BOSCH

Audi
BMW
Capri II
Lancia
Mercedes-Benz
Porsche
Saab
Volkswagen
Volvo

DESCRIPTION

Starter is a brush type, series wound, electric motor, equipped with an overrunning clutch (inner-wedge or outer-wedge type). Unit may or may not be equipped with a solenoid. Field frame is enclosed by commutator end frame and drive bushing and carries the pole shoes and field coils. A spline, located on drive end of armature, carries overrunning clutch and pinion assembly. Armature shaft is supported in sintered bronze bushings in the commutator end frame and drive end housings (these bushings are packed with lubricant at assembly and require no further lubrication).

APPLICATION

Model	Manufacturer Part No.
Audi	
100LS	058 911 023F
Fox	056 911 023B
BMW	
320i	①311045
530i, 630CSi	①311042
Capri II	
4 Cyl.	D7RY-A
V6	D7RY-A
Lancia	82301308
Mercedes-Benz	
230	002 151 1101
240D, 300D	002 151 6901
280	002 151 7101
450 Series	002 151 4301
Porsche	
924	059 911 023F
911 & Carerra	916 604 10100
Saab 99	8309643
Volkswagen	
Dasher, Rabbit, Scirocco	
Man. Trans.	055 911 023B
Auto. Trans.	056 911 023D
All Others	
Man. Trans.	113 911 023
Auto. Trans.	311 911 023D
Volvo	
4 Cyl.	464316-9
V6	464317-7

① – Basic Bosch Part No. 0 001.

TESTING

Lock Test– Mount starter in a test stand to allow starter torque measurement (follow manufacturers instructions). With voltage adjusted to specifications, ammeter reading and starter torque should be within specifications.

Free Running Test– With starter in test bench, take readings of starter current, voltage and RPM. Readings should be within specifications.

NOTE – *Starter must be mounted to prevent meshing of pinion and ring gear even in engaged position. If starter has warmed up during previous tests, RPM will be higher.*

SPECIFICATIONS

Brush Spring Tension

Application	lbs. (Kg)
208 xxx	2.54-2.98 (1150-1350)
211 xxx	2.54-2.98 (1150-1350)
211 9xx	2.38-2.69 (1080-1220)
212 xxx	2.38-2.69 (1080-1220)
311 xxx	2.54-2.87 (1150-1300)
312 1xx	1.76-1.98 (800-900)
313 xxx	2.54-2.87 (1150-1300)
362 xxx	2.54-2.87 (1150-1300)

Min. Brush Length

Application	In. (mm)
312 1xx	.394 (10)
362 xxx	.611 (15.5)
All Other Starters	.520 (13)

NOTE – *For performance test data, see specification table.*

OVERHAUL

DISASSEMBLY

1) With starter removed from vehicle, remove dust cover. Lift out brush springs using a wire hook, pull out brushes to ¾ of their length. Remove screws connecting field coil terminals to brush boxes.

2) Disconnect field coil to solenoid strap, remove hex nut on one side of drive end cover and remove screw. Remove screws securing solenoid and remove solenoid.

3) Remove commutator end assembly, remove through bolts and pull complete drive end assembly forward. Note proper location of washers for reassembly.

4) Remove yoke lever, then from armature shaft, remove cotter pin and left hand threaded castle nut. Remove snap ring and discard.

5) Remove drive assembly, intermediate bearing with bushing and armature brake, spring plate washer unit or washer spring jaw unit, depending on the model.

CLEANING & INSPECTING

Clean all parts using carbontetrachloride or suitable cleaning agent, inspect parts for wear or damage. After inspecting parts apply thin coat of oil to running surfaces.

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PARTS REPLACEMENT & TESTING

Brushes & Springs – Check brush spring pressure with suitable spring scale. Check brushes for minimum length. If replacement is necessary, replace all brushes.

Armature – Check coil and commutator to shaft (or core) for short circuit, with 110 volt ac control lamp. Control lamp should not illuminate (slight illumination is possible due to dampness). Check coil to commutator for short circuit with a 6 volt DC control lamp, touching every coil on armature and its corresponding bar, brightness of lamp should not change. Check coils on armature for short circuit between windings using a growler.
Check out of round of commutator to core, it should not exceed .00197" (0.5 mm). Commutator should have a smooth greyish-blue surface with no grooves or burned spots otherwise, it must be turned. Minimum commutator diameter is 1.32" (33.5 mm). After turning commutator, undercut insulation to a depth of .0197-.0236" (0.5-0.8 mm), decrease diameter by .0039" (0.1 mm). Do not use emery cloth, turn on a lathe only.

Housing – Check field coils for shorted or open circuits. Remove burned or damaged coils, mark location of coils and pole shoes for installation. Replace pole shoes with coils, using a suitable pole shoe screwdriver and mandrel.

Drive Assembly – Replace drive when damaged or teeth are worn. Disassemble as follows: Pull Pinion with left hand (turning to left), then pull guide discs toward commutator, also giving these a left hand turn. Mark all parts for reassembly. Remove intermediate bearing, spring, spring seat and plate from armature shaft. Carefully remove spring ring using a screwdriver and pushing stop ring back.
Take off inner and outer spring, guiding piece, locking piece, disc and thrust ring from drive cup. Remove spring ring from drive cup. Remove pinion with clutch discs, taking care not to lose disc. Remove stamping marks between stop ring and spring ring. Slacken clutch nut from pinion by twisting, being careful of small springs inside nut. If pinion, stop disc or plate is damaged, force out ring so new parts may be installed.

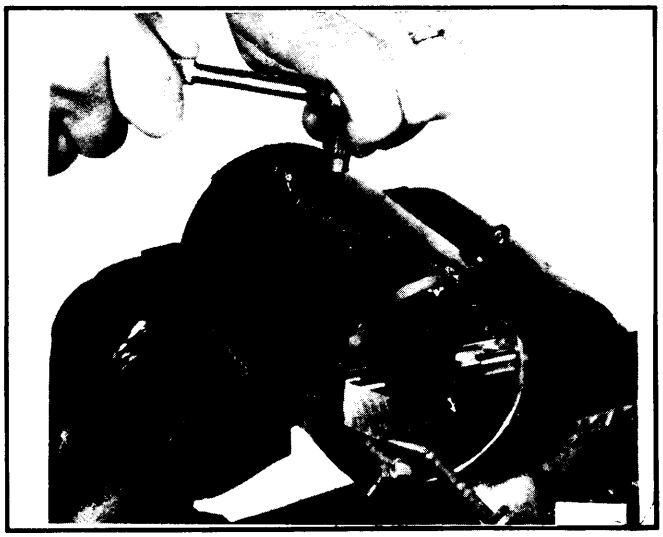

Fig. 1 Removing Pole Shoes

Bushings – Self-lubricating bushings should be replaced only when worn or damaged. Force out bushings, using a suitable mandrel, remove burrs and clean hole. Before pressing in new

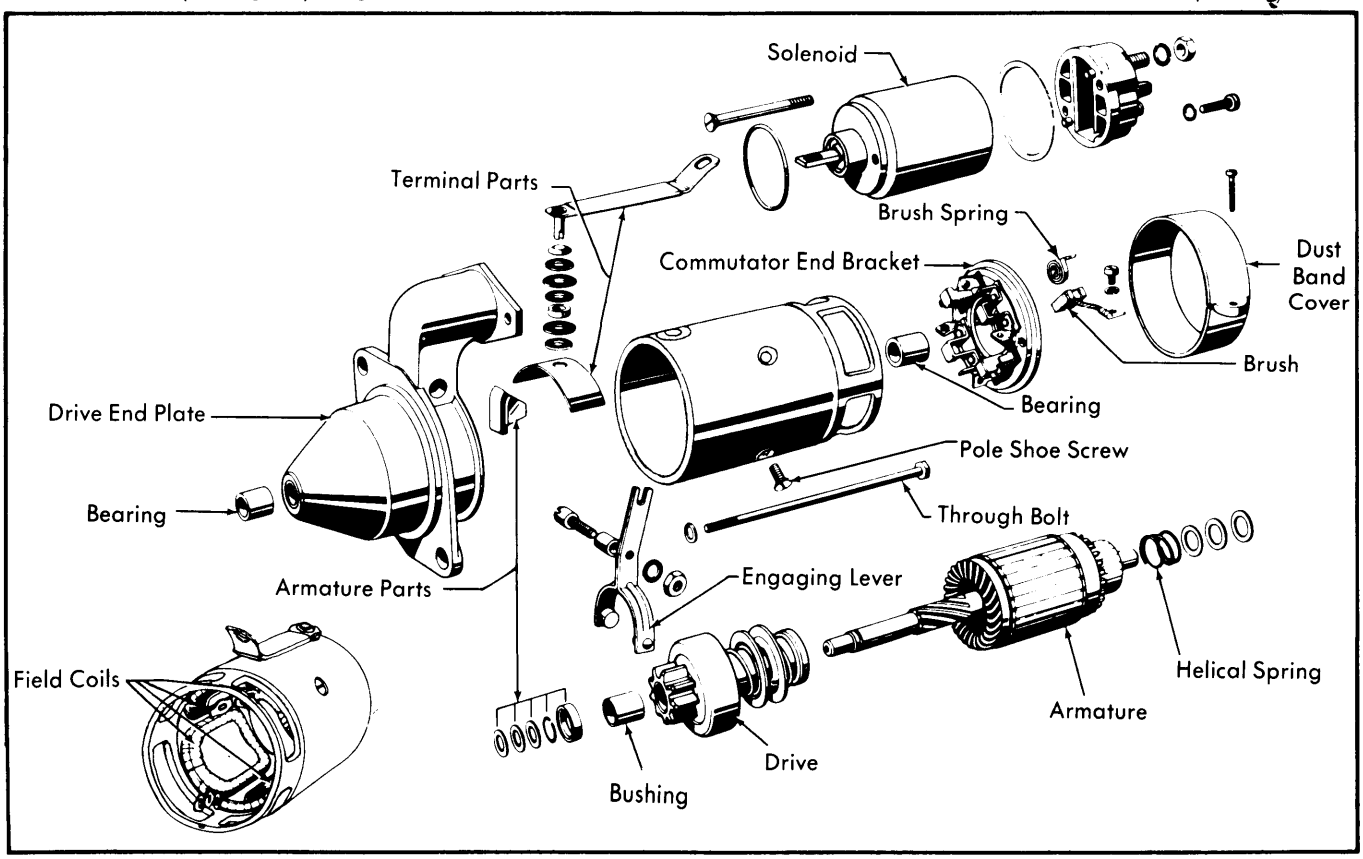

Fig. 2 Disassembled View of Bosch Starter

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bushing, soak bushing in a suitable oil for not less than 30 minutes. After replacing, cross check inner diameter of bushing by pulling a smoothing mandrel through.

REASSEMBLY

NOTE — *When reassembling use all new gaskets. When reassembly is complete, paint all main joints on starter (including solenoid) with gum-lac or equivalent.*

1) Clamp armature in a suitable holding fixture, line up armature brake unit and intermediate bearing. The bent ends of the spring plate washer unit must engage into holes of cupped washer of intermediate bearing.

2) Push drive over armature shaft, then push spring ring into groove. Use conical piece to froce ring over after adjusting it with hex bolts so that tube pushes spring straight into groove. Install castle nut and adjust with cotter pin.

3) Insert yoke lever, slipping drive end assembly over drive, being sure guide pins on fork are between guiding discs and that fork is in center of casting throat. Replace rubber seal to joint of drive end housing (on starters with intermediate bearing only).

4) Install intermediate bearing to drive end assembly and install through bolts in the reverse manner of their removal. Be certain intermediate bearing is properly seated to drive end assembly. Check armature brake spring ends to ensure proper positioning.

5) Insert armature with drive assembly into housing, do not damage field coils. Install washers on armature shaft as they were marked at disassembly, replace commutator end assembly. Check play of armature, should be .004-.006". Adjust with shims if necessary.

6) Hook in joint fork of solenoid, pushing back engagement fork. Be certain rubber seal is installed between solenoid and drive end and copper washer on bearing bolt. Attach solenoid and field coil terminal to solenoid.

7) Connect field coil terminal to brush box and install brushes. Make sure leads of brushes do not interfere with cover. Fasten dust cover being certain to install gasket, bend tongues of lock washers.

STARTER PERFORMANCE SPECIFICATIONS

Model①	No Load Test		Lock Test		
	Amps.	RPM	Amps.	Volts	Torque
208 XXX	35-55	6000-8000	320-410	8.5	9 ft. lbs.
211 XXX	30-50	6000-9000	300-390	9.0	8.7 ft. lbs.
211 9XX	30-50	6500-9500	320-410	8.5	8.3 ft. lbs.
212 XXX	35-55	6000-8000	320-410	8.5	9 ft. lbs.
311 XXX	30-50	5500-7500	350-450	8.5	13 ft. lbs.
312 1XX	55-85	8500-10500	650-730	6.0	13.7 ft. lbs.
313 XXX	50-80	8300-10300	520-610	6.5	12.3 ft. lbs.
362 XXX	65-95	6500-8500	1100-1300	7.0	32.5 ft. lbs.

① — Bosch Basic Part Number is 0 001