Revision: Adjusting data as well as emission control and output test on drum dynamometer and model 250 E/8 added.

Checking and Adjusting Data

Valve Clearance (Tappet Clearance)

Model		200 D/8 220 D/8	200/8 220/8	230/8 250/8	250 E/8
Valve clearance with engine cold (ca. 20° C)	intake	0.10[1])		0.10[1])	
	exhaust	0.30		0.20	
Valve clearance with engine warm (60° C ± 15° C)	intake	0.15[1])		0.15[1])	
	exhaust	0.35		0.25	

1) 0.05 mm higher with outside temperatures continuing for extended periods at below -20° C.

Timing Angle (Dwell Angle) for Ignition Distributor with Normal Coil Ignition

Model	Timing angle Adjusting value with new contact points	Timing angle Test value with used contact points	Change between idle and 3000/min
200/8 220/8	53° ± 1	46-53°[1])	max. ± 3°
230/8 250/8	41° ± 1	34-41°[1])	

Timing Angle for Ignition Distributor with Transistorized Coil Ignition [2]

Model	Timing angle testing and adjusting value at idle	Change between idle and 3000/min
220/8	47-53°[3])	max. ± 3°
250/8	30-36°[3])	
250 E/8	34-40°[3])	

1) Do not change timing angle with used contact points and renew points when lower test value is attained.
2) Identification of transistorized ignition: Ignition coil painted blue, one switchgear and two series resistors.
3) When installing new and when adjusting used contact points, adjust timing angle according to boldly printed value ± 1°.

Adjustment of Firing Point and Test Values

Model	Ignition distributor Bosch order No.	Adjusting value [1] of firing point without vacuum at n=4500/min	Test values ignition timing without vacuum			Vacuum adjustment toward		Installation value of ignition timer at starting speed	
			idle	1500/min	3000/min	"retard" at idle	"advance" at 4500/min (firing point total)	vacuum without	vacuum with
Engines with Standard Compression									
200/8 220/8	0 231 115 064	43°	13-19°	22-30°	30-37°	-	8-14° (51-57°)	-	6° before TDC
	0 231 170 081		2-8°	15-23°	32-40°	-	10-14° (53-57°)	7° before TDC	-
	0 231 170 138		13-20°	16-22°	33-39°	-	14-20° (57-63°)	17° before TDC	-
230/8 250/8-M 114	0 231 116 048	37°	6-14°	20-27°	25-32°	-	7-13° (44-50°)	-	4° before TDC
250/8-M 130		35°	4-12°	18-25°	23-30°	-	7-13° (42-48°)	-	2° before TDC
250 E/8	0 231 301 002 0 231 301 004 0 231 301 008	30° [2]	2-4° after TDC with vacuum	12-19°	30°	8-14°	-	8° before TDC	-
Engines with Low Compression									
200/8 220/8	0 231 115 064	45°	15-21°	24-32°	32-39°	-	8-14° (53-59°)	-	8° before TDC
	0 231 170 081		4-10°	17-25°	34-42°	-	10-14° (55-59°)	9° before TDC	-
	0 231 170 138	43°	13-20°	16-22°	33-39°	-	15-19° (58-62°)	17° before TDC	-
230/8 250/8-M 114	0 231 116 048	40°	9-17°	23-30°	27-34°	-	7-13° (47-53°)	-	7° before TDC
250/8-M 130		37°	6-14°	20-27°	25-32°	-	7-13° (44-50°)	-	4° before TDC
250 E/8	0 231 301 002 0 231 301 004 0 231 301 008	30° [2]	2-4° after TDC with vacuum	12-19°	30°	8-14°	-	8° before TDC	-

1) If engines with standard compression are operated with fuels below 98 RON (min. 88 MON), adjust firing point in direction of "retard" and match to octane rating of fuel used.
Reference value for adjustment: retard firing point by 1-2° crankshaft per 1 RON. Max. retard should not exceed 6° crankshaft.
Caution! Retardation of firing point must be considered an "emergency measure". Decreased output and increased fuel consumption will result. In addition, do not apply full load to engine.
As soon as fuel of the specified octane rating is available, adjust again to full advanced ignition.

2) On engines with retarded ignition, check specified idle speed with vacuum after adjusting firing point.

Engines - USA Version

Identification: Reference plate in English language on cylinder head cover or on cross member in front of radiator.

Model	Ignition distributor Bosch order No.	Adjusting value of firing point without vacuum at n= 4500/min	Test values ignition timing without vacuum idle	1500/ min	3000/ min	Vacuum adjustment toward "retard" at idle	"advance" at 4500/ min (firing point total)	Installation value of ignition distributor at starting speed vacuum without	with
Model Year 1968/1969									
220/8	0 231 115 065	43°	8-12° after TDC with vacuum	23-30°	31-38°	19-25°	-	7° before TDC	-
230/8 250/8	0 231 116 052	37°	TDC ± 3°	15-25°	24-32°	-	6-14° (43-51°)	-	TDC

Model	Ignition distributor Bosch order No.	Adjusting value of firing point with vacuum at n=800/min	Test values ignition timing with vacuum 1500/ min	3000/ min	4500/ min	Vacuum adjustment toward "retard"	"advance" at 4500/ min (firing point total)	Installation value of ignition distributor at starting speed without vacuum
Model Year 1970/71								
220/8	0 231 115 086 0 231 115 089 0 231 115 090	5° after TDC	4-12°	23-31°	41-45° without	13-25°	-	6° before TDC
250/8	0 231 142 003 0 231 142 004	4° after TDC	1-9°	31-39°	41-49°	9-15°	7-13°	6° before TDC
Model Year 1972								
220/8	0 231 115 093	5° after TDC	3-5° after TDC	30-36°	43-47°	10-14°	-	10° before TDC
250/8	0 231 142 005	4° after TDC	1° after TDC to 7° before TDC	42-50°	46-54°	10-14°	8-12°	8° before TDC
Model Year 1973								
220/8	0 231 176 016	10° before TDC	15-20° without vacuum	27-32°	42-48°	at 4500 min 6-10°	6-10° (48-58°)	10° before TDC

Position of Crankshaft when Installing Injection Pump

Model	position of crankshaft when installing injection pump	
200 D/8	in position begin of delivery of injection pump[1]	26° before TDC in compression stroke[2]
220 D/8		24° before TDC in compression stroke[2]

1) Injection pump is in begin of delivery position when the marking line on the camshaft of the injection pump is in alignment with that on flange of injection pump.
2) Begin of delivery of injection pump in relation to crankshaft on models 200 D/8 and 220 D/8 is checked and adjusted according to overflow method after installing injection pump.

Compression Pressure and Cylinder Leaks

For compression pressure refer to "Technical Data Passenger Cars".

Cylinder Leaks

Check with cylinder leak tester on valves, cylinder head gasket, pistons and piston rings.

Permissible loss: Total reading not above 25 %
on valves and cylinder head gasket max. 5 %
on pistons and pistons rings max. 20 %

Opening (Ejection) Pressure of Injection Nozzles

Model	Bosch designation of injection nozzles	Ejection or opening pressure in atü[1]	
		new injection nozzles	used injection nozzles at least
200 D/8	DNO SD 1510	115-123	100
220 D/8	DNO SD 220		

Note: When checking or reconditioning injection members made by Bosch, the respective Bosch representatives should be amply consulted (also refer to Job No. 07-44).
1) The difference in the opening pressure of the nozzles on one engine should not exceed 5 atü.

Spark Plugs

For electrode gap, thread lengths, list of approved spark plugs etc. refer to Spark Plug Table.

Diesel Injection Pump

Injection Pumps Installed as Standard Equipment with Governor and Delivery Pump for Operation at Altitudes up to 2000 m above Sea Level

Model	Injection pump with governor and delivery pump DB part No.	Injection pump Bosch designation	Governor Bosch designation	Delivery pump Bosch designation	Control rod path incl. compensating path[1] mm	Test values 001/4 MB - sheet date[2]
200 D/8	621 070 39 01	PES 4 M 50 C 320 RS 14	EP/MN 60 M 25 DR	FP/K 22 M 13	14.9-15	2.0a 4.1968
220 D/8	615 070 12 01	PES 4 M 55 C 320 RS 47	EP/MN 60 M 23 DR		14.8-15[3]	2.2a 5.1972
200 D/8 Sweden version[4]	621 070 41 01	PES 4 M 50 C 320 RS 14[3]	EP/MN 60 M 28 DR		14.2-14.3	2.2c 7.1969
220 D/8 Sweden version[4]	615 070 15 01	PES 4 M 55 C 320 RS 47[3]	EP/MN 60 M 27 DR		14.2-14.4	

Injection Pumps Installed as Standard Equipment with Governor and Delivery Pump for Operation at Altitudes up to 2000 m above Sea Level

200 D/8	621 070 35 01	PES 4 M 50 C 320 RS 14z	EP/MN 60 M 25 DR	FP/K 22 M 13	14.2-14.3	2.0a 4.1968
220 D/8	615 070 06 01	PES 4 M 55 C 320 RS 47z	EP/MN 60 M 23 DR		13.9-14.1[3]	2.2a 5.1972

Max. speeds according to tachometer indication	200 D/8	in 2nd speed	60 km/h
	220 D/8	in 3rd speed	98 km/h

Note: In each case, measure max. speed without load and, if required, set control valve accordingly (the specified max. speeds should never be exceeded, refer to Job No. 00-0).

Inste ad of measuring max. speed without load (end of governing down), the begin of governing down at full load or on vehicles a permissible max. speed in 2nd and 3rd gear can also be checked and corrected according to tachometer indication. For permissible max. speeds refer to previous Table. Higher speeds are not permitted for mechanical reasons and to prevent oil and dirt from being carried along out of air filter (refer to Job No. 00-43, Section D).

1) The indication of the control rod path shows the path of the control rod from full load stop up to outermost stop position. In an emergency, the injection pump can be checked without a test bench by means of the values shown for the control rod and compensating path.
However, accurate control and adjustment of the injection pump can be made on an injection test bench only or by means of a carbon monoxide test of the emissions (refer to Job No. 00-43, Section E). For workshops operating a test bench, test sheets for the various pumps are available. The injection pump named in each case corresponds to the present state. In the event of replacements, this injection pump or the respective exchange injection pump should be installed.
2) Only test values or test sheets carrying the indicated or a later date are valid.
3) On engines with injection nozzles DNO SD 1510 the control rod path is 14.5-14.7 mm due to a reduced compensation path, and on injection pumps for altitudes above 2000 m it is 13.6-13.8 mm.
4) Injection pump with lead-sealed full load stop screw and governor housing.

Prior the each exhaust gas test the following items should be strictly observed:

1. Run engine oil temperature up to min. 60-80° C (oil telethermometer). For exhaust gas or performance test on drum dynamometer, the engine oil temperature should not exceed 110° C.

2. The plug-in depth of exhaust gas probe into exhaust pipe should be at least 550 to 600 mm.

3. The distance between suction funnel and end of exhaust pipe should be min. 200 mm.

4. When measuring exhaust gas on drum dynamometer:

a) Cool engine with blower.

b) Check tire pressure and correct, if required.

c) For measuring steps on drum dynamometer, during which the time limit for a normal test is exceeded, be sure to increase tire pressure "on principle" to 4.0 kp/cm² (atü).

Safety chocks should be placed approx. 50 mm in front of front wheels, i. e., the end portion should not touch the tire surface directly, since this would not permit the rear wheels of the vehicle to climb on front drum of drum dynamometer
If this instruction is not oberved, high torques cannot be perfectly transmitted without slip, i. e., the rear wheels are showing a tendency toward slipping.

5. First run through all measuring points. In the event of deviations from nominal values, make all possible corrections and repeat exhaust gas test again.

6. Do not adjust idle speed exhaust value when the engine is too hot, e. g., directly after driving on drum dynamometer or after a fast test drive on the road.

7. Exhaust gas (emission) equipment employing the "heat conductivity method" are not suited for measurements below 2.0 % CO, since this type of equipment indicates in reverse under 2.0 % CO, i. e., when fuel is turning toward lean, the indicator travels in the direction of "rich".

Identification: no paper filter plates.

Reference Values for Emission Test

for engines with standard compression and use of a fuel of min. 98 RON and min 88 MON.

Idle Speeds and Emission Values

Model	Model year 1968-1970		Starting January 1971 Europe emission control	
	Idle speed 1/min	Emission value % CO	Idle speed 1/min	Emission value % CO
200/8, 220/8	800-900	2.0-3.5	800-900	1.0-2.5
230/8 250/8-M114 250/8-M 130				2.0-3.5 [1])
250 E/8	750-800		750-800	

1) Model 230/8, 250/8-M 130 Japan version max. 1.5 % CO.

Emission Adjusting Values on Drum Dynamometer and on Road

Model 200/8, 220/8

Measuring points		Model year 1968-1970	Starting January 1971 Europe emission control [1])
		Emission rates in % CO [2])	
Lower partial load	Dynamometer 4th speed, 50 km/h, 10 HP Road 3rd speed, n = 1500, 300 mm Hg	0.5-2.0	0.5-2.0
Upper partial load	Dynamometer 4th speed 100 km/h, 23 HP Road 3rd speed, n = 3000, 300 mm Hg	0.2-1.5	0.2-1.0
Full load	Dynamometer 3rd speed n = 4000 Road 2nd speed, n = 4000	2.0-4.0	3.0-5.0
Idle		2.0-3.5	1.0-2.5

Note: Run through all measuring points in above sequence first.

1) Identification: Stromberg-carburetor automatic starting device.
2) On Stromberg-carburetors, adjustment of fuel control screw at "lower" or "upper" idle speed emission rate will simultaneously result in adjustment of all load emission rates, either in direction of "lean" or "rich".
3) Full load measurement in 2nd speed at 4000/min should take as little time as possible to avoid overheating of brake system.

Reference Values for Emission Test

for engines with standard compression and use of a fuel of min. 98 RON and min. 88 MON.

Emission Adjusting Values on Drum Dynamometer and on Road
Model 230/8, 250/8-M 114, 250/8-M 130

	Measuring points	Model year 1968-1970	Starting January 1971 Europe emission control [1]
		Emission rates in % CO	
Lower partial load	Dynamometer 4th speed, 50 km/h, 10 HP Road 3rd speed, n = 1500, 300 mm Hg	1.0-3.0	0.5-2.0
Upper partial load	Dynamometer 4th speed, 100 km/h, 23 HP Road 3rd speed, n = 3000, 300 mm Hg	0.2-1.5	0.2-1.0
Full load [2]	Dynamometer 3rd speed, n = 4000 Road 2nd speed, n = 4000	2.0-4.0 [3]	2.0-4.0 [3]
Idle		2.0-3.5	2.0-3.5

Note: Run through all measuring points in above sequence first.
In the event of deviations, complete engine test first, then check float adjustment and correct.

1) Identification: Zenith-carburetor temperature switch in cylinder head for automatic starting device.
2) Full load measurement in 2nd speed at 4000/min should take as little time as possible to avoid overheating of brake system.
3) When full load nominal values are exceeded or in the event of complaints about excessive fuel consumption, the full load emission value may be made leaner by means of a larger air correction nozzle or a smaller fuel main nozzle of the 2nd stage..

Model 250 E/8

	Measuring points	Model year 1968-1970	Starting January 1971 Europe emission control [1]
		Emission rates in % CO	
Lower partial load	Dynamometer 4th speed, 50 km/h, 10 HP Road 3rd speed, n = 1500, 300 mm Hg	0.5-2.5	0.2-1.0
Upper partial load	Dynamometer 4th speed, 100 km/h, 23 HP Road 3rd speed, n = 3000, 300 mm Hg	0.2-1.5	0.1-1.0
Full load	Dynamometer 3rd speed, n = 4000 Road 2nd speed n = 4000	3.5-6.5	2.0-4.0
Idle		2.0-3.5	2.0-3.5

Note: Run through all measuring points in above sequence first.

1) Identification: Green sticker on switchgear and pressure censor.
2) Full load measurement in 2nd speed at 4000/min should take as little time as possible to avoid overheating of brake system.

Reference Values for Emission Test on Diesel Engines

Speeds

Model	Idle speed 1/min	Full load max. speed or begin of governing down 1/min	Max. speed no load or end of governing down 1/min
200 D/8 220 D/8	750-800	4500-4600	5200-5400

Emission Test on Drum Dynamometer

Model 200 D/8, 220 D/8

Measuring points		Emission value % CO
Full load	in 2nd speed, n = 4000/min	0.1-0.3 [1]
Full load with engine hood closed	in 2nd speed, n = 4800/min	0.1-1.0 [2]

1) Correction or adjustment of full load emission value at full load stop screw of injection pump. Clockwise "leaner", counterclockwise "richer". Always adjust emission value at which the highest engine output is attained.
2) Make corrections at full load stop screw of control valve.
Adjust to emission value at which max. engine output is attained.

Reference Values for Emission Test on Engines with USA Emission Control [1]

Idle Speed and Emission Adjusting Values

Model	Model year 1968/69		Model year 1970/71			Model year 1972/73		
	Idle speed 1/min	Emission values % CO	Idle speed 1/min	Emission values % CO 1970	1971	Idle speed 1/min 1972	1973	Emission values % CO 1972	1973
220/8	850-950	2.0-2.5	800-850	3.0 - 4.0		750 - 850		2.0-3.5	max. 1.5
230/8	800-900	1.5-2.5	-	-		-		-	
250/8-M 114	800-900	1.0-1.5	800-900	1.8-2.8	1.5-2.5	-		-	
250/8-M 130	-	-	-	-		800-900	-	1.0-1.5	-

1) On USA version vehicles always adjust to idle speed emission values named on reference plate. Instructions are in the English language, plate is attached to cross member in front of radiator.

Emission Adjusting Values on Drum Dynamometer and on Road

Model 220/8

	Measuring points	Model year 1970/71 | 1972 | 1973 Emission values in % CO		
Lower partial load	Dynamometer 4th speed 50 km/h, 10 HP	0.2-1.0	0.2-0.5	0.2-0.5
	Road 3rd speed, n = 1500, 300 mm Hg			
Upper partial load	Dynamometer 4th speed, 100 km/h, 23 HP	0.2-0.6	0.5-1.5	0.5-1.5
	Road 3rd speed, n = 3000, 300 mm Hg			
Full load[1)]	Dynamometer 3rd gear, n = 4000	3.0-5.5	3.0-3.5	3.0-3.5
	Road 2nd speed, n = 4000			
Idle		3.0-4.0	2.0-3.5	max. 1.5

Model 250/8-M 114, 250/8-M 130

	Measuring points	Model year 1970/71 | 1972 Emission values in % CO	
Lower partial load	Dynamometer 4th speed, 50 km/h, 10 HP	0.2-1.5	0.2-0.5
	Dynamometer 3rd speed, n = 1500, 300 mm Hg		
Upper partial load	Road 4th speed, 100 km/h, 32 HP	0.5-2.0	0.5-1.5
	Road 3rd speed, n = 3000, 300 mm Hg		
Full load[1)]	Dynamometer 3rd gear, n = 4000	3.0-5.5	3.0-5.0
	Road 2nd speed, n = 4000		
Idle		1.0-2.5	1.0-1.5

Note: Run through all measuring points in above sequence first.
In the event of deviations, complete engine test first, then check float adjustment and correct.

1) Full load measurement in 2nd speed at 4000/min should take as little time as possible to avoid overheating of brake system.

Output Correction on Drum Dynamometer[1)]

Engines with Standard Compression

Model	Function test for output estimate										Output test for checking output complaints			
	Manual transmission 3rd speed					Automatic transmission driving position "S"					Speed/ driv. pos.	Speed 1/min	min kW	Output (HP)
	km/h	N	(kp)	kW	(HP)	km/h	N	(kp)	kW	(HP)				
200 D/8	80	1210	121	27	36	75	1220	122	25	34	2/"L"	4000	27	37
											2/"L"	4800	21	29
220 D/8	80	1320	132	29	39	75	1330	133	27	37	2/"L"	4000	29	40
											2/"L"	4800	24	32
200/8	100	1730	173	47	64	90	1830	183	45	61	3/"S"	4800	48	66
220/8	100	1920	192	52	71	90	2040	204	50	68	3/"S"	4800	53	73
230/8	100	2100	210	58	78	90	2250	225	55	75	3/"S"	4800	61	83
250/8-M 114	100	2240	224	61	83	90	2400	240	59	80	3/"S"	5400	67	91
250/8-M 130	100	2380	238	65	88	90	2540	254	62	84	3/"S"	5400	73	99
250 E/8	100	2560	256	70	95	90	2730	273	67	91	3/"S"	5400	78	106

Engines with Low Compression

200/8	100	1527	156	42	58	90	1595	163	40	54	3/"S"	4800	43	59
220/8	100	1626	166	45	61	90	1715	175	43	58	3/"S"	4800	45	61
230/8	100	1800	183	50	68	90	1820	185	45	62	3/"S"	4800	53	72
250/8-M 130	100	2195	224	61	83	90	2290	233	57	78	3/"S"	4800	61	83

Caution! Prior to measuring, the engine, transmission, rear axle and tires should be at operating temperature. Warm up by driving under partial load. Measurements with cold tires are impossible due to high slip.

Place chocks only in front of, not under front wheels. Vehicle should be able to climb slightly on front dynamometer drum, since the transmission of a high torque is otherwise impossible and tires will spin.

In addition, it is recommended to approach the measuring points by releasing the brake from a low speed and not by braking from a high speed. The risk of spinning tires will then be reduced.

On revolution indicators having a scale of max. 5000/min, set to position "8 cylinders" and n = 4050/min for measuring a speed of 5400/min (6-cylinder engines).

Note: When measuring output, the various factors influencing the measurements must be taken into consideration (altitude of test site, barometer reading and intake air temperature).

1) Permissible losses for power steering and automatic transmission are already deducted, for power steering approx. 2 kW (3 HP), for automatic transmission approx. 4 %.

Timing for Test Measurements at 2 mm Valve Lift

Model	Camshaft	Intake valve		Exhaust valve		Min. distance between intake valve and piston at crankshaft position 5° after overlap TDC (mm)
	Code No. [1]	opens after TDC	closes after BDC	opens before BDC	closes before TDC	
200/8 220/8	60 61	14°	20°	23°	11°	0.9
	05	14°	20°	22°	12°	
200 D/8 [2] 220 D/8 [2]	12 [3] 13 [4] 17 [5] 20 [5] 18 [6]	13.5°	15.5°	19°	17°	1.3 [2]
230/8 250/8	08	15°	21°	22°	10°	0.9
250/8 250 E/8	01 05	7°	23°	28°	10°	

USA Version - Model Year 1970/71/72/73

220/8	61	14°	20°	23°	11°	0.9

USA Version - Model Year 1970/71

250/8	01	7°	23°	28°	10°	0.9

Note: Timing for test measurements at 2 mm valve lift means that the pertinent values are computed at a valve lift (stroke) of 2 mm. When measuring, cancel normal operational valve clearance by means of a feeler gauge or the like.

1) The code No. is punched into rear face to identify the individual camshaft.
2) On models 200 D/8 and 220 D/8, also measure minimum distance = 2.2 mm between exhaust valve and piston at crankshaft position 5° before overlap TDC.
3) Solid shaft for external lubrication without ring grooves at bearing points, except bearing point 1.
4) Solid shaft for external lubrication without ring grooves at bearing points.
5) Cam width 18 mm.
6) Cam width 18 mm, rocker arms 20 mm wide.

Carburetor Line-up and Adjusting Values

Model			200/8, 220/8	
Carburetor designation		Stromberg	175 CDS	175 CDT
Nozzle needle			AA[1]	YA[2]
Needle nozzle			100	
Float needle valve			2.25	
Float adjustment		mm	16-17	
Float chamber vent valve stroke (with engine stopped)		mm	min. 1	
Basic adjustment of connecting rod		mm	28-30	
Cold starting speed (measured at operating temperature)		1/min	1700-1800	3300-3600
Automatic starting device-cover preload			-	on mark
Automatic starting device-cover designation			-	2[3]
Oil damper- air piston			engine oil[4]	
Vacuum governor adjustment	Adjustment set screw, vacuum hose pulled off	1/min	1200-1400	
	Distance throttle valve lever in relation to set screw	mm	0.5	

1) Nozzle needle 4 F for model 200/8 up to chassis end No. 001 351 and for model 220/8 up to chassis end No. 003 250.
2) Nozzle needle TA for model 200/8 up to chassis end No. 109 254 and for model 220/8 up to chassis end No. 091 429.
3) Cover for automatic starting device with screw connection 29.
4) During long periods of frost below -20° C use ATF.

Carburetor Line-up and Adjusting Values

Year 1968-70

Identification: No temperature switch for automatic starting device.

Model	230/8		250/8, 250/8 Cp. with M 114		250/8, 250/8 Cp. with M 114	
Carburetor designation	2 x Zenith 35/40 INAT				2 x Zenith 35/42 INAT	
Carburetor stage	1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Air horn "K"	24	28	24	28	26	32
Main jet "Gg"	x 115	x 120	x 120[3]	x 120[3]	x 130	x 140
Air correction jet "a"	100	130	110[3]	120	130[4]	150
Mixing tube "s"	4 S	4 N	4 S	4 N	4 S	4 N
Idle fuel jet "g"	45	-	45	-	45	-
Transition fuel jet	-	60	-	60	-	80
Idle air bore (mm dia.)	1.3	-	1.3	-	1.3	-
Enriching jet	-	-	-	-	60	-
Transition air bore	-	1.0	-	1.0	-	1.0
Injection volume (cc/stroke)	0.7-1.0	-	0.7-1.0	-	0.7-1.0	-
Injection pipe	0.5 calibr.	-	0.5 calibr.	-	0.5 calibr.	-
Begin of injection at opening of throttle valve	at once	-	at once	-	at once	-
Float needle valve	2.0					
Float weight (g)	8.5					
Sealing ring for float needle valve mm	1.0					
Float adjustment (mm)	21 - 23					
Fuel return valve adjustment 1/min	2000					
Float housing-venting valve stroke (engine shut off) mm	reference dimension 2.8 - 0.3					
Choke valve gap adjustment mm	2.4					
Cold starting speed (measured at operating temperature) 1/min	2400 - 2600					
Automatic starting device-cover preload	on mark					
starter cover designation	both 24					

Note: Model 230/8

In the event of complaints based on "engine surge due to lean mixture" reduce air correction jet of 1st stage from size 100 to 90. If surge persists, increase main jet of 1st stage from 115 to 120 and reinstall air correction jet of 1st stage size 100. In the event of complaints based on transition trouble from 1st to 2nd stage, increase transition fuel jet of 2nd stage from size 60 to 80.

1) For model 250/8 up to chassis end No. 029 379, for model 250/8 Cp up to chassis end No. 000 225:35/40 INAT.

2) For model 250/8 as from chassis end No. 029 380, for model 250/8 Cp. as from chassis end No. 000 226:35/42 INAT.

3) For model 250/8 up to chassis end No. –10–010 940 or –12–012 535:maint jet 1st stage 115, 2nd stage 125, air correction jet 1st stage 100.

4) For model 250/8 up to chassis end No. 030 697 and for model 250/8 Cp. up to chassis end No. 001 536: air correction jet 1st stage 120.

Carburetor Line-up and Adjusting Values

Europe Emission Version Starting January 1971

Identification: Temperature switch in cylinder head for automatic starting device at rear carburetor.

Model		230/8		250/8 with M 114		250/8 with M 130	
Carburetor designation		2 x Zenith 35/40 INAT		2 x Zenith 35/42 INAT		2 x Zenith 35/42 INAT	
Carburetor stage		1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Air horn "K"		24	28	26	32	26	32
Main jet "Gg"		x115	x 120	x 125	x 140	x 135	x 140
Air correction jet "a"		100	130	130	140	140	120
Mixing tube "s"		4 S	4 N	4 S	4 N	4 S	4 N
Idle fuel jet "g"		45	-	45	-	45	-
Transition fuel jet		-	50	-	80	-	60
Idle air bore	mm dia	1.3	-	1.3	-	1.3	-
Enriching jet		-	-	60	-	60	-
Transition air bore		-	1.0	-	1.0	-	1.0
Injection volume	cc/stroke	0-7-1.0	-	0-7-1.0	-	0-7-1.0	-
Injection type	calibrated	0.5	-	0.5	-	0.5	-
Begin of injection		at once	-	at once	-	at once	-
Float needle valve		2.0					
Float weight	g	8.5					
Float adjustment	mm	21 - 23					
Seal for float needle valve	mm	1.0					
Fuel return valve adjustment closing point	1/min	2000					
Float housing-venting valve stroke (engine shut off)	mm	2.8 - 0.3					
Choke valve gap adjustment		2.4					
Cold starting speed (measured at operating temperature)	1/min	2400 - 2600					
Automatic starting device cover preload		on mark					
Starter cover designation		front 24 rear 18					

Carburetor Line-up and Adjusting Values

USA Version

Model		220/8
Model year		1968/69
Carburetor designation		2 x Solex 36 - 40 PDSI
Air jet "K"		28
Main jet "Gg"		137.5
Air correction jet "a"		80
Mixing chamber venting tube	mm dia	0.5
Idle fuel jet "g"		62.5
Idle air bore	mm dia.	1.6
Injection volume	cc/stroke	0.7 - 1.0[1)]
Injection pipe		0.5 calibrated
Float needle valve		2.0
Seal for float needle valve	mm	1.0
Starting device adjustment-throttle valve	1/min	1600
Starter-connecting rod - adjustment	mm	28 (dimension "a" Fig. 00-12/6)
Fuel return valve-adjustment	1/min	4500

1) Front carburetor on vehicles with automatic transmission 0.6-0.9 cc/stroke.

Carburetor Line-up and Adjusting Values

USA Version

Model		220/8		
Model year		1970/71	1972	1973
Carburetor designation		Stromberg 176 CDT		
Nozzle needle		RA	YA	
Needle nozzle		100		
Float needle valve		2.25		
Float adjustment	mm	16 - 17		
Float chamber - venting valve stroke (engine shut off)	mm	1 - 2		-
Starter enrichment bore dia.	dia. mm	-		0.6
Cold starting speed (measured at operating temperature)	1/min	2400 - 2800		2600 - 2800
Automatic starting device cover - preload		on mark		
Starter cover designation		28[1)]	1	2/90
Oil damper air piston		ATF		
Vacuum governor adjustment	Adjustment set screw vacuum hose pulled off 1/min	1600 - 1700		1200 - 1400
	Distance throttle valve lever in relation to set screw mm	0.5		

1) Up to chassis end No. 052 328 starter cover designation 25, up to chassis end No. 065 282 starter cover designation 26.

Carburetor Line-up and Adjusting Values

USA Version

Model		230/8, 250/8M 114		250/8-M 130		250/8-M 130	
Model year		1968/1971				1972	
Carburetor designation		2 x Zenith 35/40 INAT				2 x Zenith 32/40 INAT	
Carburetor stage		1st stage	2nd stage	1st stage	2nd stage	1st stage	2nd stage
Air horn "K"		24	28	24	28	20	28
Main jet "Gg"		x 115	x 125[1]	x 115	x 125	x 100	x 130
Air correction jet "a"		100	120[2]	90	110	180	110
Mixing tube "s"		4 S	4 N	4 S	4 N	mm Ø 1.7	4 N
Idle fuel nozzle "g"		45	-	45	-	45	-
Transition fuel nozzle		-	60	-	80	-	70
Idle air bore	mm dia.	1.3	-	1.3	-	1.4	-
Transition air bore		-	1.0	-	1.0	-	1.0
Injection volume	cc/stroke	0.7-1.0	-	0.7-1.0	-	0.7-1.0	-
Injection pipe		0.5 calibr.	-	0.5 calibr.	-	0.5 calibr.	-
Begin of injection at throttle valve opening		at once		at once		at once	
Float needle valve		2.0					
Float weight	g	8.5					
Float adjustment	mm	21 - 23				18 - 20[3]	
Seal for float needle valve	mm	1.0					
Fuel return valve adjustment	1/min	2000					
Float chamber - venting valve stroke (engine shut off)	mm	reference dimension 2.8-0.3				-	
Choke gap adjustment	mm	2.0-2.2				2.0-2.2[4]	
Cold starting speed (measured at operating temperature)	1/min	2500 - 2700				2500 - 2700[4]	
Automatic starting device cover-preload		on mark					
Starter cover designation		both 24		front 24 rear 18		both 24	

1) Model 230/8 = x 120
2) Model 230/8 = 130
3) With float needle without ball 21-23 mm.
4) Adjusted to mixing ratio by manufacturer. Try not to change.

Fuel Delivery Pump

Carburetor Engine

Designation of pump APG			Lever pump	Plunger pump
Vacuum	Measuring point		before pump inlet	
	at starting speed	atu	0.3-0.4	-
		mmHg	230-320	250-350
Delivery pressure	Measuring point		after pump outlet	
	at starting speed	atü	0.12-0.18	0.25-0.35
	at idle speed	atü	0.18-0.24	

Injection Engine

Bosch order No.		0 580 970 002[1)] 0 580 464 005
Measuring instruction		at idle
Delivery pressure	Measuring point	in front of pressure regulator in ring line
	atü	2.0 + 0.1[2)]
Delivery output[3)]	Measuring point	return line after pressure regulator
	1 liter	in min. 30 secs.

1) Installed up to chassis end No. 014 884.

2) After shutting-off engine, pressure may drop to 1.5 atü, on fuel pumps with Bosch designation 0 580 970 002 to 1.2 atü.

3) Fuel tank should be at least half filled for measuring delivery output.

Diesel Engine

Bosch designation			FP/K 22 M 13
Vacuum	Measuring point		before pump inlet
	at idle speed	atu	0.1
Delivery pressure	Measuring point		between fuel main filter and injection pump
	at idle speed	atü	0.6-0.8
	at n = 3000/min	atü	min. 0.8
Delivery end pressure	at idle speed	atü	min. 1.1
	at n = 3000/min	atü	min. 1.3

Fuel Overflow Valve

Model	Opening pressure in atü at idle speed	at 3000/min
200 D/8 220 D/8	0.6-0.8	min. 1.3

Oil Pressure

At operating temperature, oil pressure may drop to 0.5 atü at idle speed. Upon acceleration, the oil pressure should increase immediately and should attain at least 3 atü at 3000/min.

Oil Consumption

The oil consumption of the engine can only be judged after a certain mileage and in the beginning consumption may be in excess of the specified average value. Frequent driving at high engine speed also results in additional consumption. The oil level should therefore be checked regularly.

For average engine oil consumption see Job No. 0-3, for high oil consumption see Job No. 00-50.

Fuel Consumption

Consumption depends on driving speed. The values given in the table were obtained at uniform speeds with two passengers in the car and on a flat road.

Compared with smart driving and long-distance runs, higher fuel consumption will occur in heavy city traffic, on short runs, slow driving in a line of cars, frequent accelerating and braking and, in addition, at very low outside temperatures and snow. Thus consumption depends to a large degree on driving habits and on external circumstances.

For average consumption and fuel consumption according to DIN 70 030 see Job No. 0-3.

Hints on Economical Driving

Do not play too much with the gas pedal. Never accelerate more than is necessary to maintain the speed required.

Do not drive too much in low gears. Do not always exploit the full acceleration and top engine speeds in the various gears.

Take curves at moderate speeds. Taking curves at high speeds exerts a greater wear on your tires than many miles on a straight road.

Tightening Torques in mkp

Engine		200 D/8 220 D/8	200/8 220/8	230/8 250/8 250 E/8
Cylinder head bolt	with engine cold [1]	9	8[3]	8
	with engine warm [2]	9	9[3]	9
Hex. bolt for attaching cylinder head cover to cylinder head		0.5		
Threaded bushing in cylinder head for mounting rocker arm		-	8	
Valve adjusting screw		-	2.0-4.0	
Rocker arm bearing bracket screws[4]		3.75	-	
Spark plugs or glow plugs		5	2.5-3.0	
Prechamber in cylinder head		15+3	-	
Nozzle in nozzle holder and nozzle holder in cylinder head		7+1	-	
Hex. nut for attaching injection timer to input shaft of injection pump		7	-	
Expanding screw for attaching drive flange of injection timer		1.9	-	
Pipe connection for delivery valve on injection pump[5]		3.0+0.5	-	
Coupling nuts of injection lines		2.5	-	
Connecting rod bearing bolts	initial torque	4-5		
	angle of rotation torque	$90^{o} + 10^{o}$		
Fastening screw for flywheel or driven plate on crankshaft	initial torque	3-4		
	angle of rotation toque	$90^{o} + 10^{o}$		
Crankshaft bearing bolts		9		8
Hex. screw on crankshaft front		25-27 (30 + 1.5[6])		
Oil drain plug on air-oil cooler		3-3.5		
Fastening bolt for oil pan lower half		1.1		
Fastening bolt for oil filter lower half		4-0.5		
Oil pressure relief valve in cylinder crankcase and to oil pump		4		

Footnotes refer to next page.

Torque wrenches should not be used above 50-70% of their capacity (e. g. for a 3. 75 mkg tightening torque a torque wrench with a range of 0-6 mkg should be used).

1) Before fitting the cylinder head screws apply graphite oil to the threads and to the contact surfaces of the cylinder head screws and the washers.

   The instructions for the tightening sequence and for the tightening stages of the cylinder head screws should be strictly adhered (see Page 00-0/23).

2) After installing the cylinder head warm up the engine under slight load until the cooling temperature reaches 80° C. Run the engine for approx. 5 minutes at this cooling water temperature and then tighten the cylinder head screws with the engine warm according to the values listed.

   Carry out second retightening after another 300-1000 km.

   Caution: When retightening the cylinder head screws there is a danger of omitting the necessary retightening because the unscrewing toque is usually higher than the prescribed tightening torque and it may thus be possible that the torque value in the first tightening phase is above the nominal tightening torque.

   In order to ensure that the cylinder head gasket is really fitted with the prescribed screw tightening torque the retightening of the cylinder head screws should be carried out as follows:

   Each screw should be slightly loosened in the sequence laid down in the screw schedule and should then be tightened to the prescribed tightening torque. Under no circumstances should all screws be unscrewed in one operation and then tightened.

3) Cylinder head screws M 10 (Nos. 11-14, see page 00-0/23) should be tightened to 5 mkp with the engine cold and to 6 mkp with the engine warm.

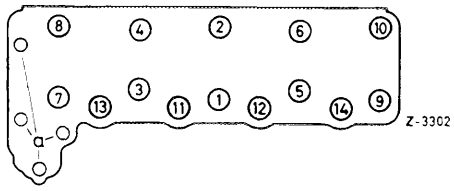
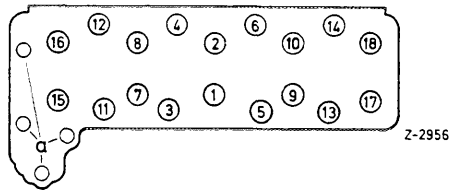
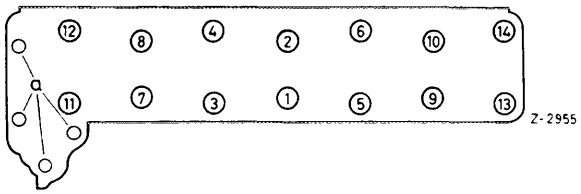
4) When tightening the rocker arm block screws the rocker arms must not be under load from the camshaft.

5) In order to ensure proper seating of the sealing rings of the pipe unions, tighten the pipe unions to 3. 0 mkp and back them out again, then tighten them to 3. 0 mkp and back them out before finally tightening them to 3. 0 + 0. 5 mkp. Care should be taken to ensure that threads of the pipe unions are coated with tallow before they are screwed in.

   Apart from this, the fixing screw of the clamping jaw lock between the pipe unions should be tightened with a tightening torque of no more than 0. 5 + 0. 2 mkp (because excessive tightening may cause leakage at the elements of the low-pressure and high-pressure side as a result of distortion of the injection pump housing).

6) Only with engine M 180 with 4 cup springs and screw M 18 x 1. 5 x 50.

Table for Tightening Sequence and Tightening Stages of Cylinder Head Screws M 12

Model	Diagram for tightening sequence of cylinder head screws	Tightening stages, tightening tourque in mkp			
		1st tightening	2nd tightening	3rd tightening	check
200/8 220/8		with engine cold			at CWT 80° C 1)
		4	6	8	9
		M 10 Screws 11 to 14			
		2	4	5	6
200 D/8 220 D/8		4	6	9	9
230/8 250/8 280 E/8		4	6	8	9

Note: All other screws "a" with M 8 thread should be tightened by means of a hand wrench (2.5 mkp).
Slackening of the cylinder head screws is the reverse of the tightening process.

1) CWT = Cooling water temperature