50 D × 16	2.5 kg./sq.cm. (36 lbs./sq. in.)	2.75 kg./sq. cm. (39 lbs./sq. in.)
VW Ambulance	5.50–16	3.50 D × 16	2.0 kg./sq.cm. (28 lbs./sq. in.)	2.0 kg./sq.cm. (28 lbs./sq. in.)
From March 1955				
All Models	6.40–15	4½ K × 15	2.0 kg./sq.cm. (28 lbs./sq. in.)	2.3 kg./sq.cm. (33 lbs./sq. in.)
Ambulance	6.40–15	4½ K × 15	1.8 kg./sq.cm. (26 lbs./sq. in.)	1.8 kg./sq.cm. (26 lbs./sq. in.)

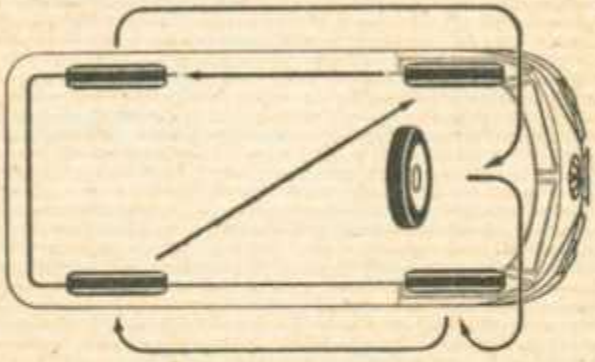
Tire Rotation

The wheels should be interchanged regularly when inspections are carried out.

VW Passenger Cars every 5000 km (3000 miles)



VW Transporters every 4000 km (2400 miles), from August 1959: every 5000 km (3000 miles)



B

ELECTRICAL SYSTEM

I. Lighting

VW Passenger Cars and Transporter	Type Model	Bulb				Part No.
Headlight	all	B	6 V	35/35	W	N 17 701 1
for asymmetrical low beam	all [1]	A	6 V	45/40	W	N 17 705 1
Parking light	all	H	6 V	2	W	N 17 720 1
up to 1-0 929 745, 20-117 901	11, 20	H	6 V	1.5	W	N 17 720 1
Stop and tail light	11, 20	S	6 V	20/5	W	N 17 736 1
Stop light, up to 1-0 929 745, 357 388	11, 20	F	6 V	15	W	N 17 716 1
Tail light, up to 1-0 929 745, 357 388	14, 11, 20	G	6 V	5	W	N 17 718 1
up to 1 708 049	14	L	6 V	5	W	N 17 725 1
Combined stop and flashing indicator light	14	F	6 V	15	W	N 17 716 1
up to 1 708 049	14	—	6 V	15	W	141 945 167
License plate light	all	G	6 V	5	W	N 17 718 1
up to 1-0 927 372, 1 676 788	11, 14	L	6 V	5	W	N 17 725 1
up to 1 600 399, 357 388	11, 20	K	6 V	10	W	N 17 723 1
Interior light	11, 143	K	6 V	10	W	N 17 723 1
	141	H65	6 V	5	W	141 947 199
up to 1-0 397 021	11	G	6 V	5	W	N 17 718 1
up to 1-0 454 950	11	L	6 V	5	W	N 17 725 1
up to 1 649 252	14	K	6 V	10	W	N 17 723 1
Dome light	20	L	6 V	5	W	N 17 725 1
Warning light	all	J	6 V	1.2	W	N 17 722 1
from 1-0 308 653 up to 1-0 397 022	11	J	6 V	0.6	W	N 17 721 1
up to 20-117 901	20	J	6 V	0.6	W	N 17 721 1
Indicator light	11, 20	M	6 V	3	W	N 17 726 1
Flashing indicator light, front	14, M 162, M 164 [2]	R	6 V	20	W	N 17 730 1
Combined stop, tail and flashing indicator light	M 162, 164 [2]	S	6 V	20/5	W	N 17 736 1
Spot light	27	E	6 V	25	W	N 17 710 1
Back-up light	27	E	6 V	25	W	N 17 710 1
Red Cross light	27	F	6 V	15	W	N 17 716 1

[1] for right hand traffic only

[2] Optional Extras

II. Batteries

VW Passenger Cars			VW Transporter		
Chassis No.	Volts	A/H.	Chassis No.	Volts	A/H.
up to 397 023	6	84			
up to 929 745	6	70	up to 117 901	6	84
from 929 746	6	66	from 117 902	6	77

Check battery:

Battery fully charged: 32° Bé = spec. gravity 1.285
Battery semi-charged: 27° Bé = spec. gravity 1.230
Battery fully discharged: 18° Bé = spec. gravity 1.142
Acid level above upper edge of plates and separetors 5 mm (.197")

GENERAL TECHNICAL DATA

I. Table of Types

A	B		Official description of types
		VW Passenger Car	
101	102	Chassis, Standard version	
103	104	Chassis, De Luxe version	
111	112	Sedan, two door, Standard version	
113	114	Sedan, two door, De Luxe version	11
115	116	Sedan, two door, Standard version with sunroof	
117	118	Sedan, two door, De Luxe version with sunroof	
		Karmann Ghia and VW Convertible	14
141	142	Ghia Convertible, two seater	
143	144	Ghia Coupé, two seater	
151	152	Convertible, four seater	15
		VW Transporter	
211		VW Delivery Van (wing door right)	21
213	214	VW Delivery Van (wing door left)	
215	216	VW Delivery Van (wing door left and right)	
		VW Fire Truck (Delivery Van) 211 M 140	21 F

A	B			Official description of types
221		VW Micro Bus	(wing door right)	
223	224	VW Micro Bus	(wing door left)	
225		VW Micro Bus with sunroof	(wing door right)	22
	228	VW Micro Bus with sunroof	(wing door left)	
231		VW Kombi	(wing door right)	
233	234	VW Kombi	(wing door left)	
235		VW Kombi with sunroof	(wing door right)	
237	238	VW Kombi with sunroof	(wing door left)	23
		VW Fire Truck (Kombi) 231 M 146		23 F
241		VW De Luxe Micro Bus	(wing door right)	
	244	VW De Luxe Micro Bus	(wing door left)	24
251		VW De Luxe Micro Bus (7 seats)	(wing door right)	25
261		VW Pick-up	(lower deck lid right)	
263	264	VW Pick-up	(lower deck lid left)	26
265		VW Pick-up with double cab	(cab door right)	
267	268	VW Pick-up with double cab	(cab door left)	26– 16
		VW Pick-up with enlarged platform 26 M 200		26–200
		VW Pick-up with enlarged wooden platform 26 M 201		26–201
271		VW Ambulance	(wing door right)	
273	274	VW Ambulance	(wing door left)	27
281		VW Micro Bus (7 seats)	(wing door right)	
285		VW Micro Bus (7 seats) with sunroof	(wing door right)	28
122		**VW Industrial Engine**		
		VW Industrial Engine		122

A – Left-hand drive B – Right-hand drive

II. Tightening Reference

	Size	Torque (mkg)	Torque (foot pounds)
Engine			
Nuts for crankcase halves [1]	M 10	3.0	22
Bolts / nuts for crankscase halves	M 8	2.0	14
Cylinder head nuts [1]	M 10	3.6–3.8	26–27
Flywheel gland nut	M 28×1.5	30.0	217
Connecting rod bolt	M 9×1	5.0	36
Fan nut	M 12×1.5	5.5–6.5	40–47
Generator pulley nut	M 12×1.5	5.5–6.5	40–47
Spark plug threaded insert [1]	M 18×1.25	7.0–7.5	50–54
Spark plug	M 14×1.25	3.0–4.0	22–29
Oil drain plug [1]	M 18×1.5	3.0–4.0	22–29

[1] Type 2 up to Chassis No. 469 446 only

	Size	Torque (mkg)	Torque (foot pounds)
Transporter engine from Chassis No. 469 447 (as previously but with the following alterations)			
Nuts for crankcase halves	M 12×1.5	3,4–3.6	25–26
Cylinder head nuts	M 10	3.0–3.2	22–23
Oil drain plug	M 14×1.5	3.0	22
Front Axle (VW Passenger Car)			
Steering wheel nut	M 18×1.5	5.0–6.0	36–43
Steering drop arm bolt	M 12×1.5	6.5–7.5	47–54
Steering gear case mounting clamp nut	M 10	2.5–3.0	18–22
Front axle at frame	M 12×1.5	5.0–6.0	36–43
Bolts and nuts for shock absorbers at shock absorber mounting plate and torsion arm	M 10×1.5	3.0–3.5	21–25
Steering damper on Axle beam	M 10×40	2.5–3.0	18–22
Front Axle (VW Transporter)			
Steering wheel nut (up to Chassis No. 20–041 711)	M 18×1.5	5.0–6.0	36–43
(from Chassis No. 20–041 712)	M 16×1.5	2.5–3.0	18–22
Hex. head screw for steering arm	M 12×1.5	6.5–7.5	47–54
Pitman arm nut	M 20×1.5	8.0–10.0	58–72
Front axle attaching bolts	M 12×1.5	9.0–10.0	65–72
Hex. head screws for steering gear bracket at frame	M 10×22	3.0–4.0	21–29
Hex. head screws for steering gear case, at bracket	M 10×40	3.0–4.0	21–29
Hex. head screw and nut for steering damper, at frame	M 10×45 M 10×1.5	4.5	33
Nuts for tie rods on steering knuckle and swing lever	M 10×1	2.5–3.0	18–22
Nuts for draglink on pitman arm and swing lever	M 10×1	2.5–3.0	18–22
Transmission and Rear Axle			
Bolts / nuts for transmission case	M 8	2.0	14
Ring gear bolts	M 10	6.0	43
Drive pinion nut (Standard transmission)	M 18×1.5	5.0	36 [3]
Nut for pinion assy. (synchromesh transm.) up to Chassis No. 1 454 550	M 22×1.5	11.0–12.0	80–87 [4]
Nut for pinion assy. (synchromesh transm.), new lockwasher from Chassis No. 1 454 551 and 234 400) [2]	M 22×1.5	8.0–9.0	58–65 [4]
Main drive shaft nut [3]	M 16×1.5	4.0–5.0	30–36
Selector fork locating screw	M 8	2.5	18
Reverse selector fork screw [3]	M 7×12	2.0	14
Rear axle shaft nut	M 24×1.5	30.0	217
Nuts and bolts for spring plates – Type 1	M 12×1.5	10.0–12.0	72–87

	Size	Torque (mkg)	Torque (foot pounds)
Spring plate mounting bolts/reduction gear case – Type 2	M 12×1.5	10.0–12.0	72–87
Oil drain plug [2]	M 18×1.5	3.0–4.0	22–29
Transporter transmission from Chassis No. 469 447 (as previously but with the following alterations and innovations)			
Lock screw for needle bearing	M 8	1.5	11
Drive pinion nut	M 35×1.5	12.0	87
Ball bearing retainer screws	M 10×1.5	5.0	36
Drive pinion nut	M 22×1.5	5.0 [3]	36
Main drive shaft nut	M 22×1.5	5.0 [3]	36
Reverse lever guide screws	M 7	2.0	14
Oil drain plug	M 24×1.5	2.0	14
Oil filler plug	M 24×1.5	2.0	14
Brakes and Wheels (VW Passenger Cars)			
Brake back plate bolts	M 10×1.5	4.0–4.5	29–32
Brake hose unions	M 10×1	1.5–2.5	11–18
Brake line unions	M 10×1	1.5–2.5	11–18
Wheel disc bolts	M 12×1.5	9.0–11.0	65–79
Stop light switch	M 10×1	1.2	9
Brakes and Wheels (VW Transporter)			
Bolts for bearing cover at rear brake back plate	M 10×35	5.0–6.0	36–43
Mounting bolts for brake back plate with front wheel brake cylinder	M 10×30	5.0–6.0	36–43
Brake hose unions	M 10×1	1.5–2.5	11–18
Brake line unions	M 10×1	1.5–2.5	11–18
Wheel disc bolts	M 14×1.5	11.0–13.0	80–94
Wheel mounting bolt (oiled)	M 14×1.5	9.0–11.0	65–80
Stop light switch	M 10×1	1.2	9
Body			
Body mounting bolts	M 10×2.5	3.0	22
Body mounting bolts	M 10×8	2.0	14
Body mounting bolts	M 12×1.5	3.0	22

Always refer to the Workshop Bulletins since the values in this booklet may change.

[2] Type 2 up to Chassis No. 469 446 only

[3] First tighten to a torque of 15 mkg (108 ft. lbs.) and loosen again. Then tighten to a torque of 5 mkg (36 ft. lbs.) and turn on to the next hole.

[4] Tighten nuts to specified torques. Do not loosen them again.

[5] First tighten to a torque of 12 mkg (87 ft. lbs.), loosen again and finally tighten to a torque of 5 mkg (36 ft. lbs.).

III. Dimensions and Weights

VW Passenger Car

Outer Dimensions	VW Sedan VW Convertible	Karmann Ghia Models
Wheelbase	2400 mm (94.5")	2400 mm (94.5")
Track, front	1290/1305 mm [1] (50.8/51.4")	1290/1305 mm [1] (50.8/51.4")
rear	1250/1288 mm [2] (49.2/50.7")	1250/1288 mm [2] (49.2/50.7")
Length	4070 mm (160.2")	4140 mm (163.0")
Width	1540 mm (60.6")	1634 mm (64.3")
Height, unladen	1500 mm (59.1")	1325 mm (59.2")
Ground clearance with car fully laden	152 mm (6.0 ins.)	152 mm (6.0 ins.)
Angle of approach	27°/27°40' [2]	23.5°/27°40' [2]
Angle of departure	13.5°/12.5° [2]	13.5°/12.5° [2]

[1] De Luxe Sedan from Chassis No. 1 673 351
VW Convertible from Chassis No. 1 665 425
Karmann Ghia Coupé from Chassis No. 1 665 213
Karmann Ghia Convertible
[2] From Chassis No. 2 528 668

Weights	VW Sedan	VW Convertible	Karmann-Ghia Models
Weight, ready for use	730 kg (1609 lbs.)	800 kg (1764 lbs.)	810 kg (1785 lbs.)
Maximum load	380 kg (838 lbs.)	360 kg (794 lbs.)	300 kg (660 lbs.)
Total weight	1110 kg (2447 lbs.)	1160 kg (2557 lbs.)	1110 kg (2450 lbs.)
Max. load on front axle	450 kg (992 lbs.)	480 kg (1058 lbs.)	450 kg (990 lbs.)
Max. load on rear axle	660 kg (1455 lbs.)	680 kg (1499 lbs.)	660 kg (1455 lbs.)