# PREFACE

This manual covers the construction, function and servicing procedures of the Honda BF8D, BF9.9D, BF10D, BF8B, BF10B, BFP8D, BFP9.9D, BFP10D, BFP8B and BFP10B outboard motors. (BFP8D, BFP9.9D, BFP10D, BFP8B and BFP10B: Power thrust type)

Careful observance of these instructions will result in better, safer service work.

Pay attention to these symbols and their meaning:

**⚠ WARNING Indicates a strong possibility of severe personal injury or loss of life if instructions are not followed.**

**CAUTION: Indicates a possibility of personal injury or equipment damage if instructions are not followed.**



**Honda Motor Co., Ltd.**
**Service Publications Office**

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# 1. SPECIFICATIONS

## DIMENSIONS AND WEIGHTS

| Model | BF8D, BF9.9D, BF10D, BF8B, BF10B | | | | | | |
|---|---|---|---|---|---|---|---|
| Description code | BF8D: BAAJ/BF9.9D, BF10D: BABJ/BF8B: BACJ/BF10B: BADJ | | | | | | |
| Type | SH | SHS | SR | LH | LHS | LR | *1:XH |
| Overall length | 610 mm (24.0 in) | | 600 mm (23.6 in) | 610 mm (24.0 in) | | 600 mm (23.6 in) | 610 mm (24.0 in) |
| Overall width | 345 mm (13.6 in) | | | | | | |
| Overall height | 1,105 mm (43.5 in) | | | 1,235 mm (48.6 in) | | | 1,375 mm (54.1 in) |
| Dry weight | 42.0 kg (92.6 lb) | 46.5 kg (102.5 lb) | 47.0 kg (103.6 lb) | 44.5 kg (98.1 lb) | 49.0 kg (108.0 lb) | 49.5 kg (109.1 lb) | 48.5 kg (106.9 lb) |
| Operating weight | 43.4 kg (95.7 lb) | 47.9 kg (105.6 lb) | 48.4 kg (106.7 lb) | 45.9 kg (101.2 lb) | 50.4 kg (111.1 lb) | 50.9 kg (112.2 lb) | 49.9 kg (110.0 lb) |
| Transom height | 433 mm (17.0 in) | | | 563 mm (22.2 in) | | | 703 mm (27.7 in) |
| Transom angle | 5-stage adjustment (4°, 8°, 12°, 16°, 20°) | | | | | | |
| Tilting angle | SH, SHS, LH, LHS type: 71° SR, LR, XH: 72° | | | | | | |
| Swivel angle | 45° right and left | | | | | | |

*1: BF8D and BF8B only.

| Model | BFP8D, BFP9.9D, BFP10D, BFP8B, BFP10B | | | | | |
|---|---|---|---|---|---|---|
| Description code | BFP8D: BAAJ/BFP9.9D, BFP10D: BABJ/BFP8B: BACJ/BFP10B: BADJ | | | | | |
| Type | LH | LHS | LR | XH | XHS | XR |
| Overall length | 610 mm (24.0 in) | | 600 mm (23.6 in) | 610 mm (24.0 in) | | 600 mm (23.6 in) |
| Overall width | 345 mm (13.6 in) | | | | | |
| Overall height | 1,235 mm (48.6 in) | | | 1,375 mm (54.1 in) | | |
| Dry weight | 44.5 kg (98.1 lb) | 49.0 kg (108.0 lb) | 49.5 kg (109.1 lb) | 48.5 kg (106.9 lb) | 53.0 kg (116.8 lb) | 53.5 kg (117.9 lb) |
| Operating weight | 45.9 kg (101.2 lb) | 50.4 kg (111.1 lb) | 50.9 kg (112.2 lb) | 49.9 kg (110.0 lb) | 54.4 kg (119.9 lb) | 54.9 kg (121.0 lb) |
| Transom height | 563 mm (22.2 in) | | | 703 mm (27.7 in) | | |
| Transom angle | 5-stage adjustment (4°, 8°, 12°, 16°, 20°) | | | | | |
| Tilting angle | LH, LHS type: 71° LR, XH, XHS, XR: 72° | | | | | |
| Swivel angle | 45° right and left | | | | | |

## ENGINE

| Model | BF8D, BF8B, BFP8D, BFP8B | BF9.9D, BF10D, BF10B, BFP9.9D, BFP10D, BFP10B |
|---|---|---|
| Type | Water cooled 4-stroke, overhead valve, vertical twin | |
| Displacement | 222 $cm^3$ (13.5 cu. in) | |
| Bore x stroke | 58 x 42 mm (2.3 x 1.7 in) | |
| Rated horsepower | 5.9 kW (8.0 PS) at 4,500 – 5,500 $min^{-1}$ (rpm) | *1: 7.3 kW (9.9 PS) at 5,000 – 6,000 $min^{-1}$ (rpm) |
| | | *2: 7.4 kW (10 PS) at 5,000 – 6,000 $min^{-1}$ (rpm) |
| Maximum torque | 12.5 N·m (1.27 kgf·m, 9.18 lbf·ft) at 4,000 $min^{-1}$ (rpm) | 13.1 N·m (1.34 kgf·m, 9.67 lbf·ft) at 4,500 $min^{-1}$ (rpm) |
| Compression ratio | 9.0 : 1 | |
| Fuel consumption | 377 g (13.3 oz.)/kWh | 394 g (13.9 oz.)/kWh |
| Cooling system | Forced water circulation by impeller pump with thermostat | |
| Ignition system | CDI | |
| Ignition timing | 0° B.T.D.C. at 1,000 $min^{-1}$ (rpm) | |
| Spark plug | CR5EH-9 (NGK), U16FER9 (DENSO) | |
| Carburetor | Horizontal butterfly valve type single carburetor | |
| Lubricating system | Forced lubrication by trochoid pump | |
| Oil capacity | 1.0 ℓ (1.06 US qt, 0.88 Imp qt) at oil change<br>1.3 ℓ (1.37 US qt, 1.14 Imp qt) with oil filter replacement | |
| Recommended oil | SAE 10W-30, API Service classification SG/SH/SJ | |
| Starting system | Electric starter and recoil starter | |
| Stopping system | Ignition primary circuit ground | |
| Fuel used | Automotive unleaded gasoline (minimum 86 pump octane) | |
| Fuel tank capacity | Steel tank: 13 ℓ (3.4 US gal, 2.9 Imp gal)<br>Plastic tank: 12 ℓ (3.2 US gal, 2.6 Imp gal) | |
| Fuel pump | Mechanical plunger type | |
| Exhaust system | Under water type | |

*1: BF9.9D and BFP9.9D only
*2: BF10D, BF10B, BFP10D and BFP10B only

## LOWER UNIT

| Model | | BF8D, BF8B, BF9.9D, BF10D, BF10B | BFP8D, BFP8B, BFP9.9D, BFP10D, BFP10B |
|---|---|---|---|
| Clutch | | Dog clutch (Forward-neutral-reverse) | |
| Gear ratio | | 0.43 (12/28) | |
| Reduction type | | Spiral bevel gear | |
| Gear case oil capacity | | 0.285 ℓ (0.27 US qt, 0.23 Imp qt) | |
| Propeller | Number of blades | 4 | 4 |
| | Diameter | 235 mm (9.3 in) | 254 mm (10 in) |
| | Pitch | S type: 229 mm (9.0 in)<br>L, XL type: 203 mm (8.0 in) | 165 mm (6.5 in) |
| | Rotating direction | Clockwise (viewed from rear) | |

## TYPES OF Honda BF8D/BF9.9D/BF10D/BF8B/BF10B/BFP8D/BFP9.9D/BFP10D/BFP8B/BFP10B OUTBOARD MOTOR

It may be necessary to refer to this chart for reference purposes when reading this manual.

| Model | Type | Shaft length | Tiller handle | Remote control | Electric starter | Recoil starter | Charge coil | Stating enrichment system |
|---|---|---|---|---|---|---|---|---|
| BF8D/ BF9.9D/ BF10D/ BF8B/ BF10B | SH | S | ● | | | ● | 6A | Manual |
| | SHS | S | ● | | ● | ● | 12A | Automatic |
| | SR | S | | ● | ● | ● | 12A | Automatic |
| | LH | L | ● | | | ● | 6A | Manual |
| | LHS | L | ● | | ● | ● | 12A | Automatic |
| | LR | L | | ● | ● | ● | 12A | Automatic |
| | *1: XH | XL | ● | | | ● | 6A | Manual |
| BFP8D/ BFP9.9D/ BFP10D/ BFP8B/ BFP10B | LH | L | ● | | | ● | 6A | Manual |
| | LHS | L | ● | | ● | ● | 12A | Automatic |
| | LR | L | | ● | ● | ● | 12A | Automatic |
| | XH | XL | ● | | | ● | 6A | Manual |
| | XHS | XL | ● | | ● | ● | 12A | Automatic |
| | XR | XL | | ● | ● | ● | 12A | Automatic |

*1: BF8D and BF8B only

S: Short shaft L: Long shaft XL: Extra long shaft

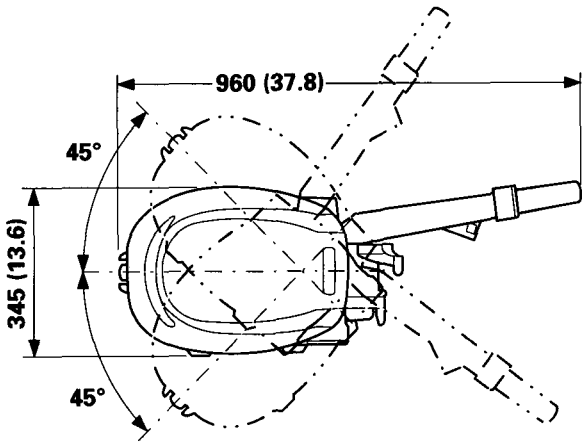
# 2. DIMENSIONAL DRAWINGS

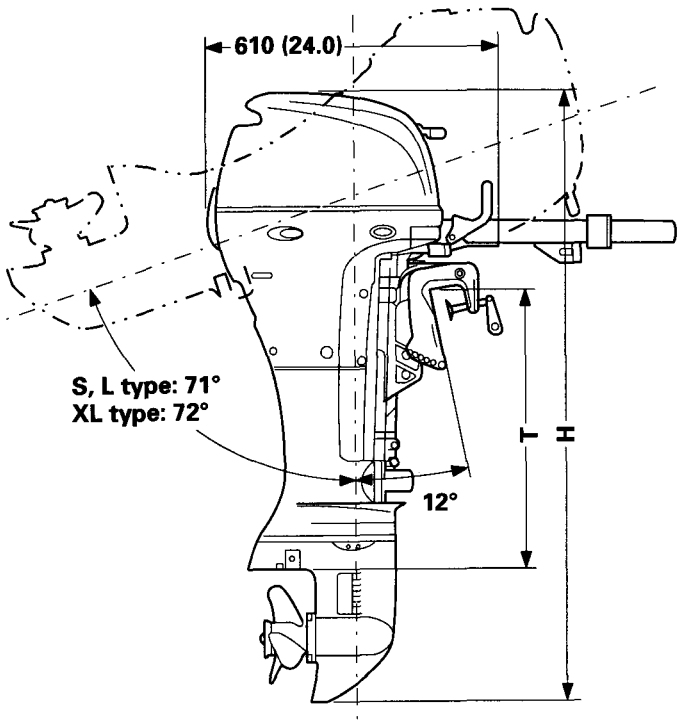
Unit: mm (in)

### Tiller Handle Type

Unit: mm (in)

| Type | H | T |
|---|---|---|
| S | 1,105 (43.5) | 433 (17.0) |
| L | 1,235 (48.6) | 563 (22.2) |
| XL | 1,375 (54.1) | 703 (27.7) |



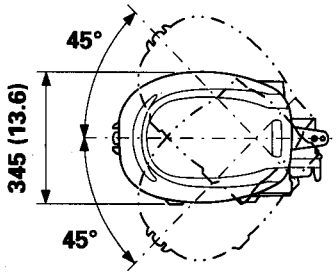



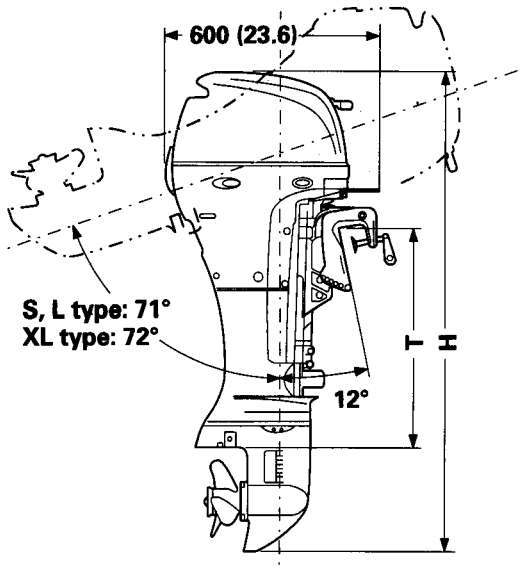
## Remote Control Type

Unit: mm (in)

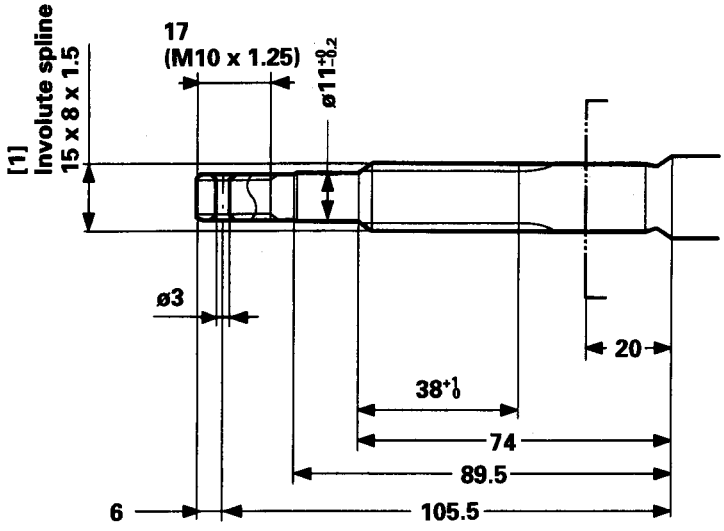
Unit: mm (in)

| Type | H | T |
|---|---|---|
| S | 1,105 (43.5) | 433 (17.0) |
| L | 1,235 (48.6) | 563 (22.2) |
| XL | 1,375 (54.1) | 703 (27.7) |




## PROPELLER SHAFT DETAIL



# 2. SERVICE INFORMATION





## 1. THE IMPORTANCE OF PROPER SERVICING

Proper servicing is essential to the safety of the operator and the reliability of the outboard motor. Any error or oversight made by the technician while servicing can easily result in faulty operation, damage to the outboard motor, or injury to the operator.

**⚠WARNING**

- **Improper servicing can cause an unsafe condition that can lead to serious injury or death.**
- **Follow the procedures and precautions in this shop manual carefully.**

Some of the most important precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance or repairs. Only you can decide whether or not you should perform a given task.

**⚠WARNING**

- **Failure to follow maintenance instructions and precautions can cause you to be seriously hurt or killed.**
- **Follow the procedures and precautions in this shop manual carefully.**

## 2. IMPORTANT SAFETY PRECAUTIONS

Be sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and safety equipment. When performing maintenance or repairs, be especially careful of the following:

- **Read the instructions before you begin, and be sure you have the tools and skills required to perform the tasks safely.**
  Be sure the engine is off before you begin any maintenance or repairs. This will reduce the possibility of several hazards:

- **Carbon monoxide poisoning from engine exhaust.**
  Be sure there is adequate ventilation whenever you run the engine.

- **Burns from hot parts.**
  Let the engine cool before you touch it.

- **Injury from moving parts.**
  Do not run the engine unless the instruction tells you to do so. Even then, keep your hands, fingers, and clothing away.

To reduce the possibility of a fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep all cigarettes, sparks, and flames away from the battery and all fuel-related parts.

# 3. SERVICE RULES

1. Use genuine Honda or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage the unit.
2. Use the special tools designed for the product.
3. Install new gaskets, O-rings, etc. when assembling.
4. When torquing bolts or nuts, begin with larger-diameter or inner bolts first, and tighten to the specified torque diagonally, unless a particular sequence is specified.
5. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before assembly.
6. After assembly, check all parts for proper installation and operation.
7. Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the female threads and ruin the hole.
8. Use only metric tools when servicing this unit. Metric bolts, nuts and screws are not interchangeable with nonmetric fasteners. The use of incorrect tools and fasteners will damage the unit.
9. Follow the instructions represented by these symbols when they are used.


: Apply oil. S. TOOL : Use special tool. GREASE : Apply grease

O x O (O) : Indicates the type, length, and number of the flange bolt used.

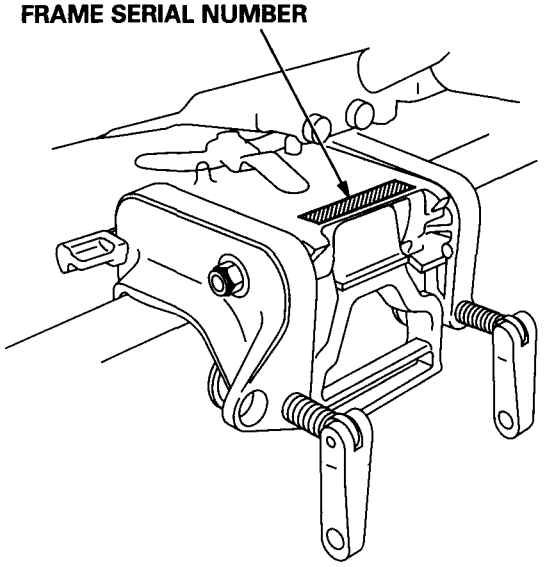
P. : Indicates the reference page.

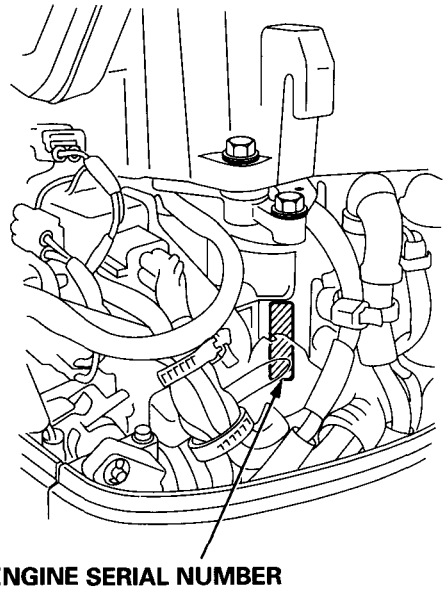
GREASE

(Molybdenum disulfide oil) : Use molybdenum oil solution (mixture of the engine oil and molybdenum grease with the ratio 1:1).

# 4. SERIAL NUMBER LOCATION

The engine serial number is stamped on the left front of the cylinder block and the frame serial number is located on the swivel case. Refer to these numbers when ordering parts and when making technical inquiries.



# 5. MAINTENANCE STANDARDS

## • ENGINE

| Part | Item | | Standard | Service limit |
|---|---|---|---|---|
| Engine | Idle speed (in neutral) | | 900 ± 50 $min^{-1}$ (rpm) | ——— |
| | Recommended full throttle rpm | | [*1]: 4,500 – 5,500 $min^{-1}$ (rpm) | ——— |
| | | | [*2]: 5,000 – 6,000 $min^{-1}$ (rpm) | ——— |
| | Cylinder compression | | 1.23 – 1.42 MPa (12.5 – 14.5 $kgf/cm^2$, 178 – 206 psi) at 600 $min^{-1}$ (rpm) | ——— |
| Cylinder heads | Warpage | | 0.05 mm (0.002 in) max. | 0.10 mm (0.004 in) |
| | Valve seat width | IN/EX | 0.9 – 1.1 mm (0.035 – 0.043 in) | 2.0 mm (0.08 in) |
| | Camshaft journal I.D. | No. 1 | 20.000 – 20.021 mm (0.7874 – 0.7882 in) | 20.05 mm (0.789 in) |
| Valves | Clearance | IN | 0.15 – 0.19 mm (0.006 – 0.007 in) | ——— |
| | | EX | 0.21 – 0.25 mm (0.008 – 0.010 in) | ——— |
| | Stem O.D. | IN | 4.975 – 4.990 mm (0.1959 – 0.1965 in) | 4.95 mm (0.195 in) |
| | | EX | 4.955 – 4.970 mm (0.1951 – 0.1957 in) | 4.93 mm (0.194 in) |
| Valve guides | Guide I.D. | IN/EX | 5.000 – 5.012 mm (0.1969 – 0.1973 in) | 5.04 mm (0.198 in) |
| | Stem-to-guide clearance | IN | 0.010 – 0.037 mm (0.0004 – 0.0015 in) | 0.07 mm (0.003 in) |
| | | EX | 0.030 – 0.067 mm (0.0012 – 0.0026 in) | 0.12 mm (0.005 in) |
| Valve springs | Free length | | 33.28 mm (1.310 in) | 32.0 mm (1.26 in) |
| Rocker arms, rocker arm shaft | Shaft O.D. | | 12.962 – 12.980 mm (0.5103 – 0.5110 in) | 12.92 mm (0.509 in) |
| | Arm I.D. | | 13.000 – 13.018 mm (0.5118 – 0.5125 in) | 13.04 mm (0.513 in) |
| | Shaft-to-rocker arm clearance | | 0.020 – 0.056 mm (0.0008 – 0.0022 in) | 0.07 mm (0.003 in) |
| Camshaft | Camshaft axial play | | 0.05 – 0.30 mm (0.002 – 0.012 in) | 0.4 mm (0.016 in) |
| | Cam height (IN/EX) | | [*1]: 21.916 – 22.076 mm (0.8628 – 0.8691 in) | 21.716 mm (0.8550 in) |
| | | | [*2]: 23.396 – 23.556 mm (0.9211 – 0.9274 in) | 23.196 mm (0.9132 in) |
| | Journal O.D. | No. 1 | 19.959 – 19.980 mm (0.7858 – 0.7866 in) | 19.93 mm (0.785 in) |
| | | Oil pump | 15.966 – 15.984 mm (0.6286 – 0.6293 in) | 15.94 mm (0.628 in) |
| | Journal-to-shaft clearance | No. 1 | 0.020 – 0.062 mm (0.0008 – 0.0024 in) | 0.08 mm (0.003 in) |
| Oil pump | Rotor tip clearance | | 0.15 mm (0.006 in) max. | 0.20 mm (0.008 in) |
| | Outer rotor-to-body clearance | | 0.15 – 0.21 mm (0.006 – 0.008 in) | 0.26 mm (0.010 in) |
| | Rotor-to-pump body side clearance | | 0.04 – 0.09 mm (0.002 – 0.004 in) | 0.12 mm (0.005 in) |
| | Pump body I.D. | | 40.71 – 40.74 mm (1.603 – 1.604 in) | 40.76 mm (1.605 in) |
| | Pump body depth | | 12.04 – 12.07 mm (0.474 – 0.475 in) | 12.11 mm (0.477 in) |
| | Outer rotor height | | 11.98 – 12.00 mm (0.4717 – 0.4724 in) | 11.96 mm (0.471 in) |
| | Camshaft journal I.D. | | 16.000 – 16.018 mm (0.6299 – 0.6306 in) | 16.05 mm (0.632 in) |
| | Pump body-to-camshaft clearance | | 0.016 – 0.052 mm (0.0006 – 0.0020 in) | 0.07 mm (0.003 in) |
| Fuel pump | Pump arm I.D. | | 13.000 – 13.080 mm (0.5118 – 0.5150 in) | 13.10 mm (0.516 in) |
| | Shaft-to-pump arm clearance | | 0.020 – 0.118 mm (0.0008 – 0.0046 in) | 0.13 mm (0.005 in) |
| Cylinders | Sleeve I.D. | | 58.000 – 58.015 mm (2.2835 – 2.2841 in) | 58.055 mm (2.2856 in) |

[*1]: BF8D, BF8B, BFP8D and BFP8B only
[*2]: BF9.9D, BF10D, BF10B, BFP9.9D, BFP10D and BFP10B only

## ENGINE (continued)

| Parts | Item | | Standard | Service limit |
|---|---|---|---|---|
| Pistons | Skirt O.D. | | 57.970 – 57.990 mm (2.2823 – 2.2831 in) | 57.92 mm (2.280 in) |
| | Piston-to-cylinder clearance | | 0.010 – 0.045 mm (0.0004 – 0.0015 in) | 0.10 mm (0.004 in) |
| | Piston pin bore I.D. | | 16.002 – 16.008 mm (0.6300 – 0.6302 in) | 16.02 mm (0.638 in) |
| Piston pins | Piston pin O.D. | | 15.994 – 16.000 mm (0.6297 – 0.6299 in) | 15.97 mm (0.629 in) |
| | Piston-to-piston pin clearance | | 0.002 – 0.014 mm (0.0001 – 0.0006 in) | 0.04 mm (0.002 in) |
| Piston rings | Side clearance | Top/second | 0.025 – 0.055 mm (0.0010 – 0.0022 in) | 0.10 mm (0.004 in) |
| | | Oil | 0.055 – 0.140 mm (0.0022 – 0.0055 in) | 0.20 mm (0.008 in) |
| | End gap | Top | 0.15 – 0.30 mm (0.006 – 0.012 in) | 0.5 mm (0.02 in) |
| | | Second | 0.35 – 0.50 mm (0.014 – 0.020 in) | 0.7 mm (0.03 in) |
| | | Oil | 0.20 – 0.80 mm (0.008 – 0.031 in) | 1.0 mm (0.04 in) |
| | Thickness | Top/second | 1.175 – 1.190 mm (0.0463 – 0.0469 in) | 1.08 mm (0.043 in) |
| Connecting rods | Small end I.D. | | 16.007 – 16.022 mm (0.6302 – 0.6308 in) | 16.05 mm (0.632 in) |
| | Big end I.D. | | 28.020 – 28.033 mm (1.1031 – 1.1037 in) | 28.06 mm (1.105 in) |
| | Big end oil clearance | | 0.020 – 0.046 mm (0.0008 – 0.0018 in) | 0.06 mm (0.002 in) |
| | Big end side clearance | | 0.10 – 0.60 mm (0.004 – 0.024 in) | 0.7 mm (0.03 in) |
| Crankshaft | Main journal O.D. | | 29.984 – 29.993 mm (1.1805 – 1.1808 in) | 29.96 mm (1.180 in) |
| | Crank pin O.D. | | 27.987 – 28.000 mm (1.1018 – 1.1024 in) | 27.96 mm (1.101 in) |
| | Main journal oil clearance | | 0.015 – 0.037 mm (0.0006 – 0.0015 in) | 0.06 mm (0.002 in) |
| Carburetor | Main jet | | [*1]: #105 | ——— |
| | | | [*2]: #98 | ——— |
| | Pilot screw opening | | See page 6-8. | ——— |
| | Float height | | 13.5 mm (0.53 in) | ——— |

[*1]: BF8D, BF9.9D, BF10D, BFP8D, BFP9.9D and BFP10D only
[*2]: BF8B, BF10B, BFP8B and BFP10B only

## ELECTRICAL

| Parts | Item | | Standard | Service limit |
|---|---|---|---|---|
| Spark plug | Gap | | 0.8 – 0.9 mm (0.031 – 0.035 in) | ——— |
| Ignition coil | Primary coil resistance | | 0.35 – 0.43 Ω | ——— |
| | Secondary coil resistance (with plug caps) | | 23.0 – 34.8 kΩ | ——— |
| Starter motor | Brush length | | 12.5 mm (0.49 in) | 8.5 mm (0.33 in) |
| | Mica depth | | ——— | 0.2 mm (0.01 in) |
| Charge coil | Resistance | 12A charge coil | 0.2 – 0.3 Ω | ——— |
| | | 6A charge coil | 0.23 – 0.29 Ω | ——— |
| Exciter coil | Resistance | Electric starter type | 5.0 – 7.4 Ω | ——— |
| | | Recoil starter type | 6.1 – 7.5 Ω | ——— |
| Pulse generator | Resistance | | 351 – 429 Ω | ——— |
| SE thermal valve coil | Resistance | | 1.2 – 1.8 Ω | ——— |

## LOWER UNIT

| Parts | Item | | Standard | Service limit |
|---|---|---|---|---|
| Propeller shaft | Shaft O.D. | | 16.973 – 16.984 mm (0.6682 – 0.6687 in) | 16.95 mm (0.667 in) |
| Forward gear | I.D. | | 17.000 – 17.018 mm (0.6693 – 0.6700 in) | 17.04 mm (0.671 in) |
| Vertical shaft | Shaft O.D. | S and L type | 12.976 – 12.995 mm (0.5108 – 0.5116 in) | 12.96 mm (0.510 in) |
| | | XL type | 14.989 – 15.000 mm (0.5901 – 0.5906 in) | 14.97 mm (0.589 in) |

# 6. TORQUE VALUES

## • Engine

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Crankcase cover bolts | M6 x 1.0 | 14 | 1.4 | 10 |
| Oil pressure switch | PT1/8 (Apply sealant to the threads.) | 8 | 0.8 | 5.8 |
| Oil drain bolt | M8 x 1.25 | 6 | 0.6 | 4.3 |
| Oil filter cartridge | M20 x 1.5 | 12 | 1.2 | 9 |
| Spark plugs | M10 x 1.0 | 12 | 1.2 | 9 |
| Cylinder head bolts (L = 83 mm) | M8 x 1.25 (Apply oil to the threads.) | 26 | 2.7 | 20 |
| Cylinder head bolts (L = 40 mm) | M8 x 1.25 | 24 | 2.4 | 17 |
| Valve adjusting lock nuts | M5 x 0.5 | 8 | 0.8 | 5.8 |
| Connecting rod bolts | M6 x 1.0 | 12 | 1.2 | 9 |
| Timing belt driven pulley bolt | M6 x 1.0 | 16 | 1.6 | 12 |
| Recoil starter pulley bolts | M6 x 1.0 | 11 | 1.1 | 8 |
| Flywheel nut | M14 x 1.5 (Apply oil to the threads.) | 88 | 9.0 | 65 |
| Timing belt drive pulley lock nut | M24 x 1.0 (Apply oil to the threads.) | 54 | 5.5 | 40 |
| Oil pump cover bolts | M5 x 0.8 | 5 | 0.5 | 3.6 |
| Oil pump bolts | M6 x 1.0 | 11 | 1.1 | 8 |
| Silencer bolts | M6 x 1.0 | 9 | 0.9 | 6.5 |
| Silencer cover bolt | M6 x 1.0 | 10 | 1.0 | 7 |
| Oil case bolts | M8 x 1.25 | 24 | 2.4 | 17 |
| Thermo sensor | M12 x 1.5 | 18 | 1.8 | 13 |
| Exhaust chamber cover bolts | M6 x 1.0 | 11 | 1.1 | 8 |

## • Gear Case

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Gear case bolts and nuts | M6 x 1.0 | 12 | 1.2 | 9 |
| Propeller 10 mm crown head nut | M10 x 1.25 | See page 4-2 | | |
| Propeller shaft holder bolts | M6 x 1.0 | 12 | 1.2 | 9 |
| Oil level bolt | M8 x 1.25 | 3.5 | 0.35 | 2.5 |
| Oil drain bolt | M8 x 1.25 | 3.5 | 0.35 | 2.5 |
| Water pump housing bolts | M6 x 1.0 | 12 | 1.2 | 9 |
| Impeller housing bolts | M6 x 1.0 | 11 | 1.1 | 8 |
| Water screen nuts | M5 x 0.8 | 1 | 0.1 | 0.7 |
| Anode metal nut | M6 x 1.0 | 10 | 1.0 | 7 |
| Shift rod B lock nut | M6 x 1.0 | 10 | 1.0 | 7 |

## • Cover

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Left, right engine under cover screw | M5 x 0.8 | 4.5 | 0.45 | 3.3 |

## • Extension Case/Mount Rubber

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Extension case bolts | M8 x 1.25 | 24 | 2.4 | 17 |
| Upper mount rubber stay bolt | M6 x 1.0 | 12 | 1.2 | 9 |
| Lower mount rubber bolts | M8 x 1.25 | 22 | 2.2 | 16 |
| Lower mount rubber cover bolts | M6 x 1.0 | 12 | 1.2 | 9 |
| Extension case stud bolts (XL type) | M6 x 1.0 | 12 | 1.2 | 9 |
| Upper mount rubber bolt | M10 x 1.25 | 38 | 3.9 | 28 |
| Steering friction lever lock nut | M8 x 0.75 | 2.5 | 0.25 | 1.8 |

## • Stern Bracket

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Tilting bolt lock nut (Except XL and remote control type) | M8 x 1.25 | 24 | 2.4 | 17 |
| Tilting shaft nut (XL and remote control type) | 7/8-14UNF | 17 | 1.7 | 12 |
| Stern bracket nut (XL and remote control type) | M8 x 1.25 | 21 | 2.1 | 15 |

## • Tiller Handle

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Tiller handle bracket bolts | M10 x 1.25 | 33 | 3.4 | 25 |
| Tiller handle pivot nut | M8 x 1.25 | 8 | 0.8 | 5.8 |
| Shift shaft plate screws | M5 x 0.8 | 1.5 | 0.15 | 1.1 |
| Shift lever pivot bolt | M6 x 1.0 | 12 | 1.2 | 9 |
| Emergency stop switch nut | M16 x 1.0 | 1.5 | 0.15 | 1.1 |
| Throttle cable lock nut | M6 x 1.0 | 4.5 | 0.45 | 3.3 |
| Starter switch nut | M16 x 1.0 | 1.5 | 0.15 | 1.1 |

## • Frame/Electrical Equipment

| Item | Thread dia. x pitch | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Neutral switch nut | M20 x 1.0 | 2.5 | 0.25 | 1.8 |
| Neutral start cable nut | M6 x 1.0 | 4.5 | 0.45 | 3.3 |
| Starter magnetic switch bolts | M6 x 1.0 | 7 | 0.7 | 5.1 |
| Starter cord terminal nut | M6 x 1.0 | 5 | 0.5 | 3.6 |
| Starter cable terminal nut | M6 x 1.0 | 6.5 | 0.65 | 4.7 |
| Choke cable nut | M11 x 1.25 | 2.5 | 0.25 | 1.8 |

- Use standard torque values (P. 2-8) of fasteners that are not listed in this table.

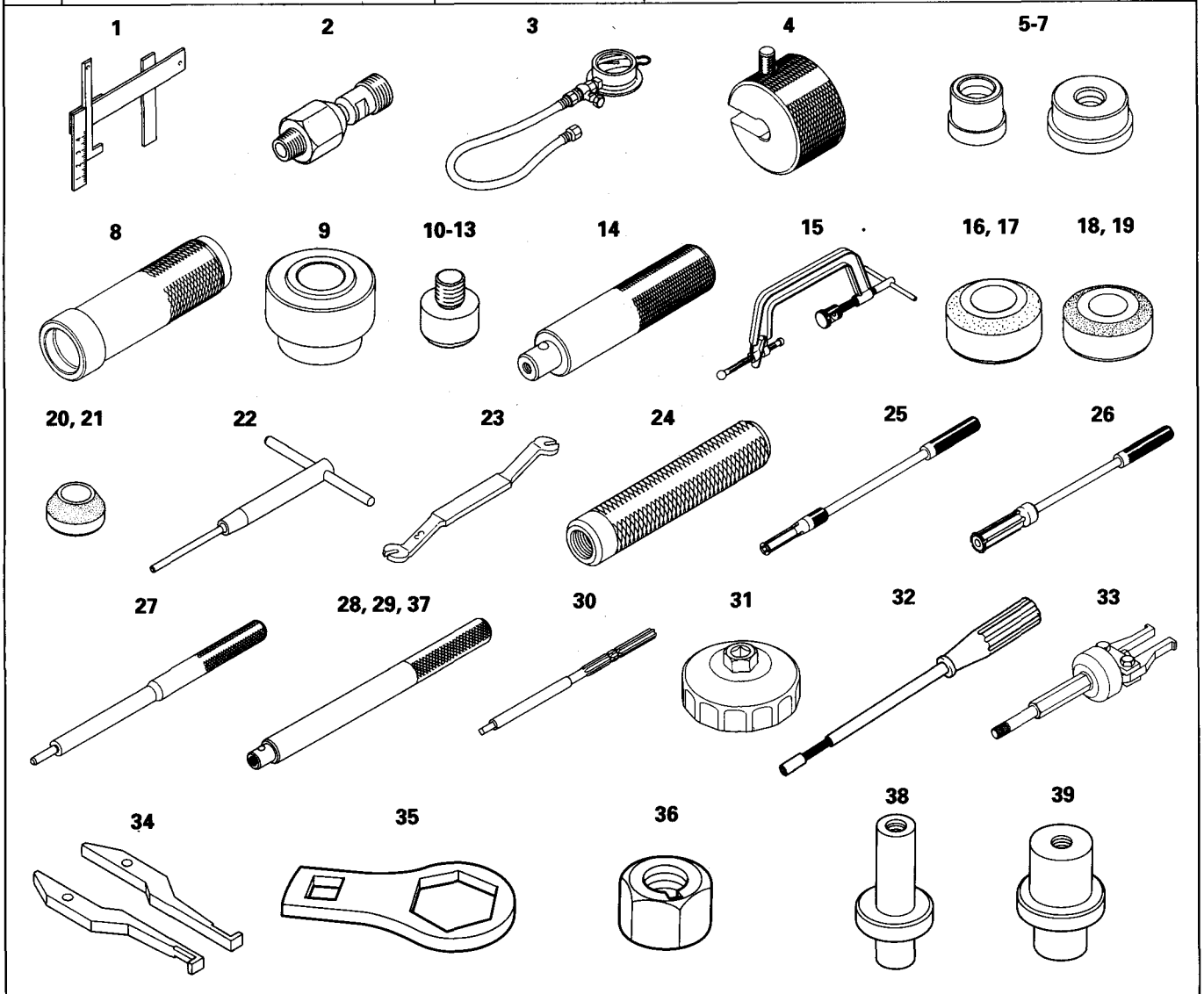
## STANDARD TORQUE

| Item | Thread size | Torque | | |
|---|---|---|---|---|
| | | N·m | kgf·m | lbf·ft |
| Screw | 4 mm | 2 | 0.2 | 1.4 |
| | 5 mm | 4.2 | 0.42 | 3.0 |
| | 6 mm | 9 | 0.9 | 6.5 |
| Hex. bolt and nut | 5 mm | 5.2 | 0.52 | 3.8 |
| | 6 mm | 10 | 1.0 | 7 |
| | 8 mm | 21.5 | 2.15 | 15.5 |
| | 10 mm | 34 | 3.5 | 25 |
| | 12 mm | 54 | 5.5 | 40 |
| Flange bolt and nut | 6 mm | 12 | 1.2 | 9 |
| | 8 mm | 26 | 2.7 | 20 |
| | 10 mm | 39 | 4.0 | 29 |
| | 12 mm | 59 | 6.0 | 43 |
| SH (small head flange) bolt | 6 mm | 12 | 1.2 | 9 |
| CT (self tapping) bolt | 5 mm | 5.5 | 0.55 | 4.0 |
| | 6 mm | 12 | 1.2 | 9 |

# 7. SPECIAL TOOLS

| | Tool name | Tool number | Application |
|---|---|---|---|
| 1. | Float level gauge | 07401 – 0010000 | Carburetor float level inspection |
| 2. | Oil pressure gauge attachment | 07406 – 0030000 | Oil pressure inspection |
| 3. | Oil pressure gauge set | 07506 – 3000000 | Oil pressure inspection |
| 4. | Remover weigth | 07741 – 0010201 | Constituent part of the tools 25, 26 and 33 |
| 5. | Attachment, 42 x 47 mm | 07746 – 0010300 | 6005 radial ball bearing installation, 25 x 47 x 15 taper roller bearing (outer race) installation (XL type), forward bevel gear bearing installation (S and L types) |
| 6. | Attachment, 24 x 26 mm | 07746 – 0010700 | 17 mm water seal installation, 15 x 24 x 5 mm water seal installation (XL type) |
| 7. | Attachment, 22 x 24 mm | 07746 – 0010800 | 17 x 24 x 20 mm needle bearing removal, 13 mm water seal installation |
| 8. | Inner driver | 07746 – 0030100 | 25 x 47 x 15 taper roller bearing (inner race) installation (XL type) |
| 9. | Attachment, 25 mm inner | 07746 – 0030200 | 25 x 47 x 15 taper roller bearing (inner race) installation (XL type) |
| 10. | Pilot, 15 mm | 07746 – 0040300 | 15 x 21 x 12 mm needle bearing installation (XL type), 15 x 24 x 5 mm water seal installation (XL type) |
| 11. | Pilot, 17 mm | 07746 – 0040400 | 17 x 24 x 20 mm needle bearing removal/ installation, 17 mm water seal installation |
| 12. | Pilot, 25 mm | 07746 – 0040600 | 6005 radial ball bearing installation, forward bevel gear bearing removal (S and L types) |
| 13. | Pilot, 13 mm | 07746 – 0041500 | 13 x 15 x 15 mm bushing removal/installation (S and L types), 13 mm water seal installation |
| 14. | Driver | 07749 – 0010000 | Driver for 5, 6, 7, 10, 11, 12 and 13 |
| 15. | Valve spring compressor | 07757 – 0010000 | Valve cotter removal/installation |
| 16. | Valve seat cutter, 45° 27.5 mm | 07780 – 0010200 | Valve seat reconditioning (IN) |
| 17. | Valve seat cutter, 45° 22 mm | 07780 – 0010701 | Valve seat reconditioning (EX) |
| 18. | Valve seat cutter, 32° 25 mm | 07780 – 0012000 | Valve seat reconditioning (EX) |
| 19. | Valve seat cutter, 32° 30 mm | 07780 – 0012200 | Valve seat reconditioning (IN) |
| 20. | Valve seat cutter, 60° 22 mm | 07780 – 0014202 | Valve seat reconditioning (EX) |
| 21. | Valve seat cutter, 60° 26 mm | 07780 – 0014500 | Valve seat reconditioning (IN) |
| 22. | Cutter holder 5.0 mm | 07781 – 0010400 | Valve seat reconditioning (IN/EX) |
| 23. | Valve adjusting wrench, 3 mm | 07908 – KE90200 | Valve clearance inspection |
| 24. | Remover handle | 07936 – 3710100 | Constituent part of the tools 32 |
| 25. | Bearing remover, 15 mm | 07936 – KC10500 | 15 x 21 x 12 mm needle bearing removal (XL type) |
| 26. | Bearing remover, 25 mm | 07936 – ZV10100 | 6005 radial ball bearing removal, forward bevel gear bearing removal (S and L types) |
| 27. | Valve guide driver, 5.0 mm | 07942 – 8920000 | Valve guide removal/installation |
| 28. | Needle bearing driver | 07946 – KA50000 | 15 x 21 x 16 mm needle bearing removal/ installation (XL type) |
| 29. | Driver, 15 x 280 mm | 07949 – 3710001 | 17 x 24 x 20 mm needle bearing removal, 25 x 47 x 15 taper roller bearing (outer race) installation (XL type), forward bevel gear bearing installation (S and L types) |

| | Tool name | Tool number | Application |
|---|---|---|---|
| 30. | Valve guide reamer, 5.010 mm | 07984 – MA60001 | Valve guide reaming (IN/EX) |
| 31. | Oil filter wrench | 07HAA – PJ70100 | Oil filter removal/installation |
| 32. | Pilot screw wrench | 07KMA – MS60101 | Pilot screw adjustment (Bodensee type only) |
| 33. | Bearing race puller | 07LPC – ZV30100 | 25 x 47 x 15 taper roller bearing (outer race) removal (XL type) [Puller jaws of the bearing race puller (07LPC – ZV30100) are removed and replaced with the puller jaws of part number 07WPC – ZW50100.] |
| 34. | Puller jaws, 25 mm | 07WPC – ZW50100 | 25 x 47 x 15 taper roller bearing (outer race) removal (XL type) |
| 35. | 30 mm lock nut wrench | 07ZPA – ZW90100 | 24 mm lock nut removal/installation |
| 36. | Crankshaft holder | 07ZPB – ZW90100 | 24 mm lock nut removal/installation |
| 37. | Driver, 13 x 325 mm | 07ZPF – ZW90100 | 13 x 18 x 20 mm bushing removal/installation (S and L types) |
| 38. | Driver, 15/13 x 30 mm | 07ZPF – ZW90200 | 13 x 15 x 15 mm bushing removal/installation (S and L types) |
| 39. | Driver, 14.5 x 18.5 mm | 07ZPF – ZW90300 | 17 x 24 x 20 mm needle bearing installation, 15 x 21 x 12 mm needle bearing installation (XL type) |



# 6. TROUBLESHOOTING

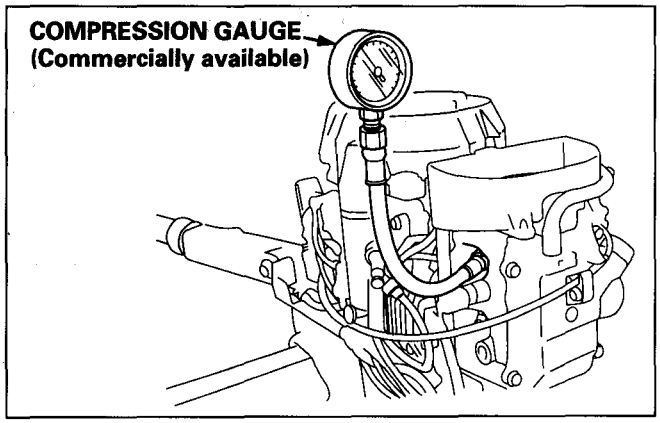
## a. ENGINE

- **Hard Starting**

1. Check the fuel level in the tank.
   - No fuel in the tank → Add fuel.
   - Sufficient fuel in the tank ↓
2. Loosen the carburetor drain screw and check whether fuel reached the carburetor.
   - Not reaching the carburetor →
     - Check for collapsed or pinched fuel line.
     - Check for clogged fuel tank breather hole. Close the tank and open the vent knob, listen for hiss.
     - Check for air leaks past primer bulb.
     - Squeeze the primer bulb and be sure that the fuel is reaching the motor.
     - Check for clogged fuel filter, fuel tubes and connector.
     - Check the fuel pump.
   - Reaching the carburetor. ↓
3. Remove the spark plugs and check for wet or fouled electrode.
   - Dry → Check for blockage in the carburetor port and nozzle.
   - Wet →
     - Clean the electrode and restart, taking care that the choke is not closed too much.
     - If excessively wet, check the carburetor for flooding. If flooding is severe, drain the carburetor and prime again, or check the carburetor float valve.
4. Perform spark test (P. 2-18).
   - No spark or weak sparks → Perform IGNITION SYSTEM troubleshooting (P. 2-16).
   - Good spark ↓
5. Check compression of each cylinder (P. 2-12).
   - Low compression →
     - Check that the valve clearance is correct.
     - Check for defective cylinder head gasket, valves or valve seats.
     - Check that the cylinder head is correctly tightened.
     - Check for worn piston, piston rings or cylinder.
   - Normal compression ↓

Reinstall the spark plugs securely and restart the engine according to the starting procedure.

## CYLINDER COMPRESSION CHECK



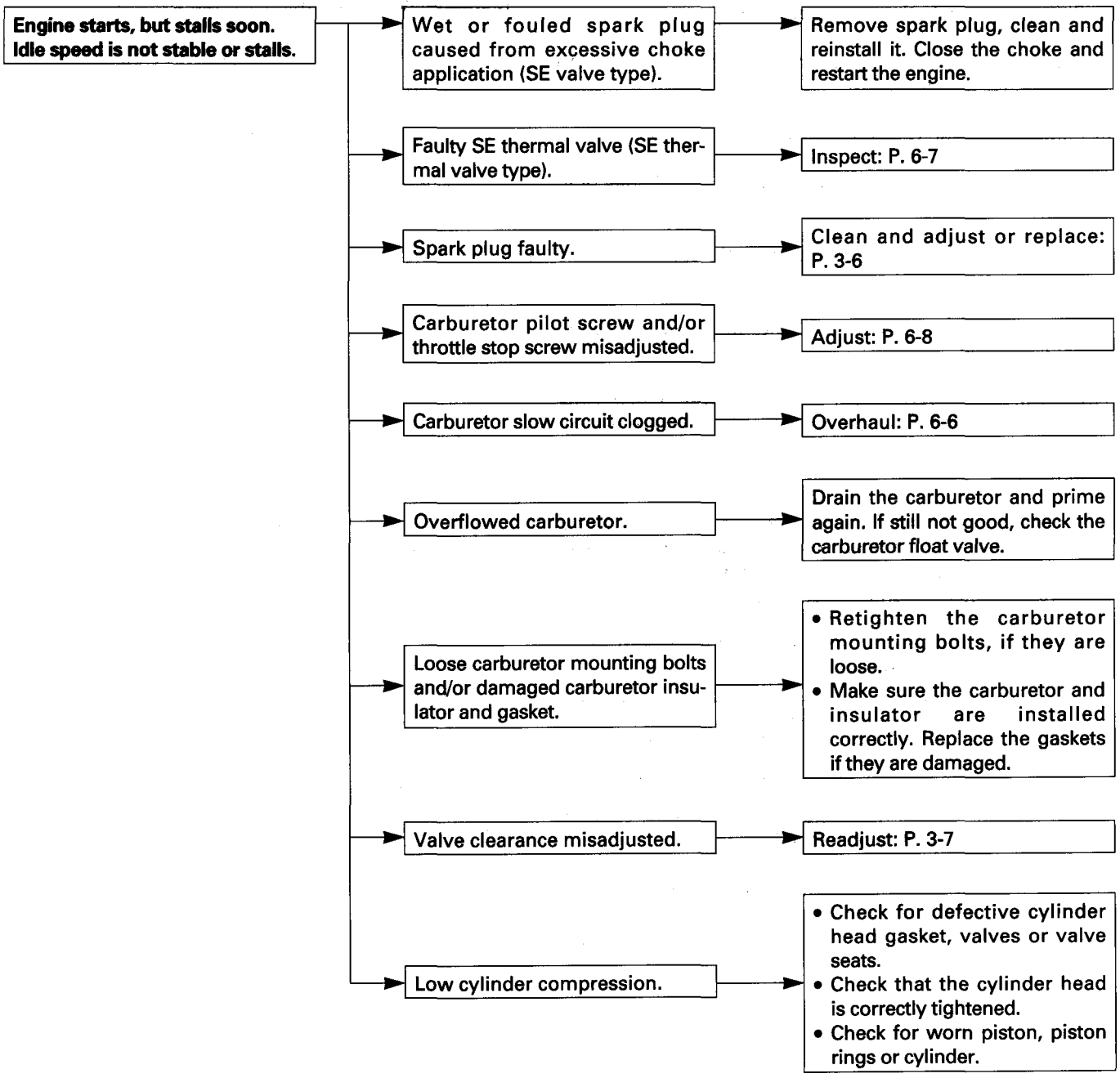

1) Shift the gear into the neutral position.
2) Disengage the emergency stop switch clip from the emergency stop switch.
3) Remove the engine cover and both spark plugs.
4) Install a compression gauge in the No. 1 cylinder plug hole.
5) Disconnect the remote control throttle cable from the throttle arm (Remote control type only).
6) Manually hold the throttle arm or throttle lever in the full open position.
7) Electric starter type: Turn the starter motor using the starter switch (Tiller handle type) or ignition switch (Remote control type) until stable compression is obtained.
   - Do not operate the starter motor for more than 5 seconds at one try. If stable compression is not obtained within 5 seconds, stop the starter motor and wait for 10 – 20 seconds, and repeat the operation again.

   Recoil starter type: Pull the recoil starter several times until stable compression is obtained.

| | |
|---|---|
| Cylinder compression | 1.23 – 1.42 MPa<br>(12.5 – 14.5 kgf/cm², 178 – 206 psi)<br>at 600 min⁻¹(rpm) |

8) Reinstall the compression gauge in the No. 2 cylinder plug hole and repeat steps 6 and 7.
9) After inspection, reinstall the removed parts in the reverse order of removal.

## • Engine Does Not Run Smoothly



| | | |
|---|---|---|
| **Engine speed does not increase.** | SE valve not returned properly (SE valve type). | Return completely. |
| | Faulty SE thermal valve (SE thermal valve type). | Readjust: P. 6-7 |
| | Throttle cable misadjusted. | Clean or replace: P. 3-13 and 3-14 |
| | Propeller mismatched. | Replace with the correct propeller. |
| | Spark plug faulty. | Clean and adjust or replace: P. 3-6 |
| | Clogged fuel filter. | Replace: P. 3-11 |
| | Water in carburetor. | Drain the carburetor. If it is still no good, overhaul the carburetor: P. 6-5. |
| | Valve timing incorrect. | Reinstall the timing belt: P. 9-10. |
| | Alert system function. | Troubleshooting: P. 2-21. |
| | Ignition control module faulty. | Inspect: P. 16-19. |

| | | |
|---|---|---|
| **Engine speed does not decrease.** | Throttle linkage does not move smoothly (Remote control type). | Replace: P. 13-2 |
| | Throttle cable stuck (Tiller handle type). | Replace: P. 15-4 |