

**SERVICE MANUAL
6HK1 ISUZU
ENGINES**

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SECTION 0A
GENERAL INFORMATION

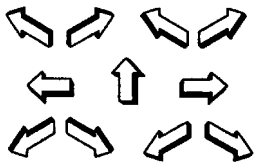
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GENERAL REPAIR INSTRUCTIONS

- 1.** Before performing any service operation with the engine mounted, disconnect the grounding cable from the battery.
This will reduce the chance of cable damage and burning due to short circuiting.
- 2.** Always use the proper tool or tools for the job on hand.
Where specified use the specially designed tool or tools.
- 3.** Use genuine CASE parts, referring to the CASE PARTS CATALOG for engine safety.
- 4.** Never reuse cotter pins, gaskets, O-rings, lock washers, and self locking nuts. Discard them as you remove them. Replace them with new ones.
- 5.** Always keep disassembled parts neatly in groups. This will ensure a smooth reassembly operation. It is especially important to keep fastening parts separate. These parts vary in hardness and design, depending on their installation position.
- 6.** All parts should be carefully cleaned before inspection or reassembly.
Oil ports and other openings should be cleaned with compressed air to make sure that they are completely free of obstructions.
- 7.** Rotating and sliding part surfaces should be lubricated with oil or grease before reassembly.
- 8.** If necessary, use sealing compound on gaskets to prevent leakage.
- 9.** Nut and bolt torque specifications should be carefully followed.
- 10.** Always release the air pressure from any machine-mounted air tank(s) before dismantling the engine or disconnecting pipes and hoses. To not do so is extremely dangerous.
- 11.** Always check and recheck your work. No service operation is complete until you have done this.

ILLUSTRATION ARROWS



Front of engine

CS01N605



Ambient/clean air flow
Cool air flow

CS01N612



Up

CS01N606



Gas other than ambient air
Hot air flow

CS01N613



Task related

CS01N607



Ambient air mixed with another gas
Temperature change

CS01N614



View detail

CS01N608



Direction

CS01N615



View angle

CS01N609



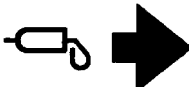
Lubrication point (oil or fluid)

CS01N616



Dimension (1:2)

CS01N610



Lubrication point (grease)

CS01N617



Sectioning (1:3)

CS01N611



Lubrication point (jelly)

CS01N618

ABBREVIATIONS

List of abbreviations which may be used in this manual

A - Ampere(s)
AC - Alternating Current
ACL - Air Cleaner
Adj - Adjust
AMP - Ampere(s)
ASM - Assembly
ATDC - After Top Dead Center
Auto - Automatic
Bat - Battery
B+ - Battery Positive Voltage
BHP - Brake Horsepower
BTDC - Before Top Dead Center
°C - Degrees Celsius
cc - Cubic Centimeters
CID - Cubic Inch Displacement
CO - Carbon Monoxide
Conn - Connector
Crank - Crankshaft
Cu.In. - Cubic Inch
Cyl - Cylinder(s)
DOHC - Double Overhead Camshaft
DTC - Diagnostic Test Mode
DTT - Diagnostic Test Terminal
ECM - Engine Control Module
ECT - Engine Coolant Temperature
EGR - Exhaust Gas Recirculation
Exh - Exhaust
°F - Degrees Fahrenheit
FL - Fusible Link
FLW - Fusible Link Wire
FP - Fuel Pump
FRT - Front
ft - Foot
Gal - Gallon
GND - Ground
Gov - Governor
g - Gram
Har - Harness
HC - Hydrocarbons
HD - Heavy Duty
Hg - Hydrargyrum (Mercury)
IC - Integrated Circuit/Ignition Control
ID - Identification/Inside Diameter
IGN - Ignition
INJ - Injection
Int - Intake
kg - Kilograms
km - Kilometers
km/h - Kilometer per Hour
kPa - Kilopascals
kV - Kilovolts (thousands of volts)
kW - Kilowatts
L - Liter
lb ft - Foot Pounds
lb in - Inch Pounds
LF - Left Front

LH - Left Hand
LR - Left Rear
LS - Left Side
L-4 - In-Line Four Cylinder Engine
Max - Maximum
Min - Minimum
mm - Millimeter
N - Newtons
NA - Naturally Aspirated
NC - Normally Closed
Nm - Newton Meters
NO - Normally Open
NOX - Nitrogen oxides
OD - Outside Diameter
OHC - Overhead Camshaft
PCV - Positive Crankcase Ventilation
PRESS - Pressure
PROM - Programmable Read Only Memory
psi - Pounds per Square Inch
PSP - Power Steering Pressure
Pt. - Pint
PWM - Pulse Width Modulate
Qt. - Quart
REF - Reference
RF - Right Front
RH - Right Hand
RPM - Revolutions Per Minute
RPM Sensor - Engine Speed Sensor
RR - Right Rear
RS - Right Side
RTV - Room Temperature Vulcanizing
SAE - Society of Automotive Engineers
Sec - Secondary
SI - System International
SOHC - Single Overhead Camshaft
Sol - Solenoid
SPEC - Specification
Speedo - Speedometer
ST - Start/Scan Tool
Sw - Switch
SYN - Synchronize
Tach - Tachometer
TDC - Top Dead Center
Term - Terminal
TEMP - Temperature
TURBO - Turbocharger
V - Volt(s)
VAC - Vacuum
V-ref - ECM Reference Voltage
VSS - Vehicle Speed Sensor
VSV - Vacuum Switch Valve
V-6 - Six Cylinder "Vee" Engine
V-8 - Eight Cylinder "Vee" Engine
W - Watt(s)
w/ - With
w/o - Without
WOT - Wide Open Throttle

MAIN DATA AND SPECIFICATIONS

NOTE:

1. These specifications are based on the standard engine.
2. Specifications for items marked with an asterisk (*) will vary according to the type of equipment on which the engine is installed.

If you are unable to locate the data applicable to these specifications, please contact Isuzu Motors LTD through your machine supplier.

ITEMS	6HK1
Engine type	Four cycle, water cooled, in-line, overhead camshaft direct injection
Combustion chamber	Open type in piston crown
Cylinder liner	Dry
Timing drive system	Gear drive
No. of cylinders - bore x stroke	6 - 115 x 125 (4.53 x 4.92)
No. of piston rings	Four rings (Compression rings: 3, Oil ring: 1)
Total piston displacement	7.790 (475.4)
Compression ratio (to 1)	17.3
Compression pressure at 200 min ⁻¹	3.24 (33/469) or more
MPa (kg/cm ² /psi)	
Engine dimensions*	1,332 x 995 x 1,143 (52.4 x 39.2 x 45.0)
Engine weight (Dry)*	650 (1,433)
Fuel injection order	1 - 5 - 3 - 6 - 2 - 4
Fuel injection timing (TDC)	9
Specified fuel type	SAE No. 2 diesel fuel
Idling speed*	1000
Valve clearances	
Intake	0.40 (0.016)
Exhaust	0.40 (0.016)
Intake valves	
Open at (BTDC)	15
Close at (ABDC)	44
Exhaust valves	
Open at (BBDC)	58
Close at (ATDC)	11
Injection pump	Bosch, in-line P-Type
Governor type*	Mechanical
Injection nozzles	Multi-hole
Injection nozzle opening pressure	
MPa (kg/cm ² /psi)	1st stage: 18.1 (185/2630)
	2nd stage: 22.1 (225/3200)
Main fuel filter	Paper element

0A-6 GENERAL INFORMATION

ITEMS	6HK1
Lubrication system	
Lubrication method	Full flow pressure circulation
Specified engine oil (API grade)	CD
Oil pressure (at oil gallery) kPa (kg/cm ² /psi)/min ⁻¹	290 - 490 (3.0 - 5.0/43-71)/2000 Condition: SAE 30 API CD grade engine oil at an oil temperature of 80°C (176°F)
Oil pump type	Gear (Timing gear drive)
Relief valve opening pressure kPa (kg/cm ² /psi)	780 (8.0/114)
Oil pressure switch operating pressure* kPa (kg/cm ² /psi)	29 (0.3/4)
Main oil filter	Paper element
By-pass valve opening pressure kPa (kg/cm ² /psi)	200 (2.0/28.4)
Oil volume* L (qts)	36 (38) with combined main and partial oil filter
Oil cooler	Plate type - Water cooled in water jacket
Cooling system	Pressured compulsory circulation water
Coolant volume L (qts)	14.5 (15.3)
Water pump	Centrifugal impeller
Delivery volume Lit/min. (Imp. gal/US gal)	167 (37/44) Pump speed a 1.600 min ⁻¹
Thermostat	Wax pellet
Valve initial opening temperature* °C (°F)	82 (180)
Valve lift mm (in)	10 (0.39)
Air cleaner	
Alternator capacity* V-A	24-50
Regulator*	IC (Built-in)
Brush length* mm (in)	Brushless
Starter motor output* V-kW	24-5
Number of poles*	4
Turbocharger model*	RHG 6
Manufacturer	Ishikawajima-Harima Heavy Industries (IHI)

SERVICE STANDARDS

ITEMS		SERVICE STANDARD	SERVICE LIMIT
Cylinder Head			
Lower Face Warp	mm (in)	0.05 (0.002) or less	0.20 (0.008) Do not regrind the lower face.
Valve Guide			
Valve Stem Clearance			
Intake	mm (in)	0.04 - 0.06 (0.0016 - 0.0024)	0.20 (0.008)
Exhaust	mm (in)	0.06 - 0.10 (0.0024 - 0.0039)	0.25 (0.010)
Valve Stem Outside Diameter			
Intake	mm (in)	7.95 - 7.96 (0.3130 - 0.3134)	7.89 (0.3106)
Exhaust	mm (in)	7.92 - 7.94 (0.3118 - 0.3126)	7.89 (0.3106)
Valve Guide Upper End Height	mm (in)	14.1 (0.56)	—
Valve and Valve Seat Insert			
Valve Thickness			
Intake	mm (in)	1.71 (0.067)	1.30 (0.051)
Exhaust	mm (in)	1.75 (0.069)	1.30 (0.051)
Valve Depression A			
Intake	mm (in)	1.0 (0.039)	2.5 (0.098)
Exhaust	mm (in)	1.3 (0.051)	2.8 (0.110)
Valve Contact Width			
Intake	mm (in)	2.5 (0.098)	3.2 (0.126)
Exhaust	mm (in)	2.0 (0.079)	2.8 (0.110)
Valve Face Angle			
Intake	deg	30	—
Exhaust	deg	45	—
Valve Spring			
Spring Height			
Intake	mm (in)	65.9 (2.59)	64.6 (2.54)
Exhaust	mm (in)	68.1 (2.68)	66.7 (2.63)
Inner and Outer Spring Squareness			
Intake	mm (in)	2.9 (0.114)	3.0 (0.118)
Exhaust	mm (in)	3.0 (0.118)	3.0 (0.118)
Intake Valve Spring Tension			
Compression Height	N (kg/lb)	348 (35.5/78)/46	
Exhaust Valve Spring Tension			
Compression Height	N (kg/lb)	383 (39.0/86)/46	
Rocker Arm Shaft and Rocker Arm			
Rocker Arm Shaft Run-Out	mm (in)		0.30 (0.012)
Rocker Arm Shaft Outside Diameter	mm (in)	21.979 - 22.000 (0.865 - 0.866)	21.85 (0.860)
Rocker Arm Inside Diameter	mm (in)	22.010 - 22.035 (0.867 - 0.868)	

0A-8 GENERAL INFORMATION

ITEMS		SERVICE STANDARD	SERVICE LIMIT
Rocker Arm Shaft and Rocker Arm Clearance	mm (in)	0.010 - 0.056 (0.0004 - 0.0022)	0.20 (0.008)
Rocker Arm Pin and Roller Clearance	mm (in)	0.068 - 0.099 (0.0027 - 0.0039)	0.50 (0.02)
Valve Cap Worn	mm (in)		0.10 (0.004)
Camshaft			
Camshaft Journal Diameter	mm (in)	39.950 - 39.975 (1.5728 - 1.5738)	39.85 (1.5689)
Cam Lobe Height	Intake mm (in)	54.54 (2.1472)	
	Exhaust mm (in)	52.85 (2.0807)	
Camshaft Run-Out	mm (in)	0.025 (0.001)	0.05 (0.002)
Camshaft Bearing Inside Diameter	mm (in)	40.00 - 40.037 (1.575 - 1.576)	
Camshaft Bearing Clearance	mm (in)	0.025 - 0.087 (0.001 - 0.003)	0.15 (0.006)
Crankshaft			
Crankshaft End Play	mm (in)	0.040 - 0.205 (0.0026 - 0.008)	0.54 (0.021)
Crankshaft Run-Out	mm (in)	0.06 (0.002) or less	0.45 (0.016)
Crankshaft Journal Diameter		See section 6A crankshaft journal diameter in this manual.	
Crankshaft Journal and Bearing Clearance	mm (in)		
No. 4 Bearing		0.093 - 0.124 (0.00366 - 0.00488)	0.14 (0.0055)
Other Bearings		0.063 - 0.094 (0.00248 - 0.00370)	0.14 (0.0055)
Crankshaft Journal and Crankpin Uneven Wear	mm (in)		0.05 (0.0020)
Piston and Piston Ring			
Piston Grade		No	
Cylinder Liner and Piston Clearance	mm (in)	0.122 - 0.156 (0.0048 - 0.0061)	—
Piston Ring and Piston Ring Groove Clearance	mm (in)		
1st Compression Ring		0.057 - 0.097 (0.0022 - 0.0038)	0.20 (0.008)
2nd and 3rd Compression Ring		0.085 - 0.120 (0.0033 - 0.0047)	0.15 (0.006)
Oil Ring		0.02 - 0.06 (0.0008 - 0.0024)	0.15 (0.006)

ITEMS		SERVICE STANDARD	SERVICE LIMIT
Piston Ring, Gap	mm (in)		
1st Compression Ring		0.18 - 0.28 (0.0071 - 0.0110)	1.20 (0.047)
2nd and 3rd Compression Ring		0.35 - 0.50 (0.0138 - 0.0197)	1.20 (0.047)
Oil Ring		0.15 - 0.35 (0.0059 - 0.0138)	1.20 (0.047)
Piston Pin			
Piston Pin Diameter	mm (in)	35.995 - 36.000 (1.4171 - 1.4173)	35.95 (1.4154)
Piston Pin Hole Diameter	mm (in)	36.004 - 36.012 (1.4175 - 1.4178)	
Piston Pin and Piston Pin Hole Clearance	mm (in)	0.004 - 0.017 (0.00016 - 0.00067)	
Connecting Rod			
Connecting Rod Alignment	mm (in)	0.05 (0.002) or less	0.20 (0.008)
Connecting Rod Small End Bushing Diameter	mm (in)	36.012 - 36.022 (1.4178 - 1.4182)	
Piston Pin and Connecting Rod Small End Bushing Clearance	mm (in)	0.012 - 0.027 (0.00047 - 0.00106)	0.05 (0.002)
Crankpin and Bearing Clearance	mm (in)	0.037 - 0.076 (0.0015 - 0.0030)	0.10 (0.004)
Connecting Rod Big End and Crankpin Side Face Clearance	mm (in)	0.17 - 0.30 (0.0067 - 0.0118)	0.35 (0.014)
Flywheel			
Flywheel Friction Surface Depth	mm (in)	43.0 (1.69) for 14 in clutch 48.0 (1.89) for 15 in clutch	44.0 (1.73) for 14 in clutch 49.0 (1.93) for 15 in clutch
Flywheel Friction Surface Thickness	mm (in)	41.0 (1.61)	40.0 (1.57)
Flywheel Friction Surface Roughness	mm (in)	Less than 0.05 (0.0020)	
Idler Gear			
Idler Gear Shaft A Outside Diameter	mm (in)	49.950 - 49.975 (1.9665 - 1.9675)	
Idler Gear Shaft B and C Outside Diameter	mm (in)	29.959 - 29.980 (1.1795 - 1.1803)	29.9 (1.1772)
Idler Gear Shaft A and Idle Gear Clearance	mm (in)	0.025 - 0.075 (0.00098 - 0.00295)	
Idler Gear Shaft B and C and Idle Gear Clearance	mm (in)	0.020 - 0.062 (0.0008 - 0.0024)	0.20 (0.008)

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