A0A5053

SERVICE MANUAL

3, 4JH2LE

YANMAR
SERVICE MANUAL

MARINE DIESEL ENGINE

MODEL 3,4JH2LE

MODELS 3,4JH2LE

CHAPTER 1

GENERAL

1. Engine Specifications

1-1 3JH Series

Model				3JH2L		3JH2L-T	
Type				Vertical 4-cycle water cooled diesel engine			
Combustion system				Direct injection			
Aspiration				Naturally aspirated		Turbocharged	
Number of cylinders				3			
Bore × stroke			mm	82 × 86			
Displacement			liter	1.363			
Output	Intermittent rating		kW/rpm(hp/rpm)	10.9/1500(14.8/1500)	12.9/1800(17.6/1800)	13.3/1500(18.1/1500)	16.9/1800(23/1800)
	Continuous rating		kW/rpm(hp/rpm)	9.93/1500(13.5/1500)	11.8/1800(16/1800)	12.1/1500(16.5/1500)	14.7/1800(20/1800)
Mean effective pressure (cont.)			kgf/cm	5.94	5.87	7.27	7.34
Mean piston speed			m/sec	4.30	5.16	4.30	5.16
Compression ratio				18.1		18.1	
Fire order				1 — 3 — 2 — 1			
Fuel injection pump				Bosh in-line type, YPES-CL H			
Fuel injection timing(FID)			Degree	12° ±1° bTDC		12° ±1° bTDC	
Fuel injection pressure			kgf/cm	200±5			
Fuel injection valve				Hole type			
Direction of rotation				Counter-clockwise viewed from flywheel			
Power take-off				At flywheel side			
Cooling system				Fresh water cooling by centrifugal fresh water pump and rubber impeller seawater pump			
Lubrication system				Forced lubrication with trochoid pump			
Starting system	Starting motor			DC 12V, 1.4kW			
	Alternator			12V, 35A(option)			
Speed regulation (Governor regulation)	Instant		%	Less than 10			
	Permanent		%	≦6.6	≦5	≦6.6	≦5
	Recovery time		sec	Less than 8			
	Stability		%	≦±0.5			
Dimensions	Overall length		mm	685		698	
	Overall width		mm	507		534	
	Overall height		mm	629		629	
Engine weight (dry)			kg	173		178	
Lube oil capacity, Effect/max.			ℓ	1.8/4.7			
Cooling water capacity (Fresh water)	Water tank		ℓ	4.4			
	Reserve tank		ℓ	0.8			

1-2 4JH Series

Model				4JH2L-T		4JH2L-HT	
Type				Vertical 4-cycle water cooled diesel engine			
Combustion system				Direct injection			
Aspiration				Turbocharged		Turbocharged & intercooler	
Number of cylinders				4			
Bore × stroke			mm	82 × 86			
Displacement			liter	1.817			
Output	Intermittent rating		kW/rpm(hp/rpm)	18.2/1500(24.7/1500)	22.4/1800(30.5/1800)	22.2/1500(30.2/1500)	28.4/1800(38.5/1800)
	Continuous rating		kW/rpm(hp/rpm)	16.5/1500(22.5/1500)	20.2/1800(27.5/1800)	20.2/1500(27.5/1500)	25.7/1800(35/1800)
Mean effective pressure (cont.)			kgf/cm	7.43	7.57	9.58	9.63
Mean piston speed			m/sec	4.30	5.16	4.30	5.16
Compression ratio				18.1		18.1	
Fire order				1 — 3 — 4 — 2 — 1			
Fuel injection pump				Bosh in-line type, YPES-CL H			
Fuel injection timing(FID)			Degree	12° ±1° bTDC		10° ±1° bTDC	
Fuel injection pressure			kgf/cm	200±5			
Fuel injection valve				Hole type			
Direction of rotation				Counter-clockwise viewed from flywheel			
Power take-off				At flywheel side			
Cooling system				Fresh water cooling by centrifugal fresh water pump and rubber impeller seawater pump			
Lubrication system				Forced lubrication with trochoid pump			
Starting system	Starting motor			DC 12V , 1.4kW			
	Alternator			12V,35A(option)			
Speed regulation (Governor regulation)	Instant		%	Less than 10			
	Permanent		%	≦6.6	≦5	≦6.6	≦5
	Recovery time		sec	Less than 8			
	Stability		%	≤ ±0.5			
Dimensions	Overall length		mm	792		792	
	Overall width		mm	534		540	
	Overall height		mm	629		639	
Engine weight (dry)			kg	224		246	
Lube oil capacity, Effect/max.			ℓ	2.3/5.8			
Cooling water capacity (Fresh water)	Water tank		ℓ	6.0			
	Reserve tank		ℓ	0.8			

2. Construction

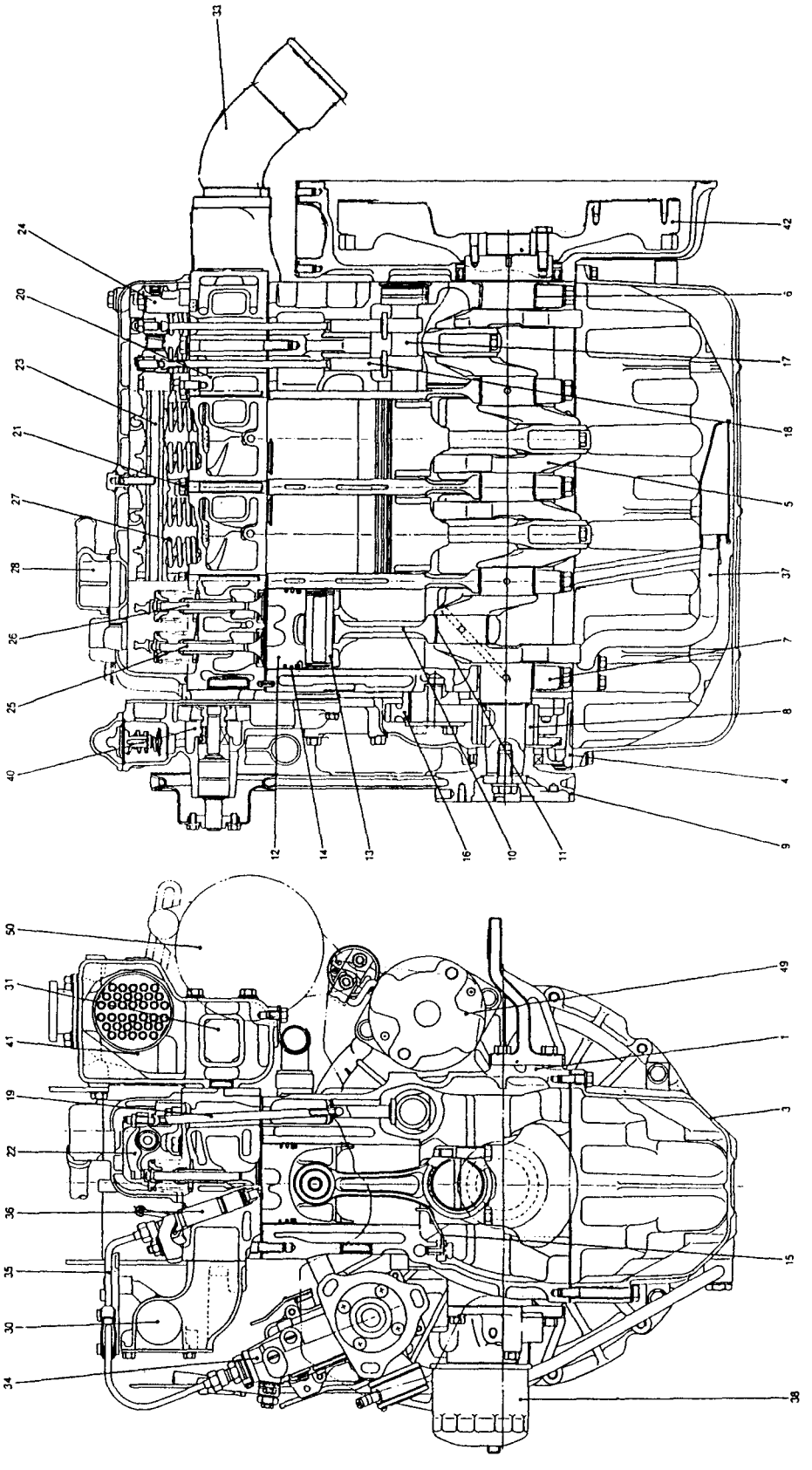
2-1 3JH Series

ENGINE MODEL		3JH2L	3JH2L-T
Group	Part	Construction	
Engine Proper	Cylinder block	Integrally-cast water jacket and crankcase	
	Cylinder liner	Sleeve less	
	Timing gear case	Cast aluminum	
	Oil sump	Steel plate	
	Main bearings	Hanger-type bearings supports	
Intake/Exhaust, Valve Drive	Cylinder head	Integrally-cast type, jet cooling between valves, Intake/exhaust valve seat inserts	
	intake/exhaust valves	Mushroom shaped, seat angle: Intake: 120° Exhaust: 90°	
	Intake manifold	Cast aluminum	
	Exhaust manifold	Water cooled integral with water tank	
	Turbocharger	——	IHI RHB 31 (Water cooled) exhaust gas turbo
	Valve drive	Overhead valve push rod rocker arm system	
	Timing gear	Helical gear	
Main Moving Parts	Crankshaft	Stamped forging	
	Flywheel	Cast iron static balance with ring gear	
	Pistons	Cast aluminum,oval type	
	Piston rings	2 compression rings, 1 oil ring	
	Piston pin	Floating type	
	Connecting rod	Forged steel	
	Crank pin bushings	Aluminum bushings	
Lube Oil System	Lube oil pump	Trochoid type	
	Oil filter	Full flow paper element cartridge type	
	Oil cooler	——	Tube type
	Control valve	Cylindrical type with external adjusting shims	
Cooling Water System	Fresh water pump	V-pulley driven, centrifugal type	
	Sea water pump	V-pulley driven, rubber impeller type	
	Thermostat	Wax pellet type	
	Fresh water cooler	Multi-tube type integral with exhaust manifold	
Fuel Injection Equipment	Fuel injection pump	YANMAR YPES-CL type integral with governor	
	Fuel injection nozzles	Hole type	
	Fuel feed pump	Diaphragm type	
	Fuel filter	Paper element cartridge type	
Governor	Governor	Centrifugal all-speed mechanical type	
Starting Equipment	Electric starter	DC12V, 1.4kW starter motor	
	Generator	12V, 35A with IC regulator(option)	

2-2 4JH Series

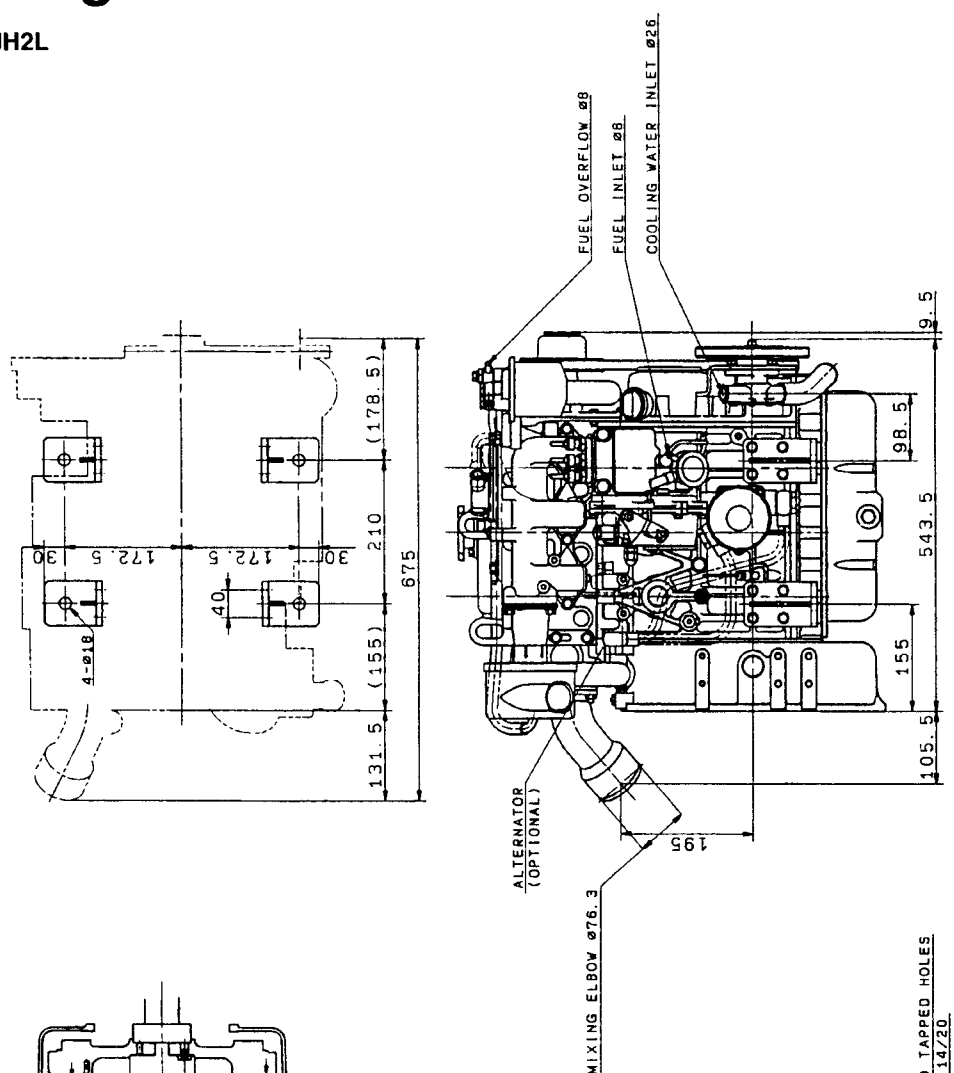
ENGINE MODEL		4JH2L-T	4JH2L-HT
Group	Part	Construction	
Engine Proper	Cylinder block	Integrally-cast water jacket and crankcase	
	Cylinder liner	Dry sleeve	
	Timing gear case	Cast aluminum	
	Oil sump	Steel plate	
	Main bearings	Hanger-type bearings supports	
Intake/Exhaust, Valve Drive	Cylinder head	Integrally-cast type, jet cooling between valves, Intake/exhaust valve seat inserts	
	intake/exhaust valves	Mushroom shaped, seat angle: intake: 120° Exhaust: 90°	
	Intake manifold	Aluminum diecast integral	
	Exhaust manifold	Water cooled integral with water tank	
	Aircooler		Plate fin type
	Turbocharger	IHI RHB 31 (Water cooled) exhaust gas turbo	
	Valve drive	Overhead valve push rod rocker arm system	
	Timing gear	Helical gear	
Main Moving Parts	Crankshaft	Stamped forging	
	Flywheel	Cast iron static balance with ring gear	
	Pistons	Cast aluminum,oval type	
	Piston rings	2 compression rings, 1 oil ring	
	Piston pin	Floating type	
	Connecting rod	Forged steel	
	Crank pin bushings	Aluminum bushings	
Lube Oil System	Lube oil pump	Trochoid type	
	Oil filter	Full flow paper element cartridge type	
	Oil cooler	Tube type	Double tube type
	Control valve	Cylindrical type with external adjusting shims	
Cooling Water System	Fresh water pump	V-pulley driven, centrifugal type	
	Sea water pump	V-pulley driven, rubber impeller type	
	Thermostat	Wax pellet type	
	Fresh water cooler	Multi-tube type integral with exhaust manifold	
Fuel Injection Equipment	Fuel injection pump	YANMAR YPES-CL type integral with governor	
	Fuel injection nozzles	Hole type	
	Fuel feed pump	Diaphragm type	
	Fuel filter	Paper element cartridge type	
Governor	Governor	Centrifugal all-speed mechanical type	
Starting Equipment	Electric starter	DC12V, 1.4kW starter motor	
	Generator	12V, 35A with IC regulator(option)	

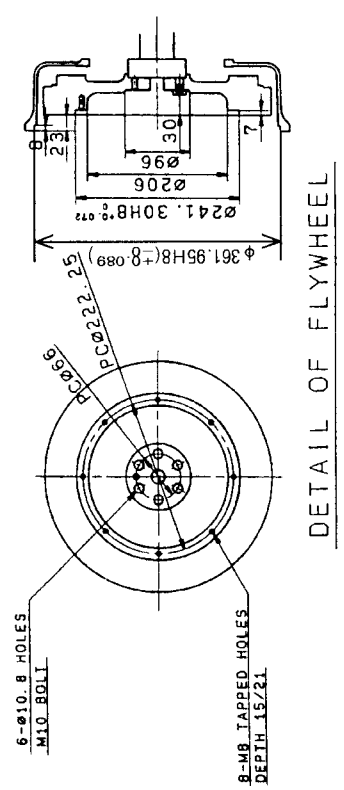
3. Engine Cross Section

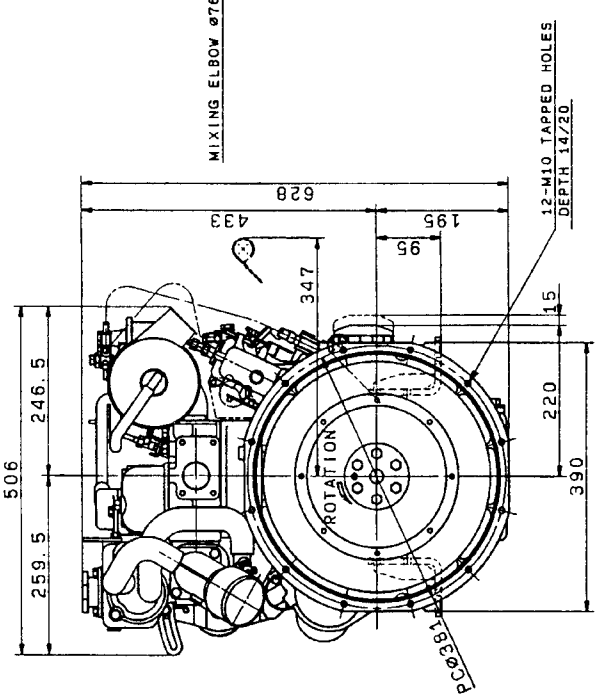


4. Engine Outline

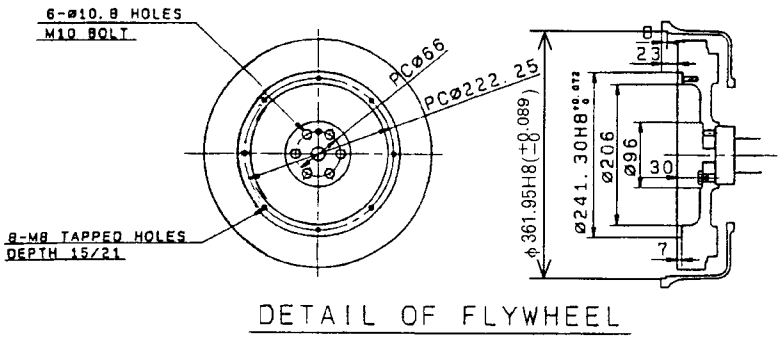
4-1 3JH2L



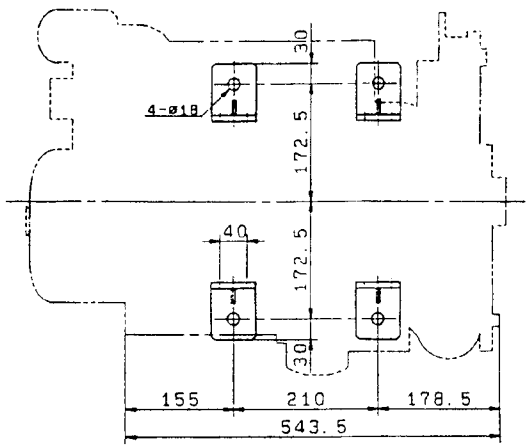


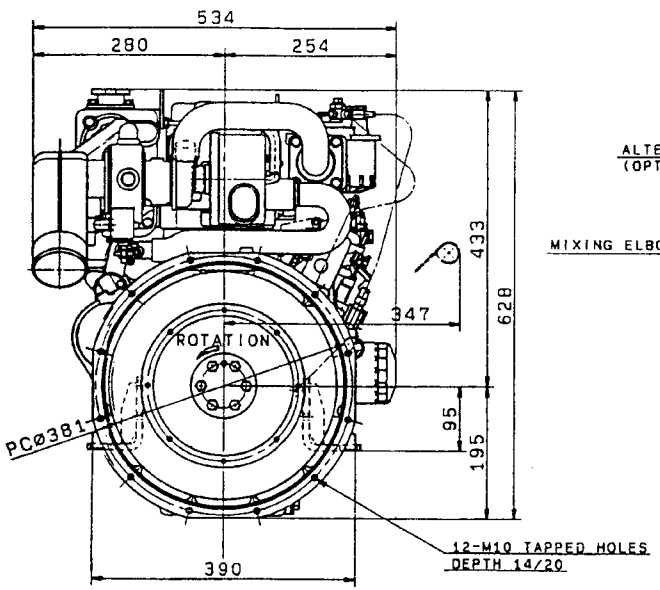


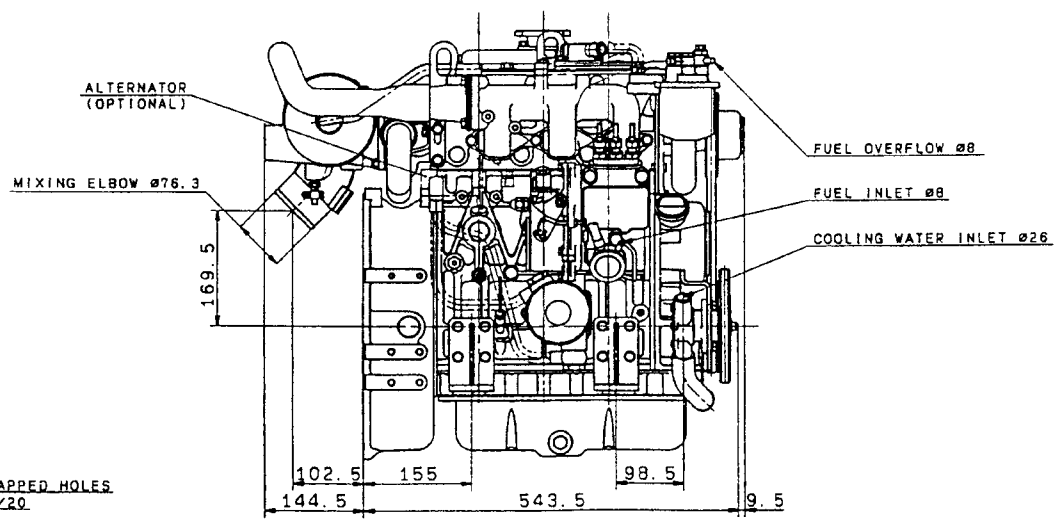
SPECIFICATIONS			
Model		3JH2L	
Continuous rating output	kw(HP/rpm)	9.93/1500(13.5/1500)	11.8/1800(16/1800)
Intermittent rating output	kw(HP/rpm)	10.9/1500(14.8/1500)	12.9/1800(17.6/1800)
Reduction ratio		—	
Dry weight	kg	Approx. 173	
Direction of crankshaft rotation (Viewed from flywheel side)		Counter-Clockwise	



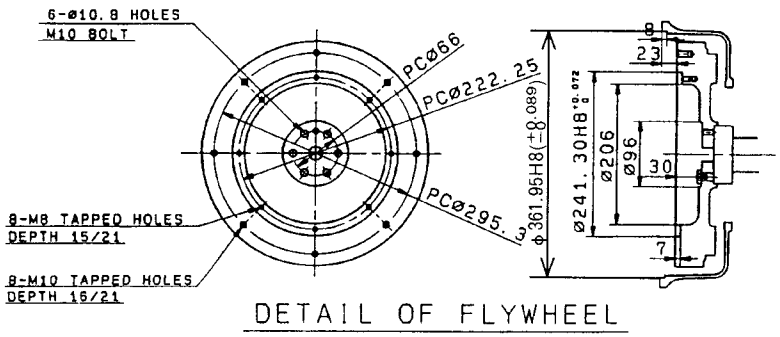
DETAIL OF FLYWHEEL



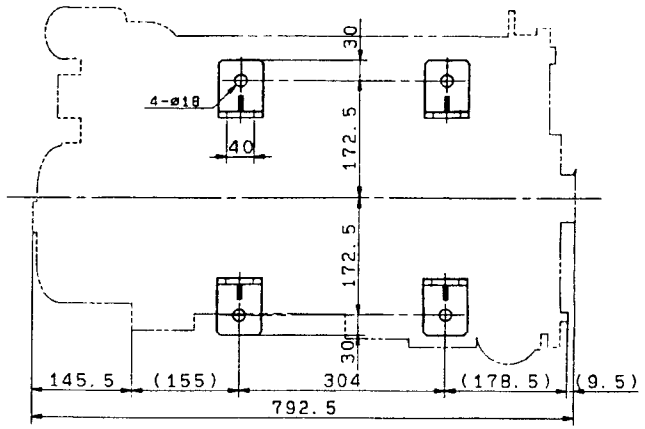


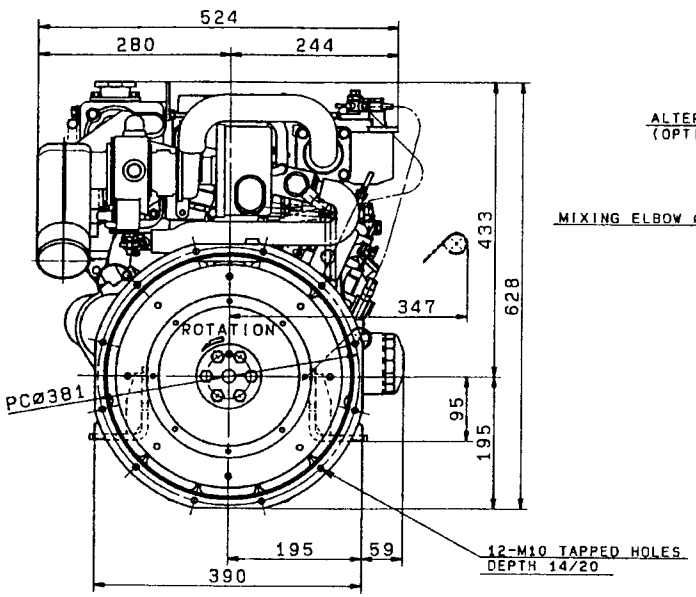


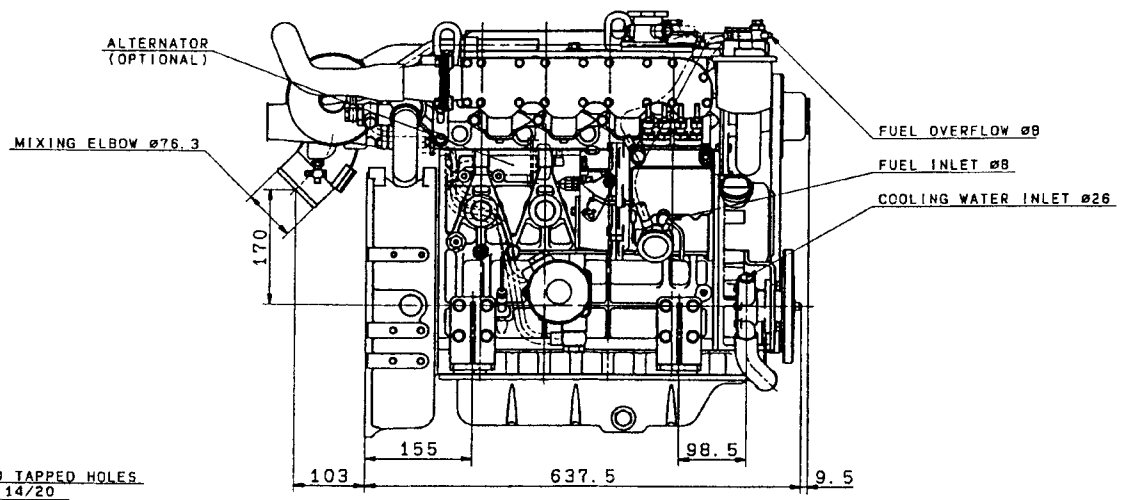
SPECIFICATIONS			
Model		3JH2L-T	
Continuous rating output	kw(HP/rpm)	12.1/1500(16.5/1500)	14.7/1800(20/1800)
Intermittent rating output	kw(HP/rpm)	13.3/1500(18.1/1500)	16.9/1800(23/1800)
Reduction ratio		—	
Dry weight	kg	Approx. 178	
Direction of crankshaft rotation (Viewed from flywheel side)		Counter-Clockwise	



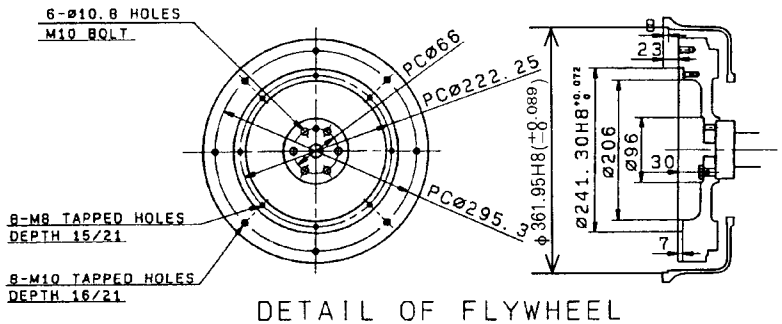
DETAIL OF FLYWHEEL



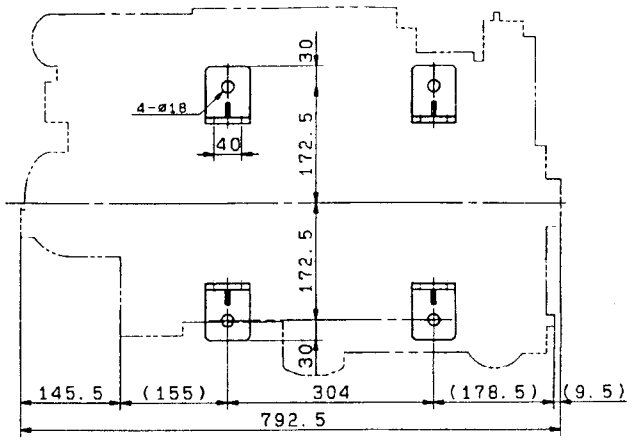


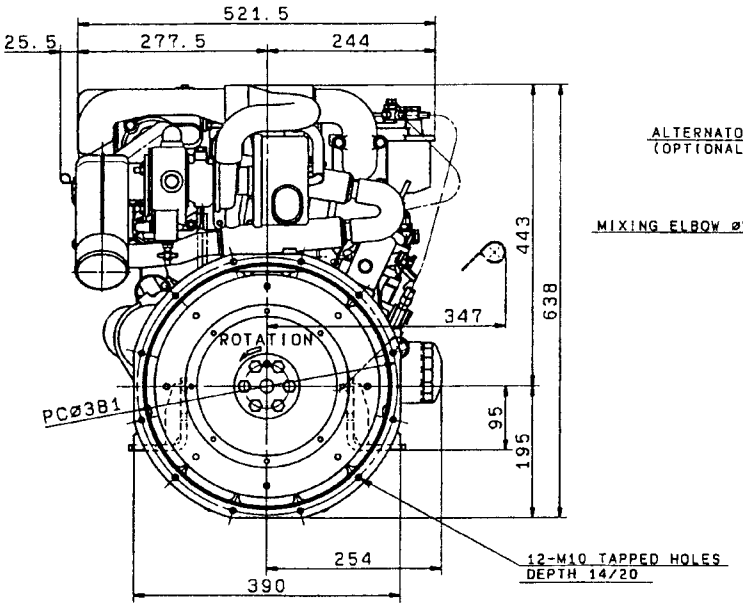


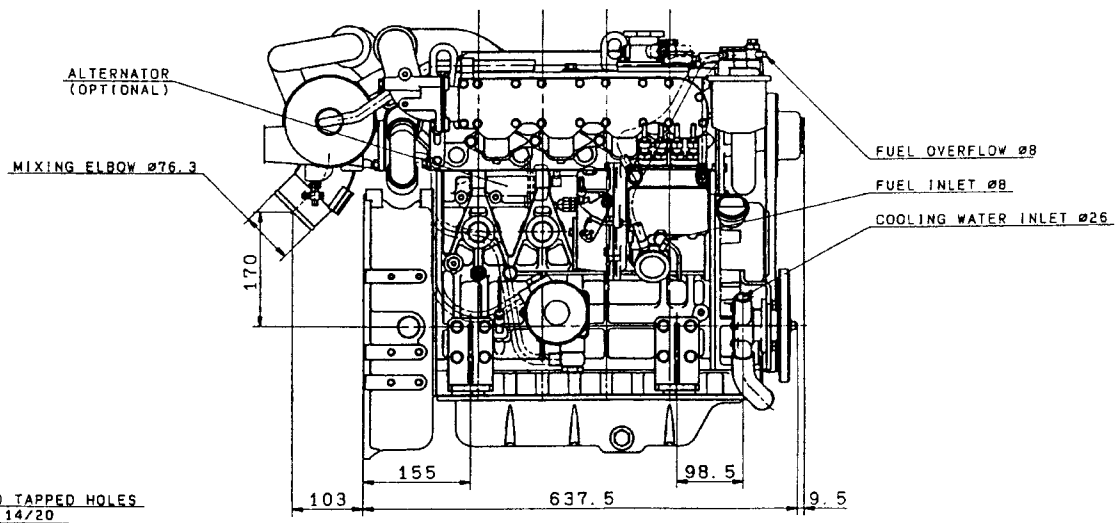
SPECIFICATIONS			
Model		4JH2L-T	
Continuous rating output	kw(HP/rpm)	16.5/1500(22.5/1500)	20.2/1800(27.5/1800)
Intermittent rating output	kw(HP/rpm)	18.2/1500(24.7/1500)	22.4/1800(30.5/1800)
Reduction ratio		—	
Dry weight	kg	Approx. 224	
Direction of crankshaft rotation (Viewed from flywheel side)		Counter-Clockwise	



DETAIL OF FLYWHEEL



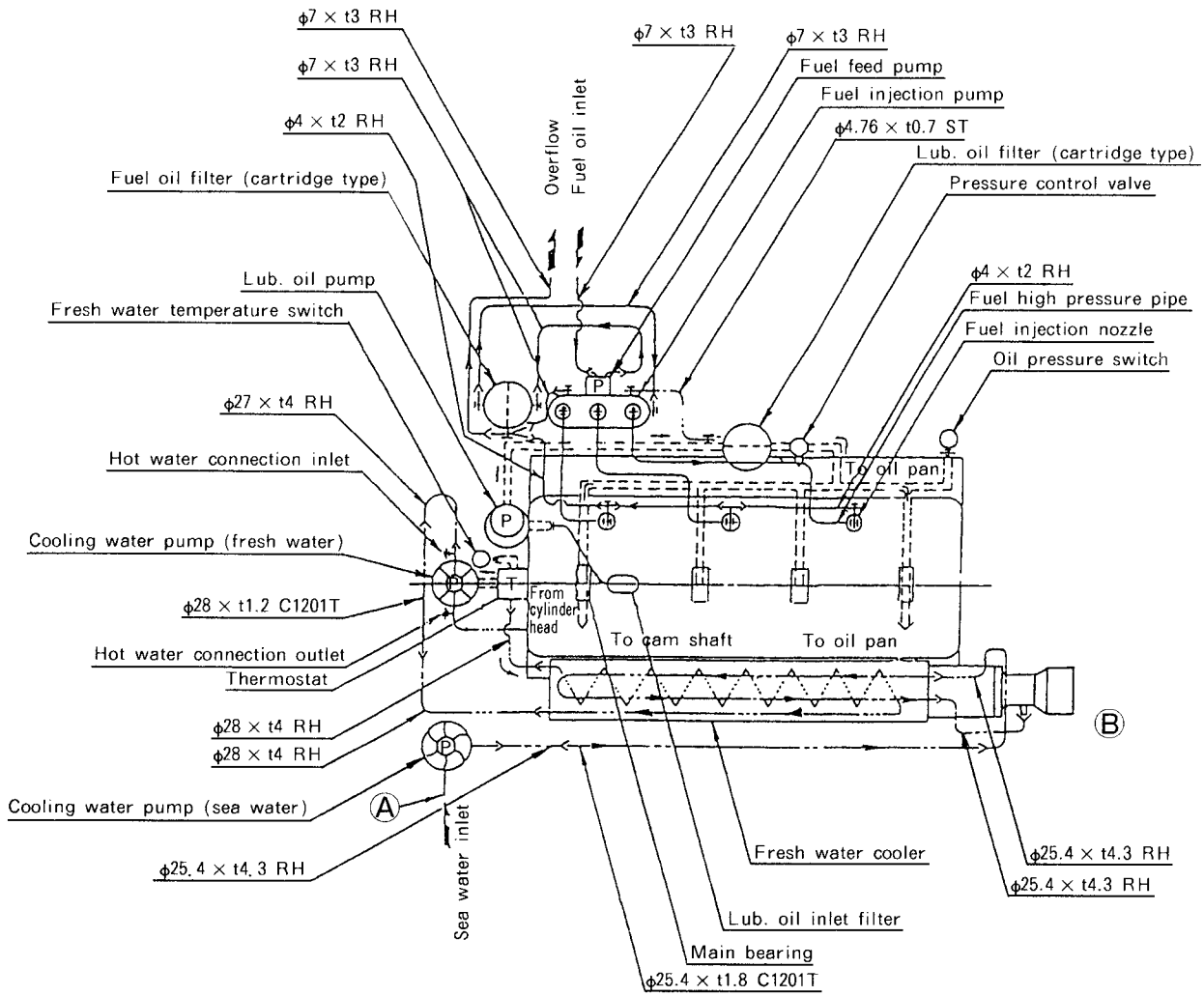




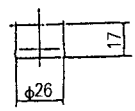
SPECIFICATIONS			
Model		4JH2L-HT	
Continuous rating output	kw(HP/rpm)	20.2/1500(27.5/1500)	25.7/1800(35/1800)
Intermittent rating output	kw(HP/rpm)	22.2/1500(30.2/1500)	28.4/1800(38.5/1800)
Reduction ratio		—	
Dry weight	kg	Approx. 246	
Direction of crankshaft rotation (Viewed from flywheel side)		Counter-Clockwise	

5. Piping Diagrams

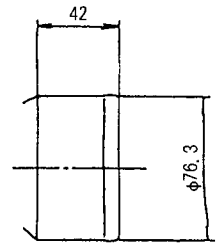
5-1 3JH2L



MARKS OF PIPING	NAME
RH	RUBBER HOSE
STS	CARBON STEEL PIPE
C1201T	COPPER PIPE
	SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB.OIL PIPING
	FUEL OIL PIPING

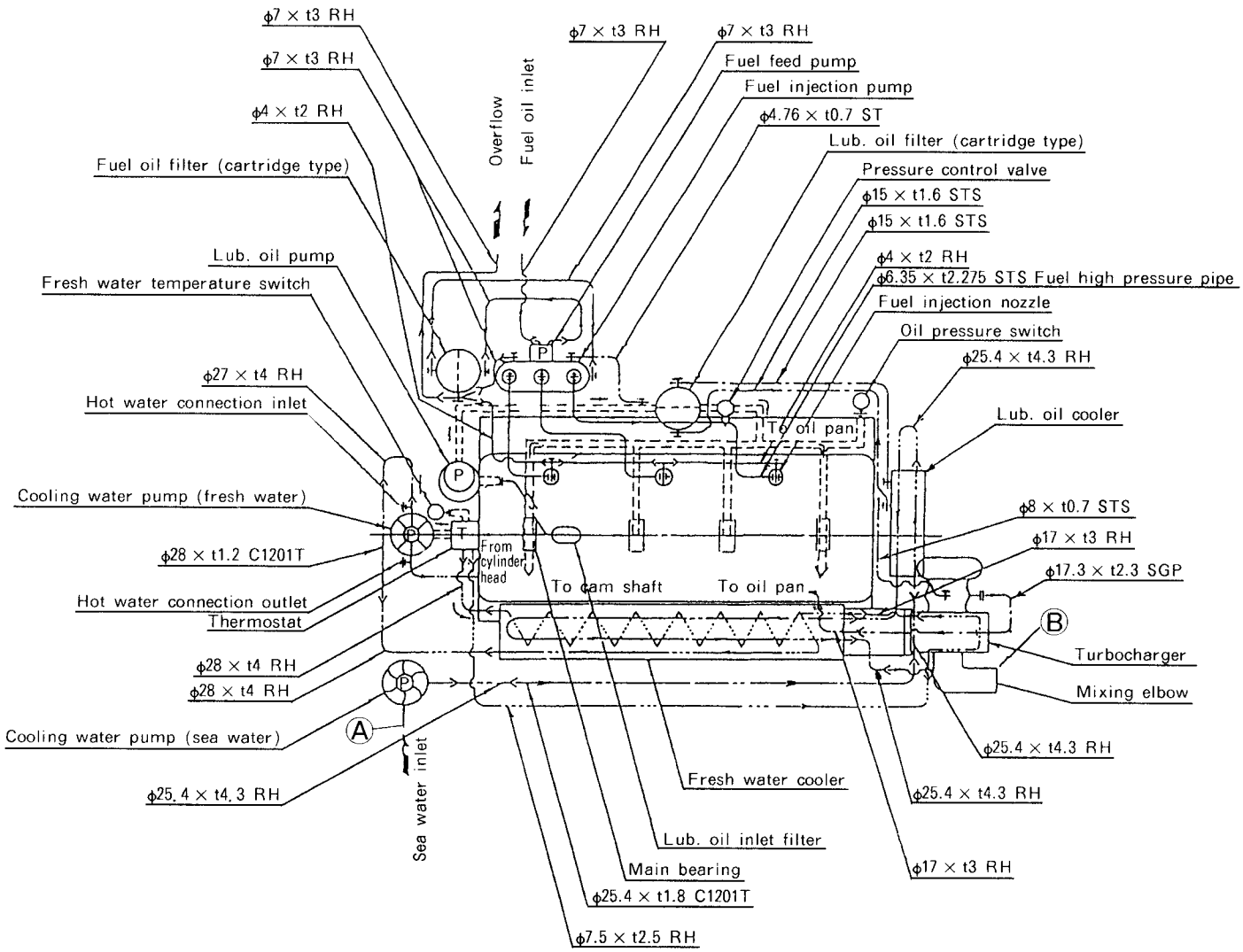


Detail of part Ⓐ

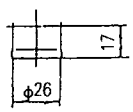


Detail of part Ⓑ

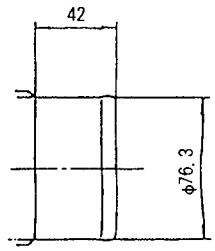
5-2 3JH2L-T



MARKS OF PIPING	NAME
RH	RUBBER HOSE
STS	CARBON STEEL PIPE
C1201T	COPPER PIPE
	SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB.OIL PIPING
	FUEL OIL PIPING

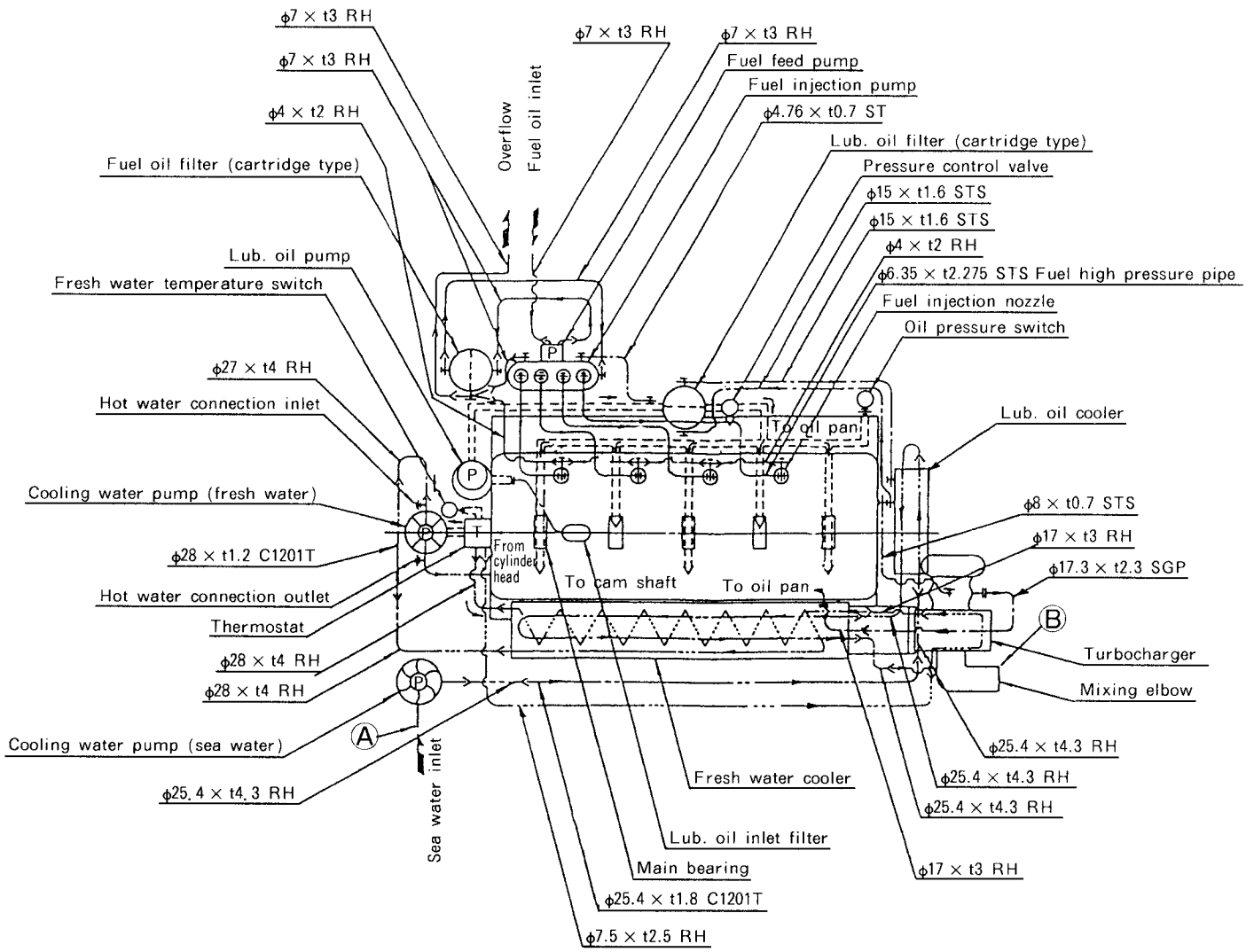


Detail of part Ⓐ (scale 1/2)

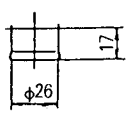


Detail of part Ⓑ (scale 1/2)

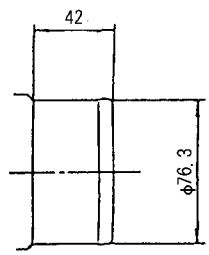
5-3 4JH2L-T



MARKS OF PIPING	NAME
RH	RUBBER HOSE
STS	CARBON STEEL PIPE
C1201T	COPPER PIPE
	SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB.OIL PIPING
	FUEL OIL PIPING

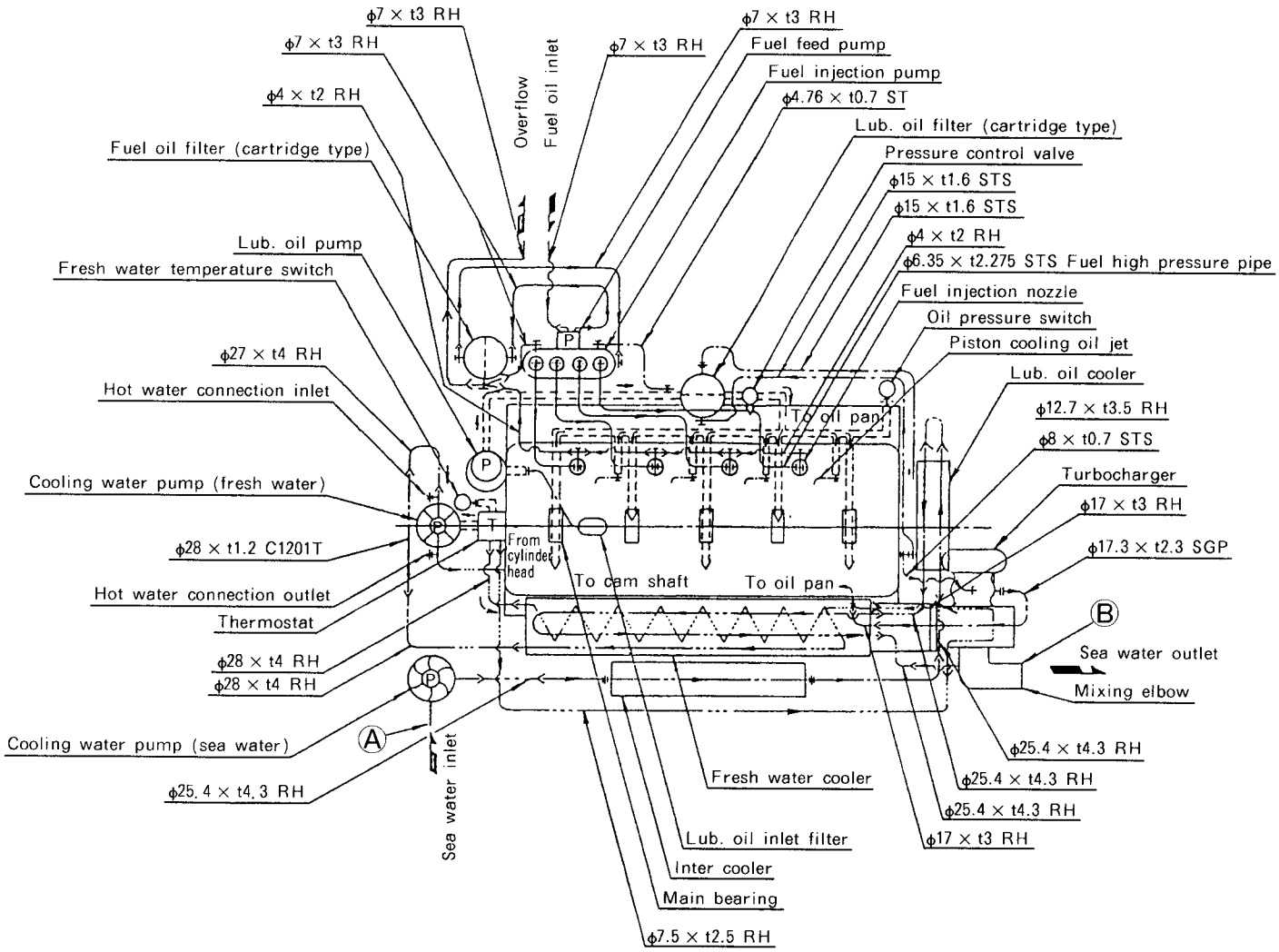


Detail of part Ⓐ (scale 1/2)

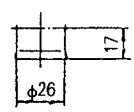


Detail of part Ⓑ (scale 1/2)

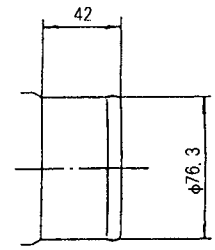
5-4 4JH2L-HT



MARKS OF PIPING	NAME
RH	RUBBER HOSE
SGP STS	STEEL PIPE
C1201T	COPPER PIPE
	(UNION) SCREW JOINT
	FLANGE JOINT
	EYE JOINT
	INSERTION JOINT
	DRILL HOLE
	COOLING FRESH WATER PIPING
	COOLING SEA WATER PIPING
	LUB.OIL PIPING
	FUEL OIL PIPING



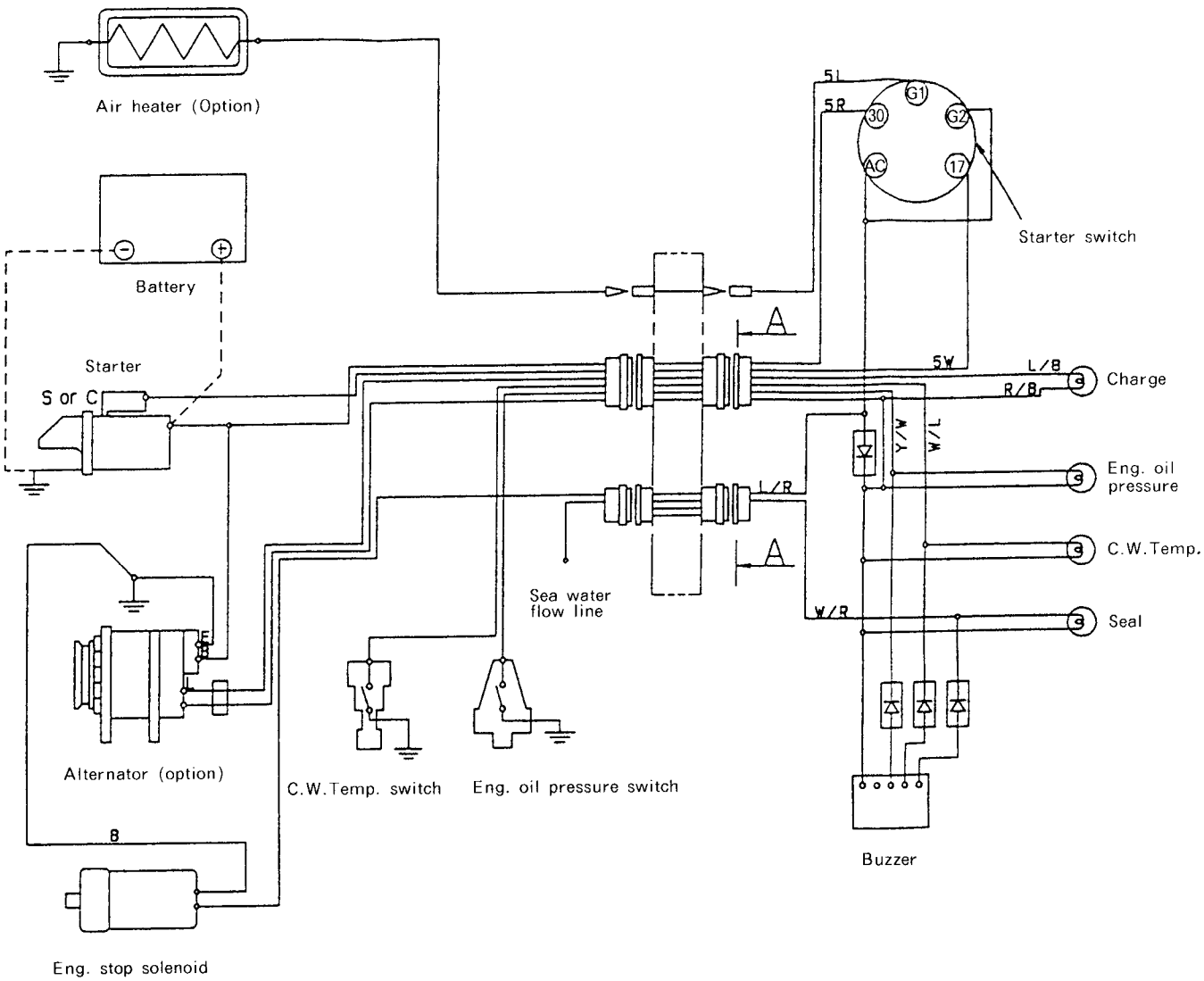
Detail of part Ⓐ (scale 1/2)

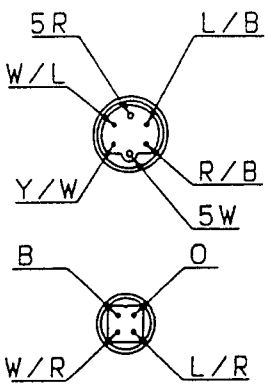


Detail of part Ⓑ (scale 1/2)

6. Wiring Diagram

Model : 3JH2L, 4JH2L





Detail of coupler
(Veiwed from A-A)

Starter switch

	30	AC	17	G1	G2
GLOW	○			○	
OFF	○				
ON	○	○			
START	○		○		○

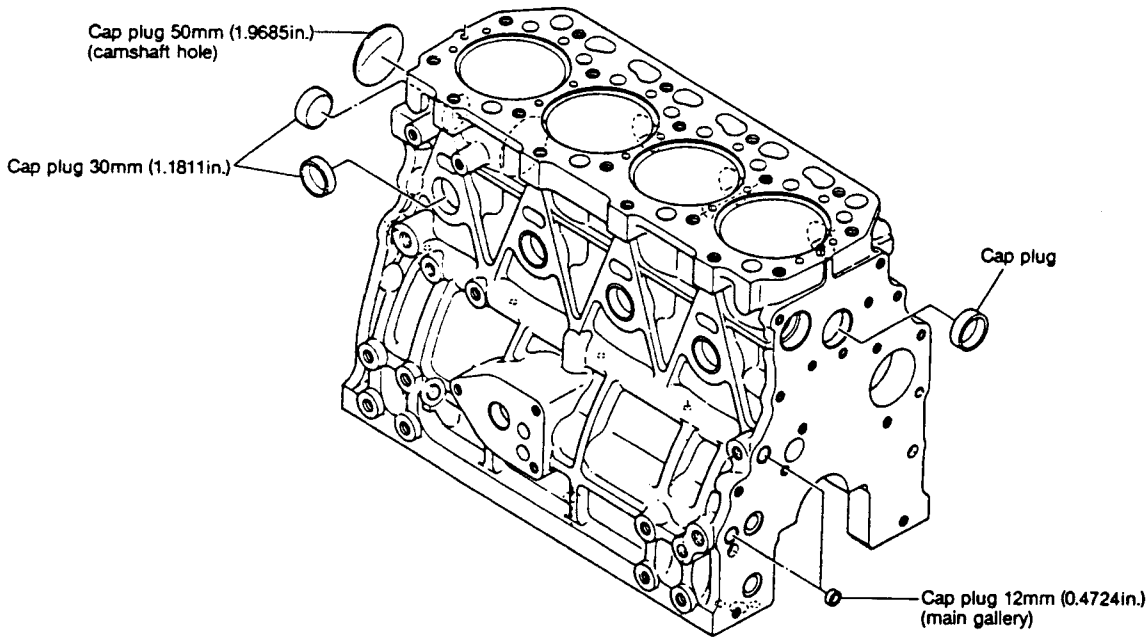
Color coding	
R	Red
B	Black
W	White
Y	Yellow
L	Blue
O	Orange

CHAPTER 2

BASIC ENGINE

1. Cylinder Block

The cylinder block is thin-skinned, (low-weight), short skirt type rationally placed ribs. The side walls are wave shaped to maximize rigidity for strength and low noise.



1-1 Inspection of parts

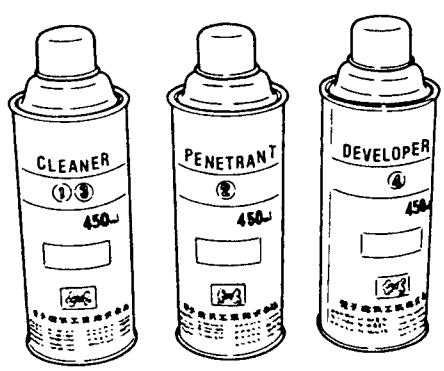
Make a visual inspection to check for cracks on engines that have frozen up, overturned or otherwise been subjected to undue stress. Perform a color check on any portions that appear to be cracked, and replace the cylinder block if the crack is not repairable.

1-2 Cleaning of oil holes

Clean all oil holes, making sure that none are clogged up and the blind plugs do not come off.

Color check kit
Part code No.97550-004560

	Quantity
Penetrant	1
Developer	2
Cleaner	3

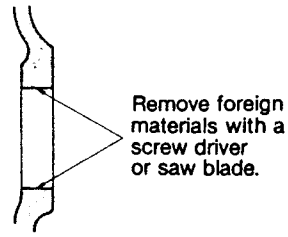
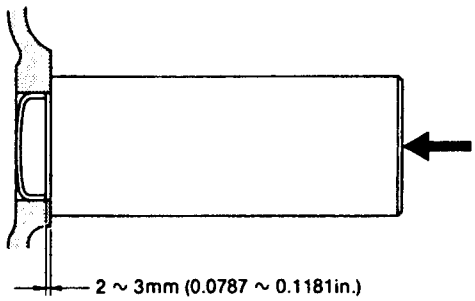
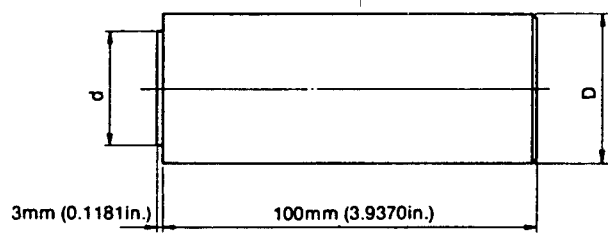


1-3 Color check procedure

(1) Clean the area to be inspected.
(2) Color check kit
The color check test kit consists of an aerosol cleaner, penetrant and developer.
(3) Clean the area to be inspected with the cleaner.
Either spray the cleaner on directly and wipe, or wipe the area with a cloth moistened with cleaner.
(4) Spray on red penetrant
After cleaning, spray on the red penetrant and allow 5 - 10 minutes for penetration. Spray on more red penetrant if it dries before it has been able to penetrate.
(5) Spray on developer
Remove any residual penetrant on the surface after the penetrant has penetrated, and spray on the developer. If there are any cracks in the surface, red dots or a red line will appear several minutes after the developer dries. Hold the developer 300 - 400mm (11.8110 - 15.7480in.) away from the area being inspected when spraying, making sure to coat the surface uniformly.
(6) Clean the surface with the cleaner.

NOTE: Without fail, read the instructions for the color check kit before use.

1-4 Replacement of cap plugs

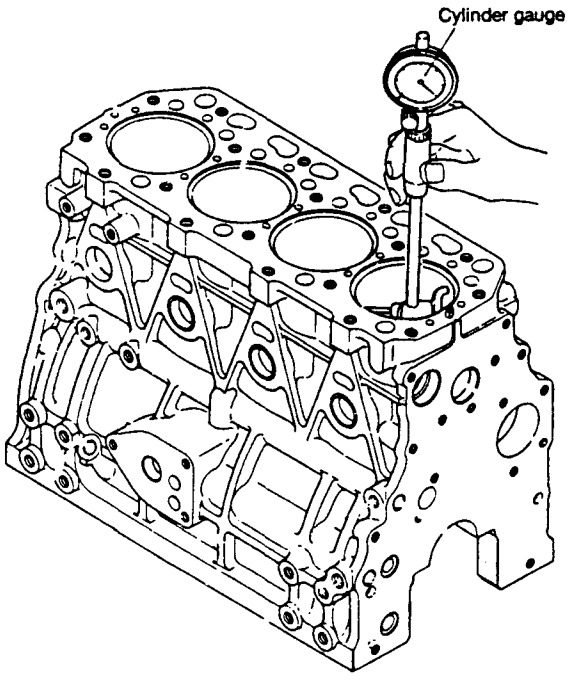
Step No.	Description	Procedure	Tool or material used
1.	Clean and remove grease from the hole into which the cap plug is to be driven. (Remove scale and sealing material previously applied.)		● Screw driver or saw blade ● Thinner
2.	Remove grease from the cap plug.	Visually check the nick around the plug.	● Thinner
3.	Apply Three bond No. 4 to the seat surface where the plug is to be driven in.	Apply over the whole outside of the plug.	● Three bond No. 4
4.	Insert the plug into the hole.	Insert the plug so that it sits correctly.	
5.	Place a driving tool on the cap plug and drive it in using a hammer.  * Using the special tool, drive the cap plug to a depth where the edge of the plug is 2 mm(0.0787 in.) below the cylinder surface.	Drive in the plug parallel to the seating surface. 	● Driving tool ● Hammer

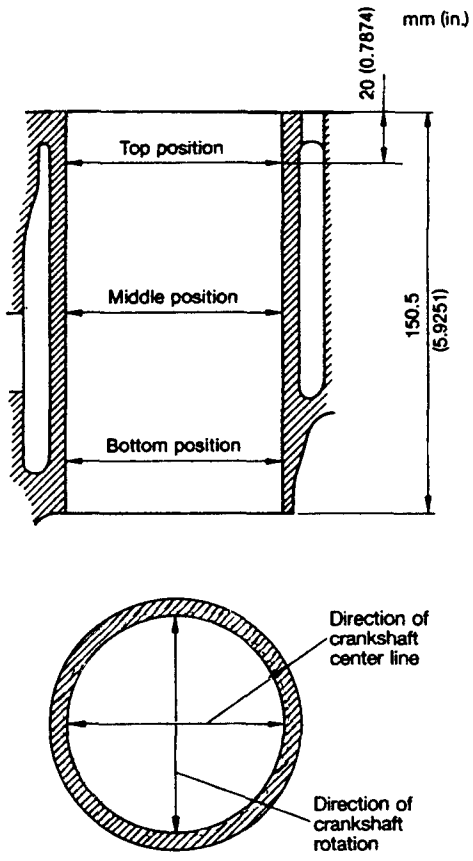
mm(in.)

Plug dia.	d	D
ϕ12	ϕ11.9–12.0 (ϕ0.4685–0.4724)	ϕ20 (ϕ0.7874)
ϕ30	ϕ29.9–30.0 (ϕ1.1770–1.8110)	ϕ40 (ϕ1.5748)

1-5 Cylinder bore measurement

Measure the bore diameter with a cylinder gauge at the positions shown in the figure.
Replace the cylinder bore when the measured value exceeds the wear limit. Measurement must be done at least at 3 positions as shown in the figure, namely, top, middle and bottom positions in both directions along the crankshaft rotation and crankshaft center lines.



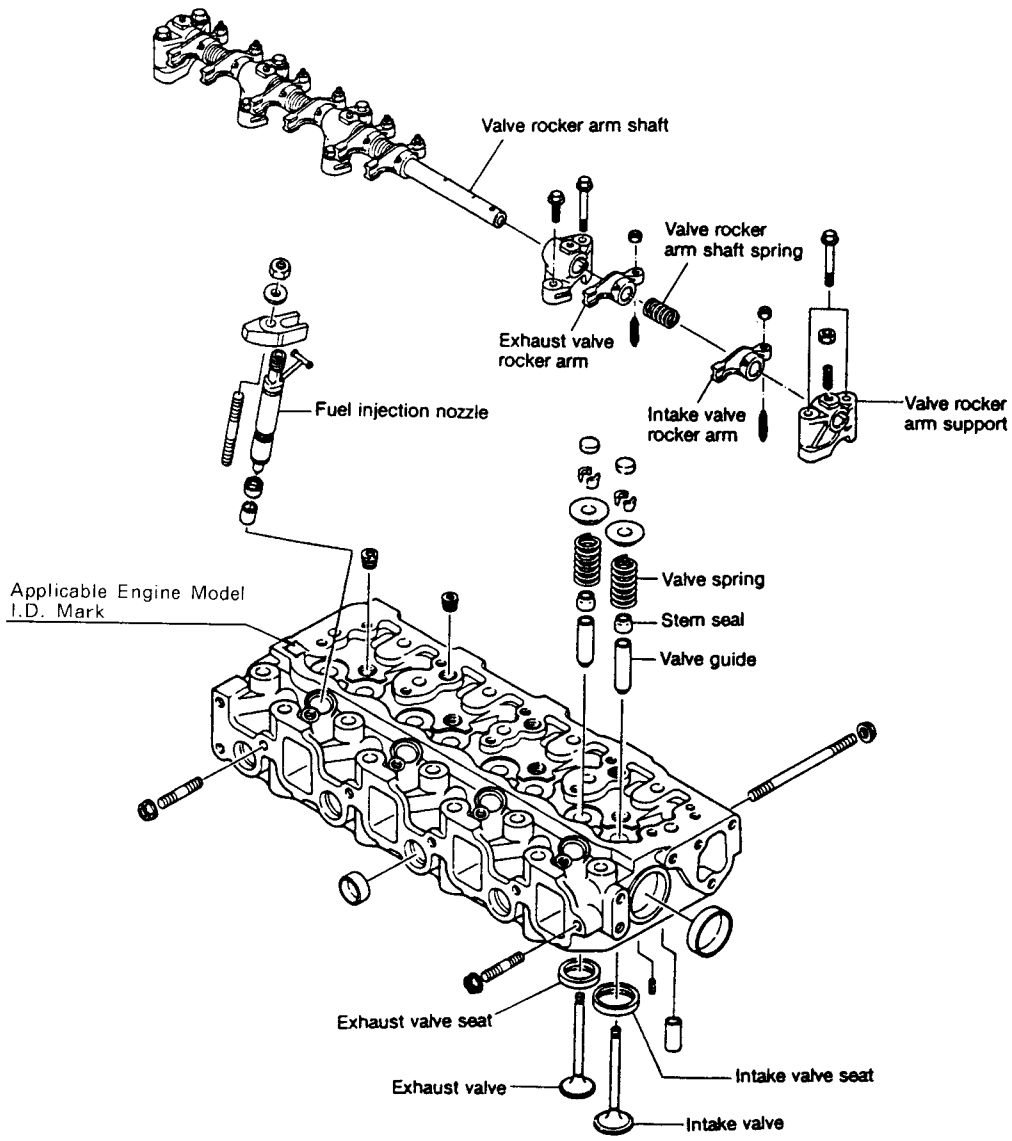


mm (in.)

	Standard	Wear limit
Cylinder bore dia.	ϕ82.00–82.03 (3.2283–3.2295)	ϕ82.06 (3.2307)
Cylinder roundness	0–0.01 (0–0.0004)	0.02 (0.0008)

2. Cylinder Head

The cylinder head is of 4-cylinder integral construction, mounted with 18 bolts. Special alloy stellite with superior resistance to heat and wear is fitted on the seats, and the area between the valves is cooled by a water jet.



Engine Model	I.D. mark
3JH2L	SH
3JH2L-T	SH
4JH2L-T	SL
4JH2L-HT	SL