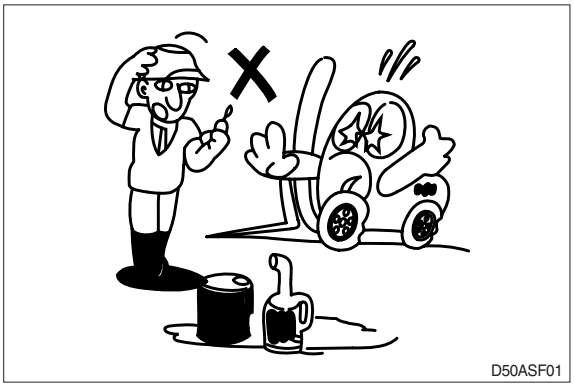
SECTION 1 GENERAL

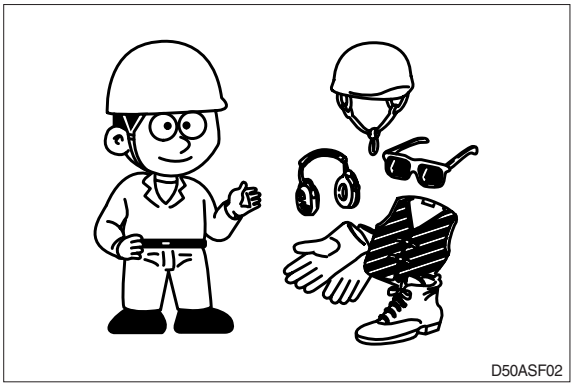
GROUP 1 SAFETY HINTS

Careless performing of the easy work may cause injuries.
Take care to always perform work safely, at least observing the following.

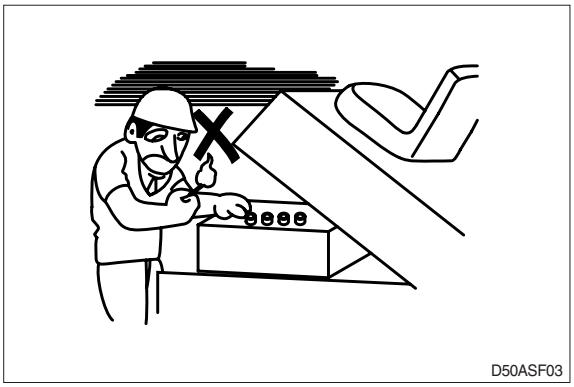
- Oil is a dangerous substance. Never handle oil, grease or oily clothes in places where there is any fire of flame.
  As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire fighting equipment.


D50ASF01

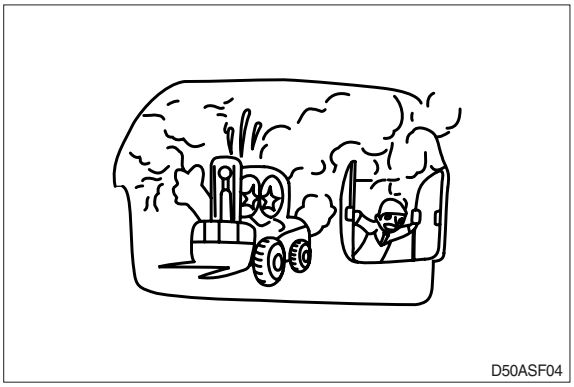
- Wear well-fitting helmet, safety shoes and working clothes. When drilling, grinding or hammering, always wear protective goggles.
  Always do up safety clothes properly so that they do not catch on protruding parts of machines. Do not wear oily clothes.
  When checking, always release battery plug.


D50ASF02

- Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil or electrolyte.

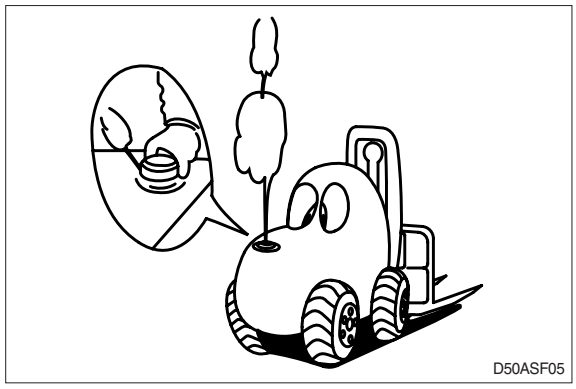

D50ASF03

- Exhaust gas is dangerous. Provide adequate ventilation when working a closed space.

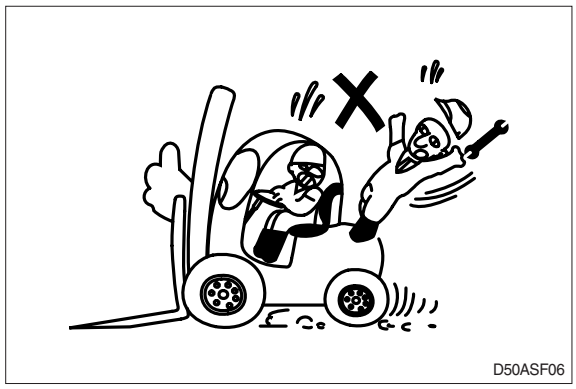

D50ASF04

⚠ Be particularly careful when removing the radiator cap and the hydraulic oil tank filler cap, if this is done immediately after using the machine, there is a danger that boiled oil may spurt out.

· The procedure for releasing the hydraulic pressure is as follows : lower the fork to the ground, and stop the engine (Motor), move the control levers to each position two or three times.

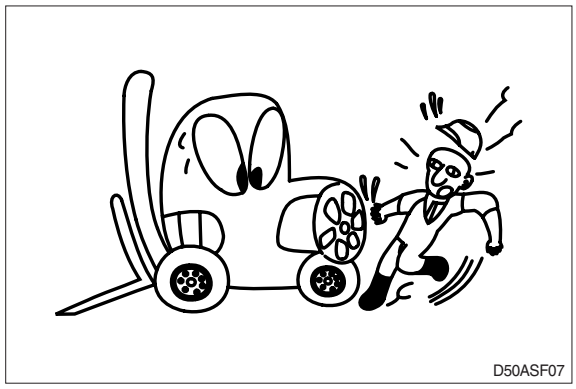

D50ASF05

· When working on top of the machine, be careful not to lose your balance and fall.


D50ASF06

· Hand a caution sign in the operator's compartment (For example **Do not start** or **Maintenance in progress**).
This will prevent anyone from starting or moving the machine by mistake.

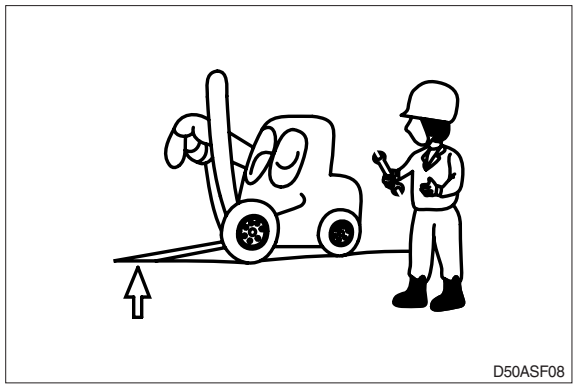
⚠ It is extremely dangerous to try to check the fan belt tension while he engine is running.


D50ASF07

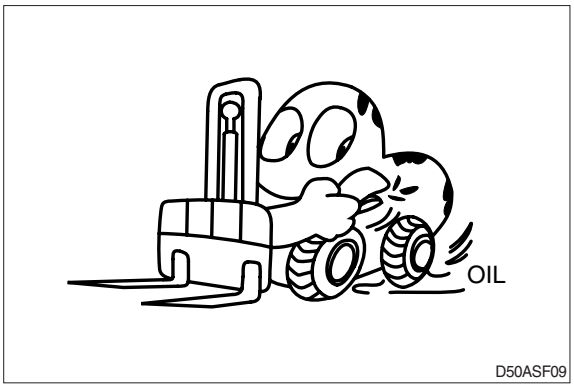
When inspecting the engine is running parts, or near such parts, always stop the engine first.

Before checking or servicing accumulator or piping, depress brake pedal repeatedLy to release pressure.

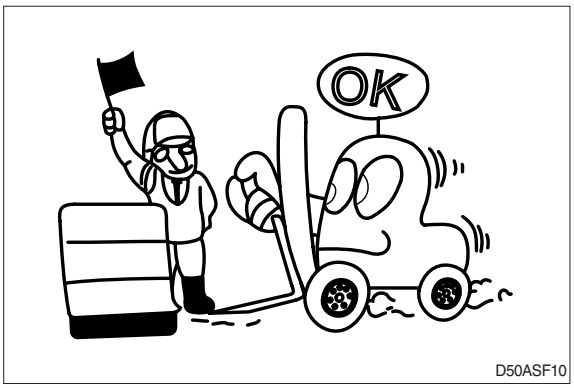
· Park the machine on firm, flat ground.
Lower the fork to the ground and stop the engine.
Return each lever to **NEUTRAL** and apply the brake lock.


D50ASF08

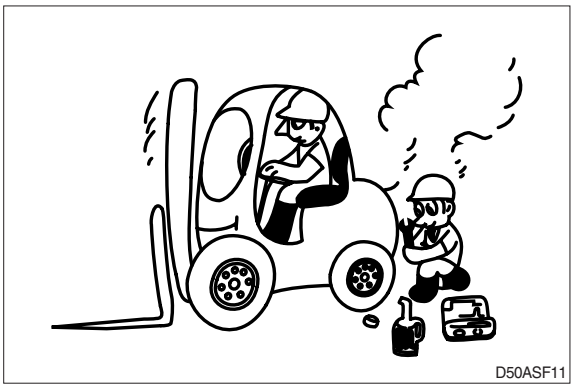
· Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine.



· When working with others, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.



· Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. If maintenance is carried out with the engine running, there must be two men present : one sitting in the operator's seat and the other one performing the maintenance. In such a case, never touch any moving part.



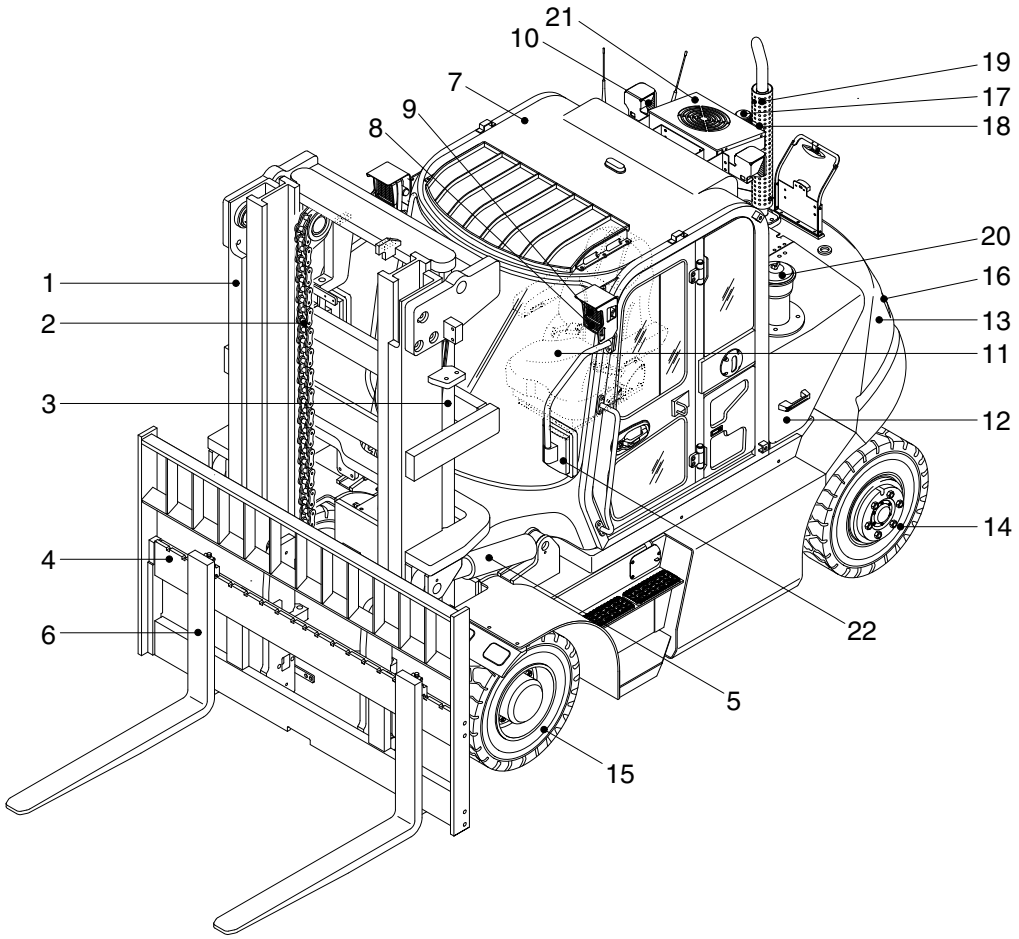
· Always remember that the hydraulic oil circuit is under pressure. When feeding or draining the oil or carrying out inspection and maintenance, release the pressure first.

- Thoroughly clean the machine. In particular, be careful to clean the filler caps, grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.
- Always use HYUNDAI Forklift genuine parts for replacement.
- Always use the grades of grease and oil recommended by HYUNDAI Forklift.
  Choose the viscosity specified for the ambient temperature.
- Always use pure oil or grease, and be sure to use clean containers.
- When checking or changing the oil, do it in a place free of dust, and prevent any dirt from getting into the oil.
- Before draining the oil, warm it up to a temperature of 30 to 40°C.
- After replacing oil, filter element or strainer, bleed the air from circuit.
- When the strainer is located in the oil filler, the strainer must not be removed while adding oil.
- When changing the oil filter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.
- When removing parts containing O-ring, gaskets or seals, clean the mounting surface and replace with new sealing parts.
- After injecting grease, always wipe off the oil grease that was forced out.
- Do not handle electrical equipment while wearing wet places, as this can cause electric shock.
- During maintenance do not allow any unauthorized person to stand near the machine.
- Be sure you fully understand the contents of the operation. It is important to prepare necessary tools and parts and to keep the operating area clean.
- When checking an open gear case there is a risk of dropping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.
- Way to use dipstick
  Push the dipstick fully into the guide, and then pull out.

Carrying out other difficult maintenance work carelessly can cause unexpected accidents. If you consider the maintenance is too difficult, always request the HYUNDAI Forklift distributor to carry out it.

GROUP 2 SPECIFICATIONS

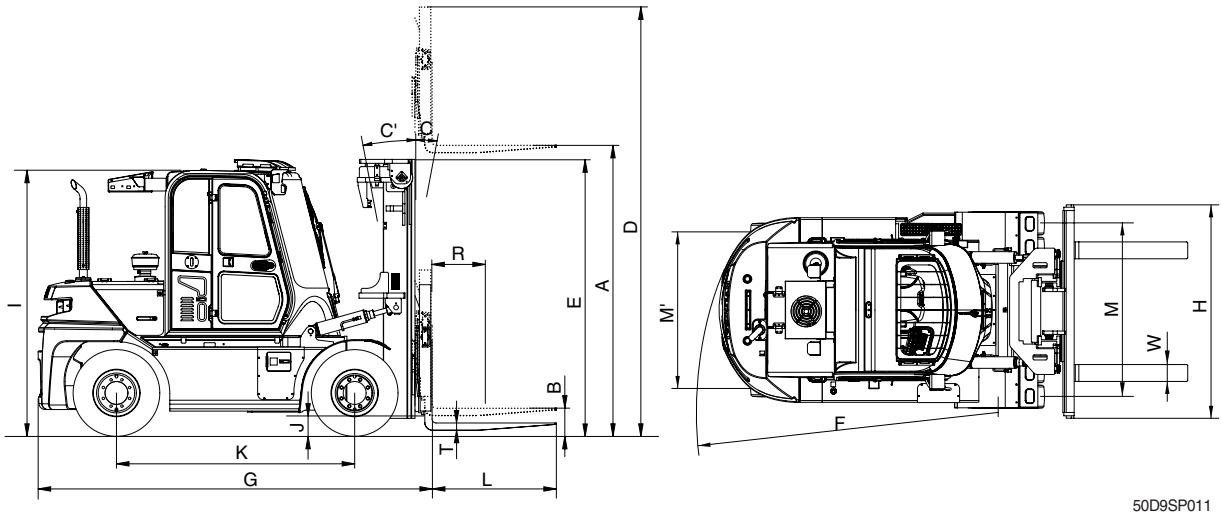
1. MAJOR COMPONENTS



50D9OM54

1	Mast	9	Head lamp	17	Beacon lamp (opt)
2	Lift chain	10	Rear work lamp (opt)	18	Camera (opt)
3	Lift cylinder	11	Operator's seat	19	Silencer
4	Carriage & backrest	12	Bonnet	20	Pre-cleaner
5	Tilt cylinder	13	Counterweight	21	Air conditioner (opt)
6	Forks	14	Rear wheel	22	Rear view mirror
7	Cabin	15	Front wheel		
8	Turn signal lamp	16	Rear combination lamp		

2. SPECIFICATIONS



50D9SP011

Model			Unit	50D-9	60D-9	70D-9	80D-9
Capacity			kg (lb)	5000 (11000)	6000 (13500)	7000 (15500)	8000 (17600)
Load center			mm (in)	600 (24")	←	←	←
Weight(Unloaded)			kg (lb)	8844 (19500)	9591 (21145)	10399 (22926)	11608 (25591)
Fork	Lifting height	A	mm (ft·in)	3030 (9' 11")	←	←	3040 (10' 0")
	Free lift	B	mm (in)	140 (5.5")	←	←	145 (5.7")
	Lifting speed (Unload/Load)		mm/sec	460/440	460/430	460/420	480/410
	Lowering speed (Unload/Load)		mm/sec	450/500	←	←	500/500
	L × W × T	L,W,T	mm (in)	1200 × 150 × 60 (47.2 × 5.9 × 2.4)	1200 × 150 × 65 (47.2 × 5.9 × 2.6)	←	1200 × 180 × 70 (47.2 × 7.1 × 2.8)
Mast	Tilt angle (forward/backward)	C/C'	degree	15/10	←	←	←
	Max height	D	mm (ft·in)	4275 (14' 0")	←	←	4375 (14' 4")
	Min height	E	mm (ft·in)	2515 (8' 3")	←	←	2675 (8' 9")
Body	Travel speed (Unload)		km/h	33.9	33.7	33.6	35
	Gradeability (Load)		%	58.7	50.6	44.4	35.2
	Min turning radius (Outside)	F	mm (ft·in)	3314 (10' 10")	3374 (11' 1")	3436 (11' 3")	3700 (12' 2")
ETC	Max hydraulic pressure		kgf/cm²	210	←	←	←
	Hydraulic oil tank		ℓ (USgal)	132 (34.9)	←	←	←
	Fuel tank		ℓ (USgal)	171.5 (45.3)	←	←	←
Overall length		G	mm (ft·in)	3516 (11' 8")	3591 (11' 9")	3666 (12' 0")	3971 (13' 0")
Overall width		H	mm (ft·in)	2087 (6' 10")	←	←	2194 (7' 2")
Cabin height		I	mm (ft·in)	2649 (8' 8")	←	←	←
Ground clearance		J	mm (in)	195 (7.7")	←	←	250 (9.8")
Wheel base		K	mm (ft·in)	2300 (7' 7")	←	←	2500 (8' 2")
Wheel tread front/rear		M/M'	mm (ft·in)	1580 / 1604 (5' 2" / 5' 3")	←	←	1632 / 1700 (5' 4" / 5' 7")

3. SPECIFICATION FOR MAJOR COMPONENTS

1) 50/60/70D-9

(1) Engine

Item	Unit	Specification
Model	-	Cummins QSF3.8
Type	-	Vertical, water-cooled, 4-cycle DI, Tier 4 final diesel engine
Cooling method	-	Water cooling
Number of cylinders and arrangement	-	4-cylinders, In-line
Firing order	-	1-3-4-2
Combustion chamber type	-	Direct injection
Cylinder bore × stroke	mm (in)	102 × 115 mm (4.0" × 4.5")
Piston displacement	cc (cu in)	3800 (232)
Compression ratio	-	17.2 : 1
Rated gross horse power	ps/rpm	102/2200
Maximum gross torque at rpm	kgf · m/rpm	42.3/1600
Engine oil quantity	ℓ (U.S.gal)	12 (3.2)
Dry weight	kg (lb)	348 (767)
High idling speed	rpm	2450
Low idling speed	rpm	850
Rated fuel consumption	g/kw.hr	220 (at 1600 rpm)
Starting motor	V-kW	24-4.8
Alternator	V-A	24-80
Battery	V-AH	24-80

(2) Main pump

Item	Unit	Specification
Type	-	Axial piston variable gear pump
Displacement	cc/rev	35+35+9.0
Maximum operating pressure	kgf/cm^2	250
Rated speed (Max/Min)	rpm	3000/600

(3) Main control valve

Item	Unit	Specification
Type	-	Sectional
Operating method	-	Hydraulic pilot
Relief valve pressure (Main/Aux)	kgf/cm^2	188/153
Flow capacity	lpm	160

(4) Steering unit

Item	Unit	Specification
Type	-	Load sensing/Non load reaction/Dynamic signal
Capacity	cc/rev	160
Rated flow	lpm	22.7
Relief pressure	kgf/cm^2	145

(5) Power train deviced

Item			Specification		
Torque converter	Model		ZF 3WG94		
	Type		3 Element, 1 stage, 2 phases		
	Stall ratio		2.395 : 1		
Transmission	Type		Full auto, power shift		
	Gear shift (FR/RR)		3/3		
	Adjustment		Electrical single lever type		
	Overhaul ratio	FR	1 : 4.714	2 : 2.341	3 : 0.974
		RR	1 : 4.711	2 : 2.340	3 : 0.974
Axle	Type		Front-wheel drive type, fixed location		
	Gear ratio		10.545		
	Gear		Ring & pinion gear type		
Wheels	Q'ty (FR/RR)		Double : 4/2		
	Front (drive)		8.25-15-14 PR		
	Rear (steer)		8.25-15-14 PR		
Brakes	Travel		Front wheel, wet disc brake		
	Parking		Wet disc (negative brake)		
Steering	Type		Full hydraulic, power steering		
	Steering angle		75.87° to both right and left angle, respectively		

2) 80D-9

(1) Engine

Item	Unit	Specification
Model	-	Cummins QSF3.8
Type	-	Vertical, water-cooled, 4-cycle DI, Tier 4 final diesel engine
Cooling method	-	Water cooling
Number of cylinders and arrangement	-	4-cylinders, In-line
Firing order	-	1-3-4-2
Combustion chamber type	-	Direct injection
Cylinder bore × stroke	mm (in)	102 × 115 mm (4.0" × 4.5")
Piston displacement	cc (cu in)	3800 (232)
Compression ratio	-	17.2 : 1
Rated gross horse power	ps/rpm	102/2200
Maximum gross torque at rpm	kgf · m/rpm	42.3/1600
Engine oil quantity	ℓ (U.S.gal)	12 (3.2)
Dry weight	kg (lb)	348 (767)
High idling speed	rpm	2450
Low idling speed	rpm	850
Rated fuel consumption	g/kw.hr	220 (at 1600 rpm)
Starting motor	V-kW	24-4.8
Alternator	V-A	24-80
Battery	V-AH	24-80

(2) Main pump

Item	Unit	Specification
Type	-	Axial piston variable gear pump
Displacement	cc/rev	35.6+33+7.6
Maximum operating pressure	kgf/cm^2	210
Rated speed (Max/Min)	rpm	3000/600

(3) Main control valve

Item	Unit	Specification
Type	-	Sectional
Operating method	-	Hydraulic pilot
Relief valve pressure (Main/Aux)	kgf/cm^2	188/153
Flow capacity	lpm	160

(4) Steering unit

Item	Unit	Specification
Type	–	Load sensing/Non load reaction/Dynamic signal
Capacity	cc/rev	200
Rated flow	lpm	32
Relief pressure	kgf/cm^2	135

(5) Power train deviced

Item			Specification
Torque converter	Model		ZF 3WG94
	Type		3 Element, 1 stage, 2 phases
	Stall ratio		2.395 : 1
Transmission	Type		Full auto, power shift
	Gear shift (FR/RR)		3/3
	Adjustment		Electrical single lever type
	Overhaul ratio	FR	1 : 4.714 2 : 2.341 3 : 0.974
		RR	1 : 4.711 2 : 2.340 3 : 0.974
Axle	Type		Front-wheel drive type, fixed location
	Gear ratio		12.4
	Gear		Ring & pinion gear type
Wheels	Q'ty (FR/RR)		Double : 4/2
	Front (drive)		9.00-20-14 PR
	Rear (steer)		9.00-20-14 PR
Brakes	Travel		Front wheel, wet disc brake
	Parking		Wet disc (negative brake)
Steering	Type		Full hydraulic, power steering
	Steering angle		75.04° to both right and left angle, respectively

4. TIGHTENING TORQUE FOR MAJOR COMPONENTS

NO	Item		Size	kgf·m	lbf·ft
1	Engine	Engine mounting bolt, nut	M12×1.25	12.3±3.0	89±21.7
2		Engine bracket mounting bolt	M10×1.5	6.9±1.4	50±10.1
3		Radiator mounting bolt, nut	M10×1.5	6.9±1.4	50±10.1
4	Hydraulic system	Hydraulic pump mounting bolt	M16×2.0	29.7±4.5	215±32.3
5		MCV mounting bolt, nut	M12×1.75	12.8±3.0	93±21.7
6		Steering unit mounting bolt	M10×1.5	6.9±1.4	50±10.1
7	Power train system	Transmission mounting bolt, nut	M16×2.0	7.5	54
8		Torque converter mounting bolt	M10×1.5	6.9±1.4	50±10.1
9		Drive axle mounting bolt, nut	M27×3.0	150±15	1085±109
10		Steering axle mounting bolt, nut	M18×2.5	41.3±6.2	299±44.8
11		Front/Rear wheel mounting nut	M22×1.5	61.2±12	443±86.8
12		Propeller shaft (To axle/TM)	3/8-24UNF	7±0.7	50.6±5.0
13	Others	Counterweight mounting bolt	M30×3.5	199±30	1439±217
14		Operator's seat mounting nut	M 8×1.25	3.4±0.7	24.6±5.1
15		Cab mounting nut	M20×2.5	57.9±8.7	419±63
16		Mast mounting bolt	M20×2.5	57.9±8.7	419±63

5. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.17 ~ 3.37	15.7 ~ 24.3	3.04 ~ 4.44	22.0 ~ 32.0
M10 × 1.25	4.46 ~ 6.66	32.3 ~ 48.2	5.93 ~ 8.93	42.9 ~ 64.6
M12 × 1.25	7.78 ~ 11.58	76.3 ~ 83.7	10.6 ~ 16.0	76.6 ~ 115
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 130	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 194	26.6 ~ 36.0	193 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 390	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 515	70.7 ~ 95.7	512 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 664	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1338	182 ~ 248	1314 ~ 1795
M36 × 3.0	192 ~ 260	1389 ~ 1879	262 ~ 354	1893 ~ 2561

2) PIPE AND HOSE(FLARE TYPE)

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE(ORFS TYPE)

Thread size	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

6. RECOMMENDED LUBRICANTS

Use only oils listed below or equivalent.

Do not mix different brand oil.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C (°F) -50 (-58) -30 (-22) -20 (-4) -10 (14) 0 (32) 10 (50) 20 (68) 30 (86) 40 (104)
Engine oil pan	Engine oil	12 (3.2)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
Torque converter transmission	Transmission oil	18 (4.8)	SHELL DONAX TD
Axle	Gear oil	12.5 (3.3)	SHELL DONAX TD
Hydraulic oil tank	Hydraulic oil	132 (34.9)	★ISO VG 15 ISO VG 46
Cabin tilt hand pump	Hydraulic oil	0.7 (0.2)	ISO VG 68
Fuel tank	Diesel fuel★1	171.5 (45.3)	★ASTM D975 NO.1 ASTM D975 NO.2
Fitting (Grease nipple)	Grease	-	★NLGI NO.1 NLGI NO.2
Brake oil	Hydraulic oil	-	★AZOLLA ZS10 (ISO VG10) AZOLLA ZS32 (Hydraulic oil, ISO VG32)
Radiator	Antifreeze : Soft water	20.4 (5.4)	Ethylene glycol base permanent type (50:50) ★Ethylene glycol base permanent type (60 : 40)
DEF/AdBlue® tank	Mixture of urea and deionized water	18.9 (5)	ISO 22241 (High-purity urea + deionized water (32.5:67.5))

NOTES :

① SAE numbers given to engine oil should be selected according to ambient temperature.

② For engine oil used in engine oil pan, use SAE 10W-30 oil when the temperature at the time of engine start up is below 0˚C, even if the ambient temperature in daytime is expected to rise to 10˚C or more.

③ Use engine oil of API service class CJ-4.

★1 : Ultra low sulfur diesel
- sulfur content ≤ 15 ppm

★ : Cold region
Russia, CIS, Mongolia

GROUP 3 PERIODIC REPLACEMENT

For operation safety, never fail to perform periodic maintenance or make periodic replacement of the consumable parts listed in the following.
These parts may deteriorate in time and are susceptible to wear. It is difficult to estimate the degree of wear at time of periodic maintenance; therefore, even if no apparent wear is found, always replace with new parts within the prescribed period of replacement (Or earlier if trouble is found).
Note that periodic replacement has nothing to do with guarantee service.

No.	Periodical replacement of safety parts	Interval
1	Fuel hose	Every 2 to 4 years
2	Hydraulic pump hose	Every 2 years
3	Power steering hose	Every 2 years
4	Packing, seal, and O-ring of steering cylinder	Every 2 to 4 years
5	Lift chain	Every 2 to 4 years
6	Lift cylinder hose	Every 1 to 2 years
7	Tilt cylinder hose	Every 1 to 2 years
8	Side shift cylinder hose	Every 1 to 2 years
9	Master cylinder and wheel cylinder caps dust seals	Every 1 years
10	Brake hose or tube	Every 1 to 2 years
11	Brake reservoir tank tube	Every 2 to 4 years
12	Intake air line	Every 2 years
13	Coolant hose and clamps	Every 2 years

※ **Replace the O-ring and gasket at the same time when replacing the hose.**

※ **Replace clamp at the same time if the hose clamp is cracked when checking and replacing hose.**