SERVICE MANUAL
6HK1 ISUZU
ENGINES

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Case

Cre 9-36560GB

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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.

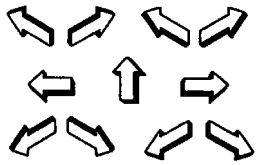
8. If necessary, use sealing compound on gaskets to prevent leakage.

9. Nut and bolt torque specifications should be carefully followed.

10. Always release the air pressure from any machine-mounted air tank(s) before dismounting the engine or disconnecting pipes and hoses. To not do so is extremely dangerous.

11. Always check and recheck you work. No service operation is complete until you have done this.

ILLUSTRATION ARROWS



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Front of engine

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View detail

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Ambient/clean air flow
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Gas other than ambient air
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Ambient air mixed with another gas
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Direction

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Lubrication point (oil or fluid)

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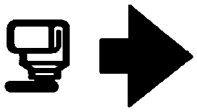
Lubrication point (grease)



CS01N618

Lubrication point (jelly)

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, overheat camshaft direct injection
Combustion chamber			Open type in piston crown
Cylinder liner			Dry
Timing drive system			Gear drive
No. of cylinders - bore x stroke		mm (in)	6 - 115 x 125 (4.53 x 4.92)
No. of piston rings			Four rings (Compression rings: 3, Oil ring: 1)
Total piston displacement		L (cid)	7.790 (475.4)
Compression ration (to 1)			17.3
Compression pressure at 200 min^{-1}		MPa (kg/cm^2/psi)	3.24 (33/469) or more
Engine dimensions*		mm (in)	1,332 x 995 x 1,143 (52.4 x 39.2 x 45.0)
Engine weight (Dry)*		kg (lb)	650 (1,433)
Fuel injection order			1 - 5 - 3 - 6 - 2 - 4
Fuel injection timing (TDC)		deg	9
Specified fuel type			SAE No. 2 diesel fuel
Idling speed*		min^{-1}	1000
Valve clearances	Intake	mm (in)	0.40 (0.016)
	Exhaust	mm (in)	0.40 (0.016)
Intake valves	Open at (BTDC)	deg	15
	Close at (ABDC)	deg	44
Exhaust valves	Open at (BBDC)	deg	58
	Close at (ATDC)	deg	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

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

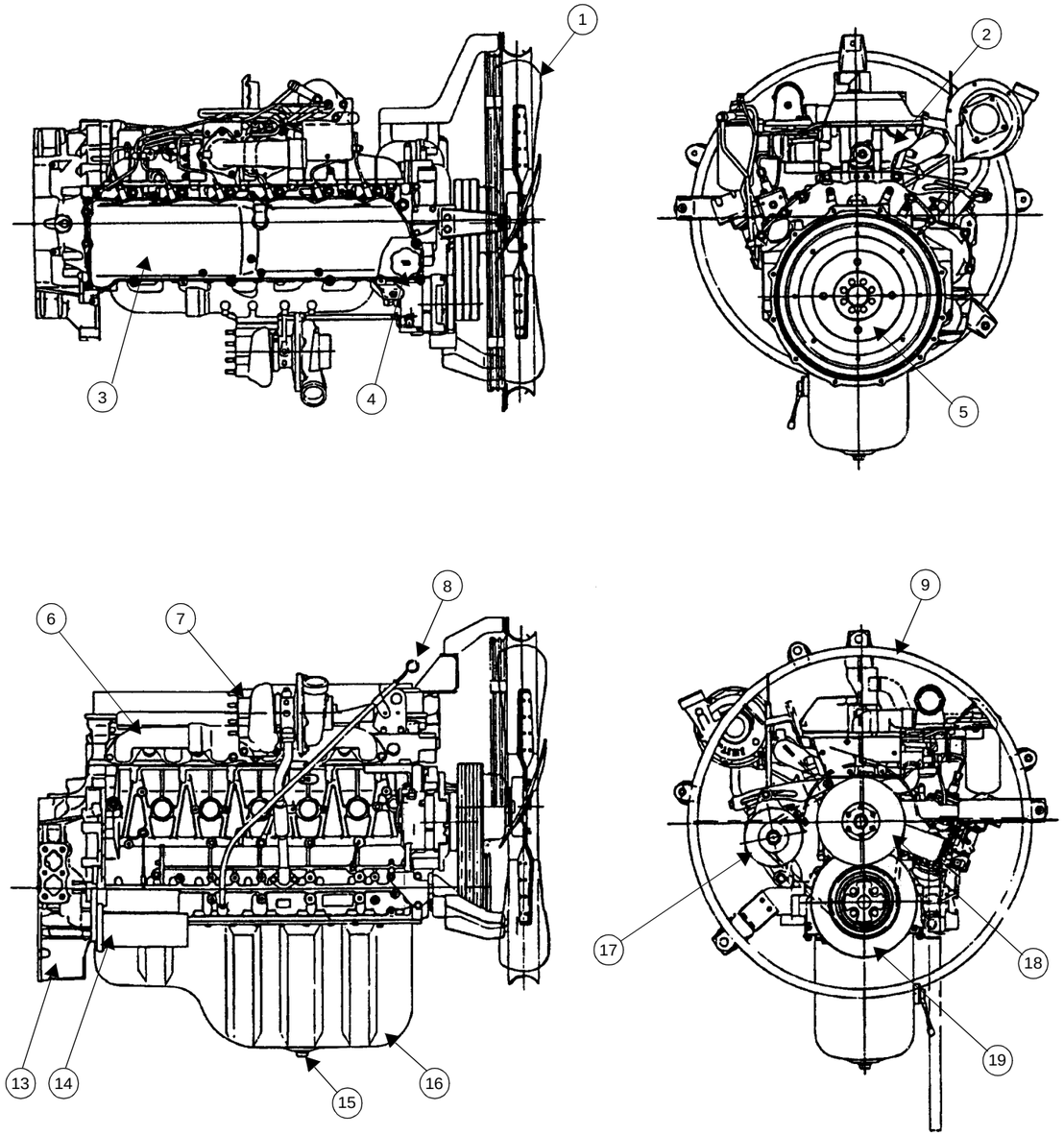
ITEMS		SERVICE STANDARD	SERVICE LIMIT
Cylinder Head			
Lower Face Warpage	mm (in)	0.05 (0.002) or less	0.20 (0.008) Do not regrind the lower face.
Valve Guide			
Valve Stem Clearance			
Intake	mm (in)	0.04 - 0.06 (0.0016 - 0.0024)	0.20 (0.008)
Exhaust	mm (in)	0.06 - 0.10 (0.0024 - 0.0039)	0.25 (0.010)
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)	

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 Gloove 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)

ITEMS		SERVICE STANDARD	SERVICE LIMIT
Idler Gear Backlash	mm (in)	0.10 - 0.17 (0.0039 - 0.0067)	0.30 (0.012)
Idler Gear End Play			
Gear A and B	mm (in)	0.08 - 0.140 (0.00315 - 0.0052)	0.20 (0.008)
Gear C	mm (in)	0.09 - 0.144 (0.00354 - 0.00567)	0.20 (0.008)
Oil Pump			
Gear Teeth and Cover Inner Wall Clearance	mm (in)	0.125 - 0.221 (0.0049 - 0.0087)	
Gear and Body Clearance	mm (in)	0.064 - 0.109 (0.0025 - 0.0043)	
Gear Shaft Outside Diameter	mm (in)	15.989 - 16.000 (0.6295 - 0.6299)	15.9 (0.626)
Gear Shaft and Pump Body or Bushing Clearance	mm (in)	0.04 - 0.07 (0.0016 - 0.0028)	
Drive Gear and Drive Gear Shaft Interference	mm (in)	0.015 - 0.044 (0.0006 - 0.0017)	
Cylinder Block			
Cylinder Block Upper Face Warpage	mm (in)	0.05 - (0.002) or less	0.20 (0.008)
Cylinder Liner Projection	mm (in)	0.06 - 0.10 (0.0024 - 0.0039)	-
Cylinder Block Bore and Cylinder Liner Outside Diameter Clearance	mm (in)	0.011 - 0.029 (0.0004 - 0.0011)	-
Cylinder Liner Grade (Reference)		See Section 6A (Cylinder liner grade selection & Clearance) in this manual.	

ENGINE EXTERNAL VIEW DRAWING



1. Cooling fan
2. Cylinder head
3. Cylinder head cover
4. Oil filler cup
5. Flywheel
6. Exhaust manifold
7. Turbocharger
8. Dipstick
9. Fan guide
10. Fuel filter
11. Inlet pipe
12. Intake duct
13. Flywheel housing
14. Starter motor
15. Oil drain plug
16. Oil pan
17. Alternator
18. Water pump
19. Crank pulley
20. Injection pump
21. Oil level sensor
22. Oil port cover

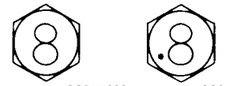
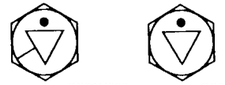
CS01N619

TIGHTENING TORQUE SPECIFICATIONS

The tightening torque values given in the table below are applicable to the bolts unless otherwise specified.

STANDARD BOLT

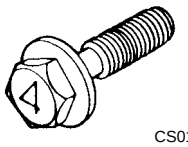
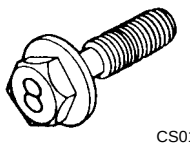
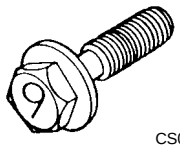
Nm (kgf.m/lb.ft)

Bolt Identification / Bolt Diameter x Pitch (mm)	 CS01N620	 CS01N622 CS01N624	 CS01N626
	 CS01N621	 CS01N623 CS01N625	 CS01N627
M6 x 1.0	4 - 8 (0.4 - 0.8/3 - 6)	5 - 10 (0.5 - 1.0/4 - 7)	–
M8 x 1.25	8 - 18 (0.8 - 1.8/6 - 13)	12 - 23 (1.2 - 2.3/9 - 17)	17 - 30 (1.7 - 3.1/12 - 22)
M10 x 1.25	21 - 34 (2.1 - 3.5/5 - 25)	28 - 46 (2.8 - 4.7/20 - 33)	37 - 62 (3.8 - 6.4/28 - 46)
***M10 x 1.5**	20 - 33 (2.0 - 3.4/15 - 25)	28 - 45 (2.8 - 4.6/20 - 33)	36 - 60 (3.7 - 6.1/27 - 44)
M12 x 1.25	49 - 74 (5.0 - 7.5/36 - 54)	61 - 91 (6.2 - 9.3/45 - 67)	76 - 114 (7.7 - 11.6/56 - 84)
***M12 x 1.75**	45 - 69 (4.6 - 7.0/33 - 51)	57 - 84 (5.8 - 8.6/42 - 62)	72 - 107 (7.3 - 10.9/53 - 79)
M14 x 1.5	77 - 115 (7.8 - 11.7/56 - 85)	93 - 139 (9.5 - 14.2/69 - 103)	114 - 171 (11.6 - 17.4/84 - 126)
***M14 x 2.0**	72 - 107 (7.3 - 10.9/53 - 79)	88 - 131 (9.0 - 13.4/65 - 97)	107 - 160 (10.9 - 16.3/79 - 118)
M16 x 1.5	104 - 157 (10.6 - 16.0/77 - 116)	135 - 204 (13.8 - 20.8/100 - 150)	160 - 240 (16.3 - 24.5/118 - 177)
***M16 x 2.0**	100 - 149 (10.2 - 15.2/74 - 110)	129 - 194 (13.2 - 19.8/96 - 143)	153 - 230 (15.6 - 23.4/113 - 169)
M18 x 1.5	151 - 226 (15.4 - 23.0/110 - 166)	195 - 293 (19.9 - 29.9/144 - 216)	230 - 345 (23.4 - 35.2/169 - 255)
***M18 x 2.5**	151 - 226 (15.4 - 23.0/110 - 166)	196 - 294 (20.0 - 30.0/145 - 217)	231 - 346 (23.6 - 35.5/171 - 255)
M20 x 1.5	206 - 310 (21.0 - 31.6/152 - 229)	270 - 405 (27.5 - 41.3/199 - 299)	317 - 476 (32.3 - 48.5/234 - 351)
***M20 x 2.5**	190 - 286 (19.4 - 29.2/140 - 211)	249 - 375 (25.4 - 38.2/184 - 276)	293 - 440 (29.9 - 44.9/216 - 325)
M22 x 1.5	251 - 414 (25.6 - 42.2/185 - 305)	363 - 544 (37.0 - 55.5/268 - 401)	425 - 637 (43.3 - 64.9/313 - 469)
***M22 x 2.5**	218 - 328 (22.2 - 23.4/161 - 242)	338 - 507 (34.5 - 51.7/250 - 374)	394 - 592 (40.2 - 60.4/291 - 437)
M24 x 2.0	359 - 540 (36.6 - 55.0/265 - 398)	431 - 711 (43.9 - 72.5/318 - 524)	554 - 831 (56.5 - 84.7/409 - 613)
***M24 x 3.0**	338 - 507 (34.5 - 51.7/250 - 374)	406 - 608 (41.4 - 62.0/299 - 448)	521 - 782 (53.1 - 79.7/384 - 576)

An asterisk (*) indicates that the bolts are used for female threaded parts that are made of soft materials such as casting.

FLANGED HEAD BOLT

Nm (kgf.m/lb.ft)

Bolt Identification / Bolt Diameter x Pitch (mm)	 CS01N628	 CS01N629	 CS01N630
M6 x 1.0	5 - 9 (0.5 - 0.9/4 - 7)	6 - 12 (0.6 - 1.2/4 - 9)	–
M8 x 1.25	11 - 20 (1.1 - 2.0/8 - 15)	15 - 28 (1.6 - 2.9/12 - 21)	18 - 34 (2.1 - 3.4/15 - 25)
M10 x 1.25	23 - 39 (2.4 - 3.9/17 - 28)	35 - 59 (3.6 - 6.1/26 - 44)	42 - 71 (4.3 - 7.2/31 - 52)
***M10 x 1.5**	22 - 37 (2.3 - 3.8/17 - 28)	35 - 58 (3.5 - 5.8/25 - 42)	40 - 67 (4.1 - 6.8/30 - 49)
M12 x 1.25	55 - 82 (5.6 - 8.4/40 - 61)	77 - 117 (7.9 - 11.9/57 - 86)	85 - 128 (8.7 - 13.0/63 - 94)
***M12 x 1.75**	51 - 77 (5.2 - 7.8/38 - 56)	71 - 107 (7.3 - 10.9/53 - 79)	80 - 119 (8.1 - 12.2/59 - 88)
M14 x 1.5	83 - 125 (8.5 - 12.7/62 - 92)	115 - 172 (11.7 - 17.6/85 - 127)	123 - 185 (12.6 - 18.9/91 - 137)
***M14 x 2.0**	77 - 116 (7.9 - 11.8/57 - 85)	108 - 162 (11.1 - 16.6/80 - 120)	116 - 173 (11.8 - 17.7/85 - 128)
M16 x 1.5	116 - 173 (11.8 - 17.7/85 - 128)	171 - 257 (17.4 - 26.2/126 - 190)	177 - 265 (18.0 - 17.1/130 - 196)
***M16 x 2.0**	109 - 164 (11.2 - 16.7/81 - 121)	163 - 244 (16.6 - 24.9/120 - 180)	169 - 253 (17.2 - 25.8/124 - 187)

A bolt with an asterisk (*) is used for female screws that are made of soft materials such as cast iron.

RECOMMENDED THREAD LOCKING AGENTS

LOCTITE Type	LOCTITE Color
LOCTITE 242	Blue
LOCTITE 262	Red
LOCTITE 271	Red

Application Steps

1. Completely remove all lubricant and moisture from the bolts and the female-threaded surfaces of the parts to be joined.

   The surfaces must be perfectly dry.

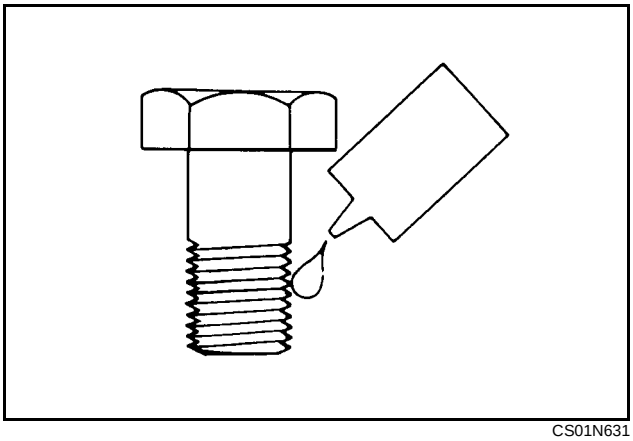
2. Apply Loctite to at least 1/3 of the bolt's treaded area.

3. Tighten the bolts to the specified torque.

   After tightening, be sure to keep the bolts free from vibration and torque for at least an hour until the LOCTITE hardens.

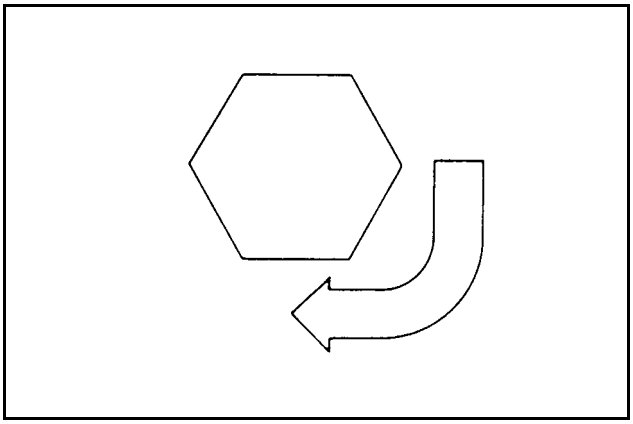
NOTE: When the application procedures are specified in this manual, follow them.

ANGULAR NUT AND BOLT TIGHTENING METHOD



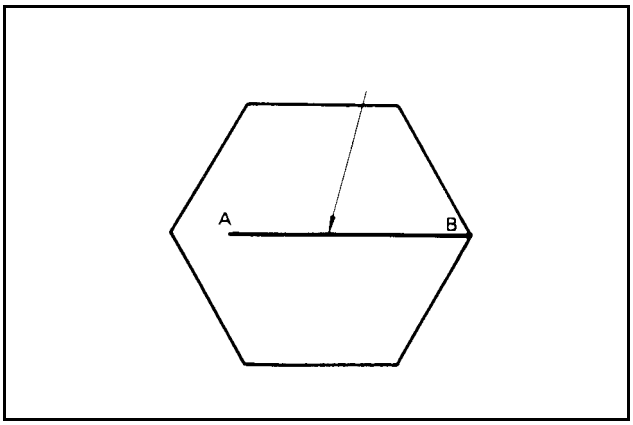
CS01N631

1. Carefully wash the nuts and bolts and to remove all oil and grease.
2. Apply a coat of molybdenum disulfide grease to the threads and setting faces of the nuts and bolts.



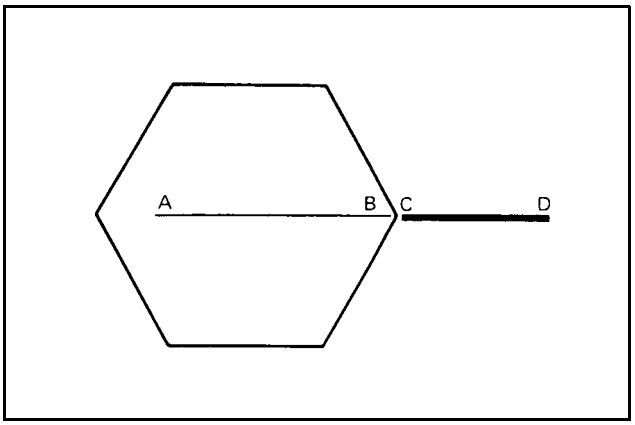
CS01N632

3. Tighten the nuts and bolts to the specified (snug torque) with a torque wrench.



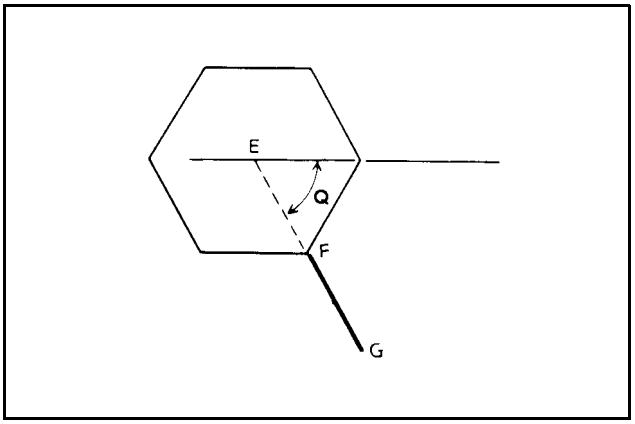
CS01N633

4. Draw a line (A-B) across the center of each bolt.



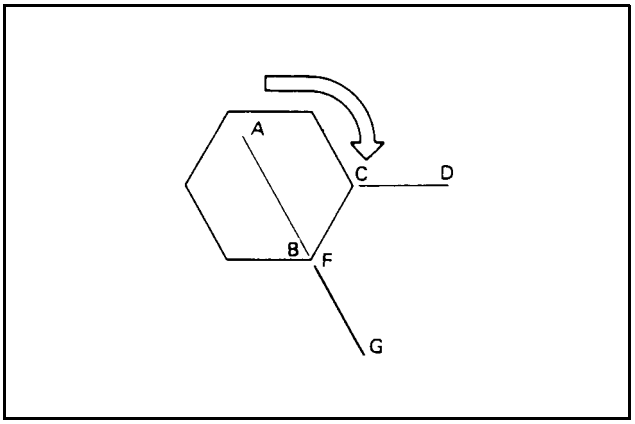
CS01N634

5. Draw another line (C-D) on the face of each of the parts to be clamped. This line should be an extension of the line (A-B).



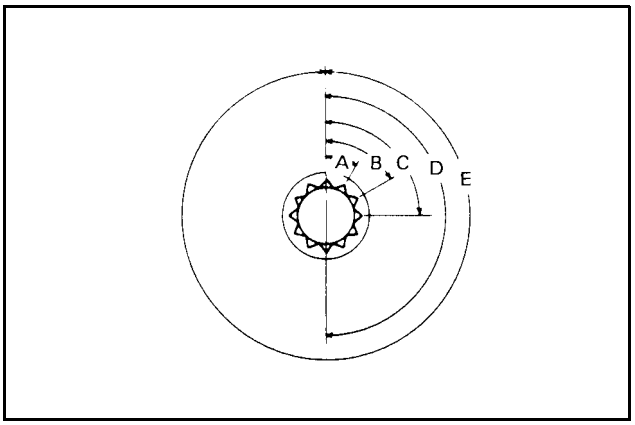
CS01N635

6. Draw another line (F-G) on the face of each of the parts to be clamped. This line will be in the direction of the specified angle (Q) across the center (E) of the nut or bolt.



CS01N636

7. Use a socket wrench to tighten each nut or bolt to the point where the line (A-B) is aligned with the line (F-G).



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Example: Specified Angle and tightening Rotation

A	**30°**	1/12 of a turn
B	**60°**	1/6 of a turn
C	**90°**	1/4 of a turn
D	**180°**	1/2 of a turn
E	**360°**	One full turn

MAJOR COMPONENT MOUNTING NUTS AND BOLTS

LUBRICANT APPLICATION

Name of Lubricant	Lubrication area
Engine Oil	Turbocharger bearings
	Cylinder head bolts (M10 bolt)
	Rocker arm rollers
	Camshaft cam nose and journal
	Camshaft fixing bolts and stud bolts
	Valve ends
	Oil seal lips
	Idle gear shaft & fixing bolts
	Cylinder liner bores
	Connecting rod bearing sliding surfaces
	Crank bearing sliding surfaces
	Thrust bearings
	Piston rings
Molybdenum disulfide grease	Cylinder head bolts
	Crankcase fixing bolts
	Flywheel bolts
	Connecting rod bolts
	Piston skirts

SEALANT APPLICATION

	Location		Name of sealant
	Name of part	Name of mating part	
1	Rubber plug	Cylinder head & cover	ThreeBond No. 1207B
2	Oil cooler	Cylinder block	ThreeBond No. 1207C or No. 1216C
3	Crankcase	Cylinder block	
4	Cylinder block	Flywheel housing	
5	Cylinder block	Front cover	
6	Water pump	Front cover	
7	Oil pump	Cylinder block	ThreeBond No. 1207C or TB1141E