



# Service Manual

**K21, K25 Gasoline Engine**

**K21**

**K25**

## FOREWORD

This service manual covers K21 and K25 Gasoline Engine of Mitsubishi Forklift Trucks and gives detailed maintenance and repair information. The instructions are grouped by systems to be a convenient reference.

Long productive life of your forklift trucks depends to a great extent on correct servicing – the servicing consistent with what you will learn from this service manual. Read the respective sections of this manual carefully and become familiar with all the truck components before attempting any work.

All descriptions, illustrations, specifications, and serial numbers in this manual are effective as of the printed date of this manual. Mitsubishi reserves the right to change specifications or designs without notice and without incurring obligations.

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GI

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# GENERAL INFORMATION

## SECTION **GI**

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# HOW TO USE THIS MANUAL

## Description

This manual explains how to use “removal, installation, disassembly, assembly, inspection and adjustment” and “diagnosis.”

## Definition of Terms

**WARNING:** Instructions and precautions that may lead to fatal hazards and/or serious injuries if not observed properly.

**CAUTION:** Instructions and precautions that require special attention and may lead to problems and/or accidents as well as damages to the vehicle and/or components.

**NOTE:** Provides additional information that facilitates operation.

**Standard:** Indicates tolerances for inspection and adjustment.

**Repair limit:** Indicates maximum or minimum values allowed for inspection and adjustment.

## Definition of Units

The units and numerical values in this Standard are SI units, and those given in ( ) in this Standard are based on the conventional unit system and are appended for informative reference.

Example: Tightening torque 59 - 78 N·m (6.0 - 8.0 kgf·m)

SI (Metric system)

## Main unit changes

Measure	SI	Conventional unit	Conversion factor to SI
Acceleration	m/s <sup>2</sup>	G	9.80665
Torque, moment	N·m	kgf·m	9.80665
Force	N	kgf	9.80665
Pressure	MPa	kgf/cm <sup>2</sup>	0.0980665
	kPa	mmHg	0.133322
Power efficiency	kW	PS	0.735499
	W	kcal/h	1.16279
Volume	cm <sup>3</sup>	cc	1
Spring constant	N/mm	kgf/mm	9.80665
Fuel consumption	*g/kW·h	g/PS·h	1.3596

\* The conventional unit can be used for SI.

## Description

**Caution:** At the beginning of each section, the precautions exclusive to the section are described.

**Preparation:** At the beginning of each section and during the trouble diagnosis items, the Special Tools (STs), gauges, and other tools to be prepared before operation are described. Some commercial service tools, assumed to be available in any workshop, are omitted.

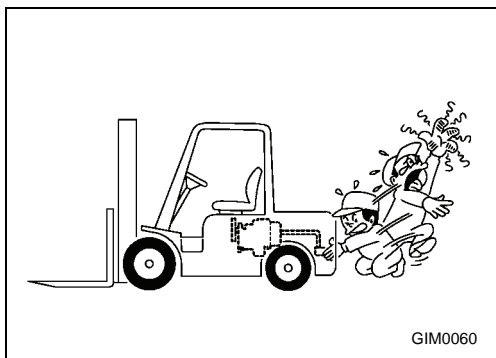
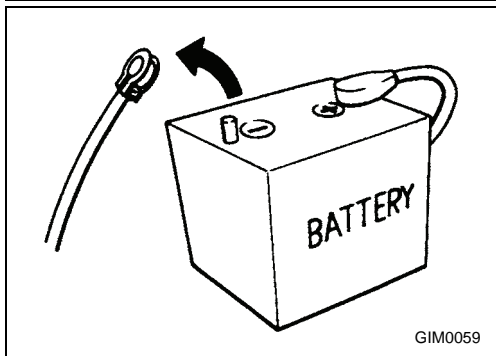
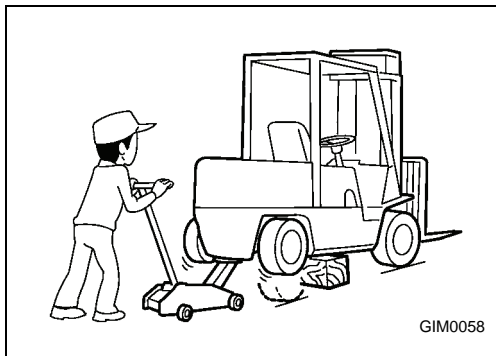
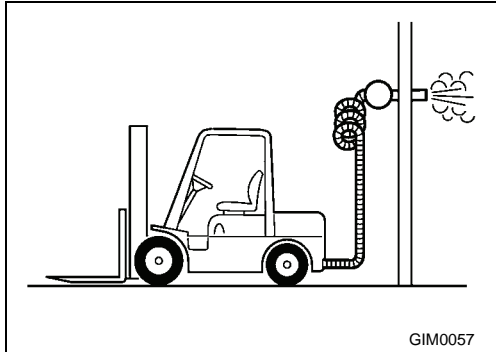
**Description:** To perform correct operations, operational procedures, notes, STs, and other service information are described.

**CAUTION:** Descriptions of visual inspections and cleaning of removed parts are generally omitted. Please remember that actual operations require these processes.

# PRECAUTIONS FOR SAFETY AND QUALITY

- The following precautions must be carefully observed for safe and appropriate service work.
- Only qualified and designated personnel must perform inspections, repairs and adjustments.
- Always keep the workplace clean, and store tools neatly in specified places.

## Safe Operation



- Do not run engines inside the workshop without proper ventilation (ex. no ventilation ducts).
- Keep the workshop well ventilated and free of any flammable materials. Special care should be taken when flammable or poisonous materials such as gasoline are handled.
- Discard waste oil after oil changes or parts treatment in accordance with local laws and regulations.
- Be careful of burns and injury when working on high-temperature parts, rotating parts, or sliding portions.
- When working in a pit or enclosed area, ensure that adequate ventilation is provided for discharging any hazardous emissions.
- Do not work underneath a vehicle supported only by a jack. Always use rectangular wood blocks at the prescribed points to support the vehicle.
- Support it at the prescribed points and lock it in position with safety devices before lifting the vehicle.
- When removing a heavy component such as the engine and vehicle side, be careful the vehicle body does not become off-balance and fall.
- Do not smoke during service work.
- Do not wear any rings and necklaces when working. These objects may cause electric short.
- Before starting repair work that requires no battery power, always turn OFF the ignition switch, and disconnect the negative battery cable.
- Do not touch any metal portions immediately after the engine is stopped. Otherwise the heated metals may cause burns. Do not attempt to remove any cooling system parts such as the radiator cap while the engine is hot.
- To perform repair work safely and efficiently, always use appropriate commercial service tools and specified STs wherever required.

## Correct Operation

- Make sure that you understand the symptoms before starting trouble diagnosis.
- Check correct installation status prior to removal or disassembly. Make sure that they do not interfere with the function of the parts they are applied to if matching marks are required.
- Once they are removed, always replace parts indicated as “do not reuse” with new ones. This includes: oil seals, gaskets, packings, O-rings, lock washers, cotter pins, and self-locking nuts.
- Replace inner and outer races of tapered or needle roller bearings as a set.
- Arrange disassembled parts in order and prevent them from being mixed-up.
- Clean or flush disassembled parts prior to inspection or assembly.
- Use Genuine MITSUBISHI parts for replacement.
- Use authorized grease and sealer.
- Release the pressure before disconnecting pressurized piping or hoses.
- Be sure to check for leakage after repairing fuel, oil, coolant, exhaust, or vacuum systems.

## Precautions for Radio Equipment Installation

Check the following when installing a commercial/ham radio or mobile phone. If mounting position is not chosen carefully, the unit may interfere with the electric control system.

- Separate the antenna as far from the Engine Control System as possible.
- Route an antenna feeder line at least 20 cm apart from the control unit harness.
- Adjust antenna and feeder line to eliminate radio wave interference.

# PRECAUTIONS

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## Precautions in Draining Engine Coolant

- Drain coolant only after the engine has cooled down.

## Precautions for Disconnecting Fuel Piping

- Operation should be done in a place free from fire.
- Release fuel pressure before operation. (Electric controlled specifications): Refer to “Release of Fuel Pressure” in EC section.
- After disconnecting, plug the pipe to prevent fuel from draining.

## Precautions for Removing and Disassembling

- Use correct STs in the specified position. Always pay attention to safety.
- Be careful not to lose surface accuracy of mating or sliding surfaces.
- To prevent foreign material from entering the engine, close openings with appropriate tape as necessary.
- Arrange disassembled parts in their normal positions in order to simplify locating the cause of damage or excessive wear and to ensure correct reassembly.
- As a rule, nuts and bolts must be untightened in a diagonal manner starting from an outer one. If a particular untightening sequence is provided separately, follow the sequence.

## Precautions for Inspection, Correction, and Replacement

- Following the inspection procedure, inspect the parts adequately and repair or replace as necessary. Perform the same inspections even for new parts and replace them if necessary.

## Precautions for Assembly and Installation

- Always use a torque wrench when tightening bolts and nuts.
- Unless otherwise specified, tighten nuts and bolts from inside to outside in a crisscross pattern. Tighten them gradually and evenly in 2 to 3 steps.
- Always replace gasket, packing, oil seals, and O-rings with new ones.
- For each part, perform adequate cleaning/washing and drying with a dryer. In particular, ensure that the oil and coolant passages are free from plugging and clogging.
- Remove any dirt and lint on sliding and mating surfaces. Before assembly, apply ample amount of engine oil to sliding surfaces.
- If coolant was drained, bleed air from the system.
- After assembly, start engine and increase the engine speed, then check coolant, fuel, oil, grease, and exhaust gas for leakage.



# PRECAUTIONS

## Parts Requiring Angle Tightening

- When tightening the following parts, use an angle wrench (ST).
- Cylinder head bolt  
Before assembly, verify that no grease/oil and dust are present on the cylinder head, cylinder block mounting face, and head gasket. Then apply antirust oil or engine oil to the threads and head bottoms of the head bolts.

## Caution with Use of Power Tools

- The use of power tools such as pneumatic air tools is only allowed for disassembly. Do not use them for assembly.

## Precautions for Liquid Gasket Application

### REMOVING PARTS ATTACHED WITH LIQUID GASKET

- Remove mounting nuts and bolts. Remove liquid gasket using a seal cutter (ST).

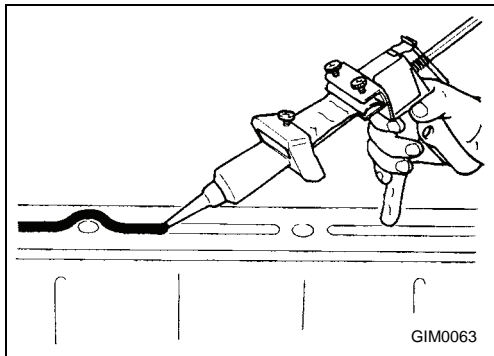
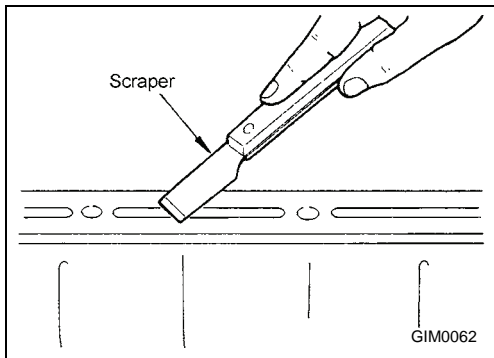
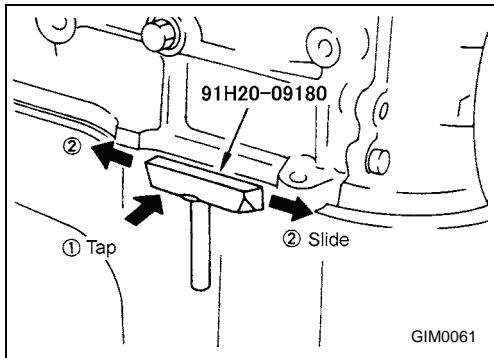
#### CAUTION:

**Be careful not to damage the mating surfaces.**

- In positions where a seal cutter is difficult to use, lightly tap with a plastic hammer, and remove.

#### CAUTION:

**Be careful not to scratch the mating surfaces when using a screwdriver.**



### LIQUID GASKET APPLICATION INSTRUCTION

1. Remove any old liquid gasket remaining on the gasket application surface and its mating surface using a scraper.
  - Remove any old liquid gasket remaining in the gasket application groove and on the threads of bolts and bolt holes.
2. Wipe the gasket application surface and its mating surface using Isozole or any equivalent thinner to remove any moisture, oil, and foreign material.
3. Set genuine liquid gasket to tube presser (commercial service tool).
4. Apply a continuous bead of liquid gasket to the specified position at the specified diameter.
  - Apply liquid gasket in the application groove.
  - Apply liquid gasket inside bolt holes as a rule. Make sure to carefully read the relevant instructions.
  - Attaching should be done within 5 minutes after gasket application.
  - Immediately wipe off any protruding liquid gasket.
  - Do not retighten nuts and bolts after installation.
  - After finishing work, wait at least 30 minutes before refilling engine oil and coolant.

#### CAUTION:

**Follow any directions specified in the text on the following pages.**

# TIGHTENING TORQUE

## Standard Bolt Tightening Torque

Upper: Lubricated (Antirust oil is applied to abrasive faces of threads and seating faces)

Lower: No lubrication (Threads and seating faces are completely degreased)

	Thread size		Unit	4T (Bolt)	7T (Bolt)	9T (Bolt)
	Diameter	Pitch				
Hexagon head bolt and nut	M6	1	N·m	3.82 - 4.41	6.37 - 7.45	9.22 - 10.8
			(kgf·m)	(0.39 - 0.45)	(0.65 - 0.76)	(0.94 - 1.1)
			N·m	5.00 - 6.47	8.43 - 10.8	11.8 - 15.7
			(kgf·m)	(0.51 - 0.66)	(0.86 - 1.1)	(1.2 - 1.6)
	M8	1.25	N·m	9.32 - 10.8	15.7 - 17.7	22.6 - 25.5
			(kgf·m)	(0.95 - 1.1)	(1.6 - 1.8)	(2.3 - 2.6)
			N·m	12.7 - 15.7	20.6 - 26.5	29.4 - 37.3
			(kgf·m)	(1.3 - 1.6)	(2.1 - 2.7)	(3.0 - 3.8)
	M10	1.25	N·m	19.6 - 22.6	32.4 - 38.2	47.1 - 53.9
			(kgf·m)	(2.0 - 2.3)	(3.3 - 3.9)	(4.8 - 5.5)
			N·m	25.5 - 33.3	43.1 - 54.9	61.8 - 78.5
			(kgf·m)	(2.6 - 3.4)	(4.4 - 5.6)	(6.3 - 8.0)
1.5		N·m	18.6 - 21.6	30.4 - 36.3	44.1 - 52	
		(kgf·m)	(1.9 - 2.2)	(3.1 - 3.7)	(4.5 - 5.3)	
		N·m	24.5 - 31.4	41.2 - 52	58.8 - 74.5	
		(kgf·m)	(2.5 - 3.2)	(4.2 - 5.3)	(6.0 - 7.6)	
Flanged bolt	M6	1	N·m	4.9 - 5.69	8.14 - 9.51	11.8 - 13.7
			(kgf·m)	(0.5 - 0.58)	(0.83 - 0.97)	(1.2 - 1.4)
			N·m	5.98 - 7.65	9.81 - 12.7	14.7 - 18.6
			(kgf·m)	(0.61 - 0.78)	(1.0 - 1.3)	(1.5 - 1.9)
	M8	1.25	N·m	11.8 - 13.7	19.6 - 23.5	28.4 - 33.3
			(kgf·m)	(1.2 - 1.4)	(2.0 - 2.4)	(2.9 - 3.4)
			N·m	14.7 - 18.6	24.5 - 31.4	35.3 - 45.1
			(kgf·m)	(1.5 - 1.9)	(2.5 - 3.2)	(3.6 - 4.6)
	M10	1.25	N·m	24.5 - 29.4	41.2 - 48.1	59.8 - 69.6
			(kgf·m)	(2.5 - 3.0)	(4.2 - 4.9)	(6.1 - 7.1)
			N·m	30.4 - 39.2	51.0 - 64.7	73.6 - 93.2
			(kgf·m)	(3.1 - 4.0)	(5.2 - 6.6)	(7.5 - 9.5)
1.5		N·m	23.5 - 27.5	39.2 - 46.1	56.9 - 65.7	
		(kgf·m)	(2.4 - 2.8)	(4.0 - 4.7)	(5.8 - 6.7)	
		N·m	29.4 - 37.3	49.0 - 61.8	69.6 - 89.2	
		(kgf·m)	(3.0 - 3.8)	(5.0 - 6.3)	(7.1 - 9.1)	

### CAUTION:

- Except special nuts and bolts.
- The bolts applicable to this table have one of the following marks embossed on their heads.

4T.....4

7T.....7

9T.....9

# TIGHTENING TORQUE

## Standard Bolt Tightening Torque (Cont'd)

### TAPER SCREW TIGHTENING TORQUE

Allowable materials for tightening	Unit	Aluminum		Cast iron	
		Standard	Max. value	Standard	Max. value
Normal size					
R1/8	N-m	7.8	11.8	15.7	21.6
	kg-m	0.796	1.2	1.6	2.2
	ft-lb, in-lb*	69*	9	12	16
R1/4	N-m	19.6	29.4	34.3	44.1
	kg-m	2.0	3.0	3.5	4.5
	ft-lb	14	22	25	33
R3/8	N-m	39.2	54.9	53.9	73.5
	kg-m	4.0	5.6	5.5	7.5
	ft-lb	29	41	40	33

## Engine Part Tightening Torque

### TIGHTENING TORQUE AT VARIOUS POINTS OF ENGINE

Tightening point	Unit	Standard	Max. value
Cylinder head (lubricated)	Separately given		
Main bearing cap (lubricated)	Separately given		
Crankshaft pulley bolt	N-m	220.5	240.1
	kg-m	22.5	24.5
	ft-lb	163	177
Flywheel bolt (lubricated)	N-m	132	142
	kg-m	13.47	14.49
	ft-lb	94.4	104.8
Connecting rod nut (lubricated)	N-m	31.4	37.3
	kg-m	3.2	3.81
	ft-lb	23	27.6
Rear plate bolt	N-m	44.1	58.8
	kg-m	4.5	6.0
	ft-lb	33	43
Camshaft sprocket bolt	N-m	39.2	49
	kg-m	4.0	5.0
	ft-lb	29	36
Oil filter stud	N-m	29.4	39.2
	kg-m	3.0	4.0
	ft-lb	22	29
Oil filter element	N-m	14.7	20.6
	kg-m	1.5	2.1
	ft-lb	11	15
Spark plug	N-m	19.6	29.4
	kg-m	2.0	3.0
	ft-lb	14	22
Engine slinger bolt	N-m	22.6	25.5
	kg-m	2.31	2.6
	ft-lb	16.7	19
Rocker cover nut	N-m	14.7	16.7
	kg-m	1.5	1.7
	ft-lb	11	13
Water temperature gauge	N-m	15.7	19.6
	kg-m	1.6	2.0
	ft-lb	12	14
Oil pressure switch	N-m	15.7	21.6
	kg-m	1.6	2.2
	ft-lb	12	16
Exhaust manifold nut	N-m	41.2	48.1
	kg-m	4.2	4.91
	ft-lb	30	35.5
Straight screw plug (For head top face)	N-m	44.1	53.9
	kg-m	4.5	5.5
	ft-lb	33	40
Oil pan drain plug	N-m	29.4	39.2
	kg-m	3.0	4.0
	ft-lb	22	29

# TIGHTENING TORQUE

## Engine Part Tightening Torque (Cont'd)

Tightening point	Unit	Standard	Max. value
Mass air flow sensor mounting screw	N·m	1.27	1.67
	(kgf·m)	0.13	0.17
Fuel tube flare nut	N·m	16.0	23.0
	(kgf·m)	1.63	2.35
Crankshaft position sensor plug bolt	N·m	6.37	7.45
	(kgf·m)	0.65	0.76
Thermo-housing relief plug	N·m	6.37	7.45
	(kgf·m)	0.65	0.76

### CYLINDER HEAD

Tightening torque for general service is 68.6 N·m (7.0 kgf·m) in the place of the tightening torque (5) as shown in the figure.

**Tightening procedure**

③ Step

	Tightening torque (Reference)	N·m (kgf·m)	
①	19.6 - 23.52 (2.0 - 2.3)		Tightening for brake-in
②	68.6 (7.0)		
③	0.0		Return
④	19.6 - 23.52 (2.0 - 2.3)		Retightening
⑤	90° - 92°		

**Assembly sequence**

← Crankshaft pulley side

**Precautions before assembling**

- Do not allow oil or dust to get on cylinder head, mounting surface of cylinder block, and head gasket.
- Apply anticorrosive oil onto head bolt thread and surface under the head.

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### MAIN BEARING CAP

☞ : 83.4 - 93.2 N·m (8.51 - 9.51 kgf·m)

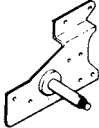
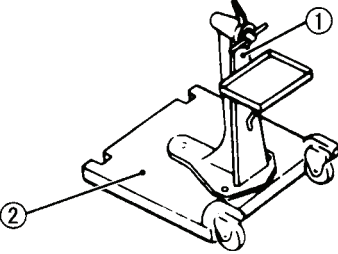
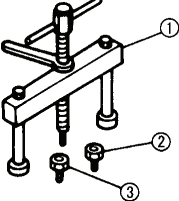
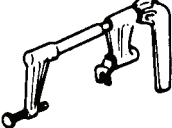
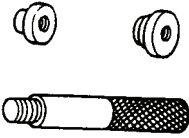

- Apply antirust oil or engine oil to the bolt threads and head bottom.
- Do not use any power tools such as a pneumatic air tool for assembly.

**Assembly sequence**

← Crankshaft pulley side

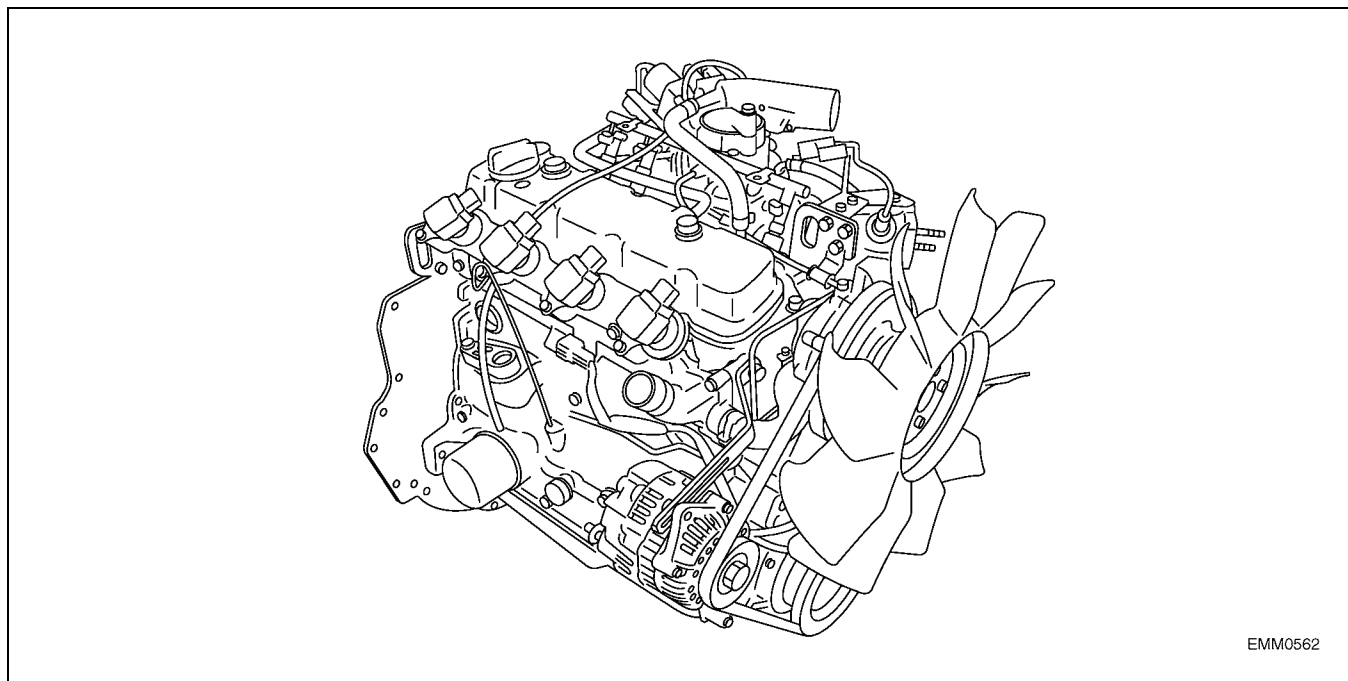
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# SPECIAL SERVICE TOOLS

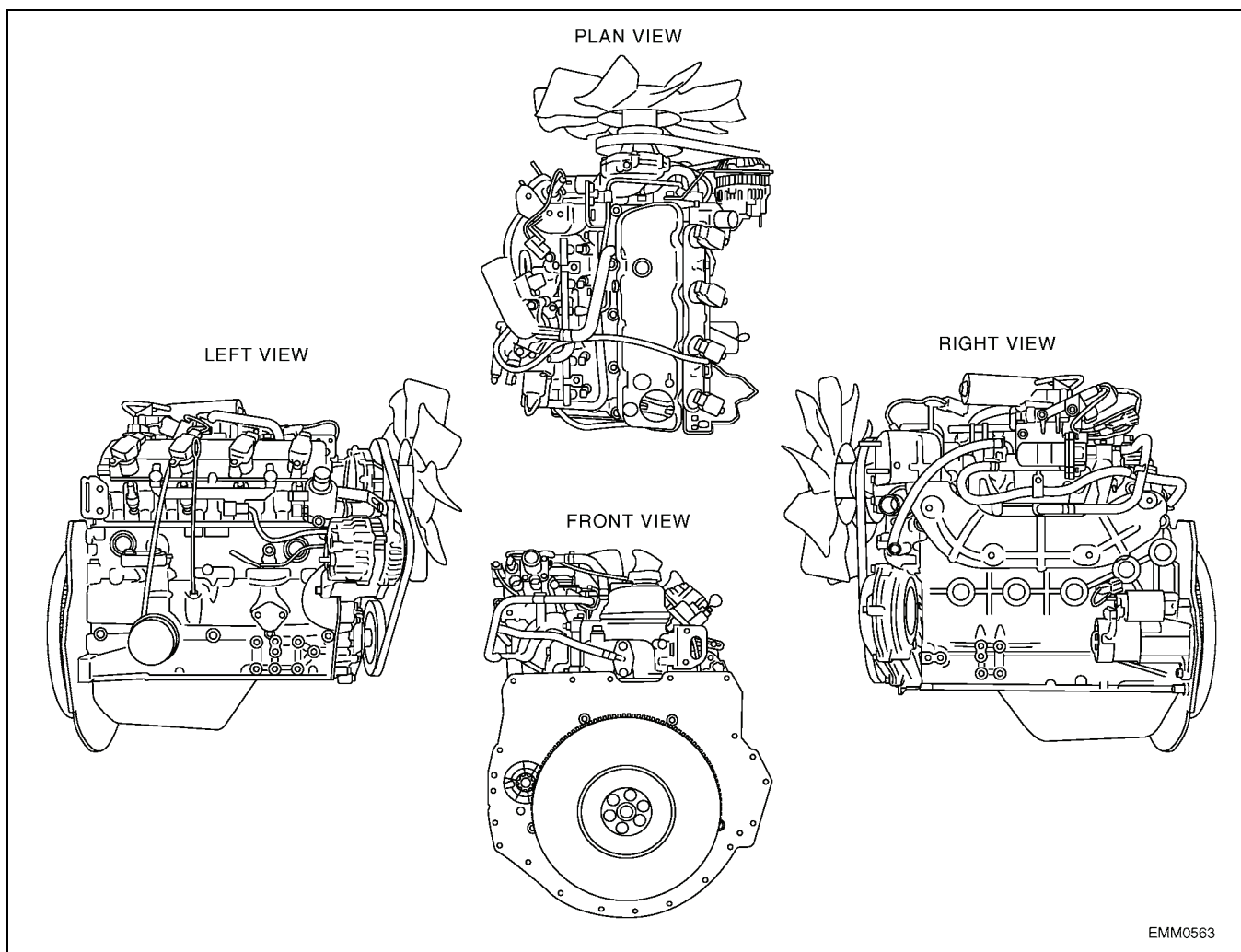
Tool number	Tool name	
91H20-09080	Engine attachment  GIM0066	
91H-20-09090 (1) 91H20-09091 (2) 91H20-09092	Engine stand assembly Engine stand Stand  GIM0067	
91H20-09100 (1) 91H20-09110 (2) 91H20-09111 (3) 91H20-09112	Crankshaft main bearing cap puller Crankshaft main bearing puller Adapter Adapter  GIM0068	
91H20-09120	Valve lifter  GIM0069	
91H20-09150 91H20-09160 91H20-09170	Front oil seal drift Rear oil seal drift Drift rod  GIM0071	
91H20-09020	Heated oxygen sensor wrench  GIM0072	Removing and installing heated oxygen sensor

# ENGINE OUTSIDE DRAWINGS

## ELECTRIC CONTROLLED SPECIFICATION



EMM0562



EMM0563

# MAIN SPECIFICATIONS

Engine type		K21		
Engine control system		Electric controlled specifications		
Fuel specification		Gasoline	LPG	Combined
Total displacement (cc)		2,065		
Shape of combustion chamber		Bathtub		
Valve mechanism		OHV		
Bore x stroke mm (in)		89 x 83 (3.50 x 3.27)		
Compression ratio		8.7		
Compression pressure [kPa (bar, kg/cm <sup>2</sup> , psi)/rpm]		1,450 (14.5, 14.79, 210.3)/250		
Engine speed control system		Engine Control System, electric controlled throttle		
Fuel in use (Note)		Unleaded regular gasoline	At 20P	At 20P
Valve opening/closing timing (degree)	Intake open (ATDC)	4		
	Intake close (ABDC)	40		
	Exhaust open (BBDC)	36		
	Exhaust close (ATDC)	0		
Valve clearance mm (in)	Intake (when engine is hot)	0.38 (0.0150)		
	Exhaust (when engine is hot)	0.38 (0.0150)		
Firing order		1-3-4-2		
Ignition timing (idling)	degree (BTDC°/rpm)	0±2/700		
On board idle speed (rpm)	ATM	700±50		
	MTM	700±50		
PTO system		Silent chain-driven/side PTO		
Engine oil (originally fitted)	Specification	10W-30 (Class SL)		
	Amount l (US qt, Imp qt)	3.8 (4, 3-3/8) (including oil filter)		

Note: Fuel  
 Gasoline: Use unleaded regular gasoline with an octane rating of 91 or more.  
 LPG: Use a fuel of 30P or more in cold seasons. In ambient temperature of -5°C (23°F) or less, use a 100P fuel.

# MAIN SPECIFICATIONS

Engine type		K25		
Engine control system		Electric controlled specifications		
Fuel specification		Gasoline	LPG	Combined
Total displacement (cc)		2,488		
Shape of combustion chamber		Bathtub		
Valve mechanism		OHV		
Bore x stroke mm (in)		89 x 100 (3.50 x 3.94)		
Compression ratio		8.7		
Compression pressure [kPa (bar, kg/cm <sup>2</sup> , psi)/rpm]		1,510 (15.1, 15.4, 219)		
Engine speed control system		Engine Control System, electric controlled throttle		
Fuel in use (Note)		Unleaded regular gasoline	At 20P	At 20P
Valve opening/closing timing (degree)	Intake open (ATDC)	4		
	Intake close (ABDC)	40		
	Exhaust open (BBDC)	36		
	Exhaust close (ATDC)	0		
Valve clearance mm (in)	Intake (when engine is hot)	0.38 (0.0150)		
	Exhaust (when engine is hot)	0.38 (0.0150)		
Firing order		1-3-4-2		
Ignition timing (idling)	degree (BTDC°/rpm)	0±2/700		
On board idle speed (rpm)	ATM	700±50		
	MTM	700±50		
PTO system		Silent chain-driven/side PTO		
Engine oil (originally fitted)	Specification	10W-30 (Class SL)		
	Amount l (US qt, Imp qt)	3.8 (4, 3-3/8) (including oil filter)		

Note: Fuel  
 Gasoline: Use unleaded regular gasoline with an octane rating of 91 or more.  
 LPG: Use a fuel of 30P or more in cold seasons. In ambient temperature of -5°C (23°F) or less, use a 100P fuel.



# MAIN SPECIFICATIONS

## MAIN SPECIFICATIONS OF IGNITION SYSTEM

Engine type		K21			K25		
Engine control system		Electric controls			Electric controls		
Fuel specification		Gasoline	LPG	Combined	Gasoline	LPG	Combined
Ignition device		Non-contact type (Engine Control System)			Non-contact type (Engine Control System)		
Ignition coil (with power transistor)		AIC-4002G			AIC-4002G		
Crankshaft position sensor	Crankshaft position sensor (POS)	A29-640			A29-640		
	Camshaft position sensor (PHASE)	A29-660			A29-660		
Distributor (with ignition coil)		—			—		
Spark plug		NGK type			FR2A-D, FR2B-D		
		Gap (mm)			0.9		

## FUEL SYSTEM AND ENGINE SPEED CONTROL SYSTEM

Engine type		K21			K25		
Engine control system		Electric controls			Electric controls		
Fuel specification		Gasoline	LPG	Combined	Gasoline	LPG	Combined
Fuel device standard type		Electric controlled fuel injection device (Engine Control System)			Electric controlled fuel injection device (Engine Control System)		
Fuel device		Gasoline injector	LPG injector	Gasoline & LPG	Gasoline injector	LPG injector	Gasoline & LPG
Air-fuel ratio control device		Air-fuel ratio feedback control			Air-fuel ratio feedback control		
Starting auxiliary device		Electric throttle control actuator			Electric throttle control actuator		
Idle load control type		Electric throttle control actuator			Electric throttle control actuator		
Engine speed control type		Electric throttle control actuator			Electric throttle control actuator		

## EXHAUST GAS CLEANUP DEVICE LIST

Engine type		K21			K25		
Engine control system		Electric controls			Electric controls		
Fuel specification		Gasoline	LPG	Combined	Gasoline	LPG	Combined
Catalytic device (Reducing HC, CO, Nox)	Type	Three-way catalyst (Monolith)			Three-way catalyst (Monolith)		
	Location	In counter weight with muffler separated			In counter weight with muffler separated		
	Capacity	0.45L			0.45L		
PCV gas recirculation device		Closed type			Closed type		

# STANDARD AND REPAIR LIMIT

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## INSPECTION AND ADJUSTMENT

- Oil capacity H line (L)  
3.5
- Oil capacity L line (L)  
2.5
- (Oil filter capacity) (L)  
0.3
- Fan belt deflection (When pressed by a force of approximately 10 kgf) (mm)  
Standard 11 - 13
- Compression [MPa (kgf/cm<sup>2</sup>)/rpm]  
Standard 1.45 (14.8) / 250 (K21)  
1.51 (15.4) / 250 (K25)  
Limit 1.25 (12.7) / 300 (K21)  
1.31 (13.4) / 300 (K25)
- Difference between each cylinder [MPa (kgf/cm<sup>2</sup>)/rpm]  
Repair limit 0.1 (1.0) / 300
- Spark plug gap (mm)  
Standard 0.8 - 0.9
- Distributor (Full transistor type) air gap (mm)  
Standard 0.35 - 0.45
- Valve clearance (Hot) (mm)  
Standard Intake: 0.38 ± 0.03  
Exhaust: 0.38 ± 0.03
- Thermostat valve opening temperature (STD) (°C)  
Standard 76.5
- Idle speed and ignition timing (BTDC°/rpm)  
Standard 0/700±50

## CYLINDER HEAD

- Cylinder head (mm)  
Material Aluminum alloy  
Distortion limit 0.1

## CYLINDER BLOCK

- Block upper surface (mm)  
Distortion limit 0.1
- Bore diameter dimension (mm)  
Standard 89.00 - 89.05
- Bore diameter wear (mm)  
Repair limit 0.2
- Bore diameter out-of-round (mm)  
Standard 0.02 or less
- Bore diameter taper (mm)  
Standard 0.02 or less
- Bore diameter out-of-round and taper (mm)  
Repair limit 0.1

# STANDARD AND REPAIR LIMIT

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## PISTON

- Piston (mm)
  - Type Thermal flow type
  - Material Aluminum alloy
  - Outer diameter Standard 88.965 - 89.015
- Clearance between piston and cylinder (mm)
  - Standard 0.025 - 0.045 (Selective fit service parts)
- Piston pin outer diameter (mm)
  - Standard 19.993 - 19.998
- Piston pin fitting quality
  - Standard To a degree allowing movement by hand
- Piston ring end clearance (mm)
  - Standard
    - Top 0.28 - 0.43
    - Second 0.45 - 0.60
    - Oil 0.20 - 0.60
    - Various limit values 1.00
- Clearance between piston ring and ring groove (mm)
  - Standard
    - Top 0.045 - 0.080
    - Second 0.030 - 0.070
    - Oil —
  - Repair limit
    - Top 0.10
    - Second 0.10
    - Oil —

## CONNECTING ROD

- Distance between both end hole centers (mm)
  - Standard 143.970 - 144.030 (K25)
  - 152.470 - 152.530 (K21)
- Large end hole diameter (mm)
  - Standard 48.0 - 48.013
- Small end hole diameter (mm)
  - Standard 19.965 - 19.978
- Bend (per 100 mm) (mm)
  - Repair limit 0.05
- Torsion (per 100 mm) (mm)
  - Repair limit 0.05
- Large end thrust clearance
  - Standard 0.2 - 0.3
  - Repair limit 0.40
- Large end oil clearance (mm)
  - Standard 0.030 - 0.066
  - Repair limit 0.10
- Difference of weight (Piston combination) (g)
  - Standard 4 or less

# STANDARD AND REPAIR LIMIT

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## CRANKSHAFT

- Bend (mm)  
Repair limit 0.05
- End play (mm)  
Standard 0.05 - 0.18  
Repair limit 0.20
- Journal dimension (mm)  
Standard 62.942 - 62.955
- Pin standard dimension (mm)  
Standard 44.961 - 44.974
- Journal oil clearance (mm)  
Standard 0.020 - 0.073  
Repair limit 0.10
- Pin oil clearance (mm)  
Standard 0.032 - 0.066

## FLYWHEEL

- Flywheel surface swing (mm)  
Repair limit 0.10
- Ring gear surface swing (mm)  
Repair limit 0.50
- Flatness (mm)  
Repair limit 0.30

## CAMSHAFT

- Bend (mm)  
Repair limit 0.05
- Camshaft height (mm)  
Standard 36.750 - 36.800 (For both intake and exhaust)  
Size reduction limit 36.5
- Journal dimension (mm)  
Standard Front 45.434 - 45.447  
Center 43.897 - 43.910  
Rear 41.218 - 41.231
- End play (mm)  
Standard 0.025 - 0.255  
Repair limit 0.40
- Journal oil clearance (mm)  
Standard Front 0.025 - 0.051  
Center 0.038 - 0.064  
Rear 0.025 - 0.051  
Repair limit Front 0.10  
Center 0.15  
Rear 0.10

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