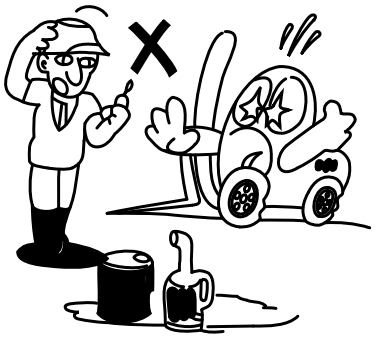
SECTION 1 GENERAL

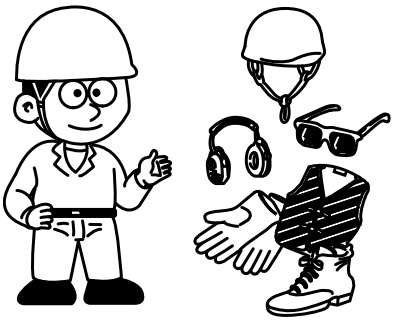
GROUP 1 SAFETY HINTS

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

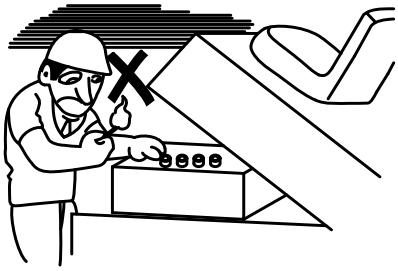
- Oil is a dangerous substance. Never handle oil, grease or oily clothes in places where there is any fire of flame.
  As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire fighting equipment.


D35ASF01

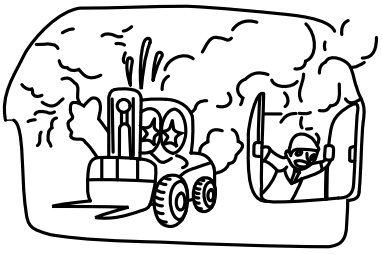
- Wear well-fitting helmet, safety shoes and working clothes. When drilling, grinding or hammering, always wear protective goggles.
  Always do up safety clothes properly so that they do not catch on protruding parts of machines. Do not wear oily clothes.
  When checking, always release battery plug.


D35ASF02

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

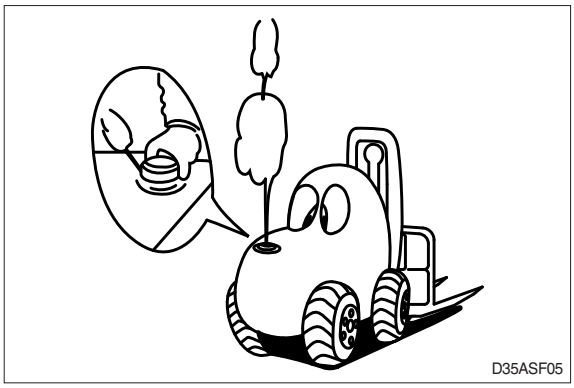

D35ASF03

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

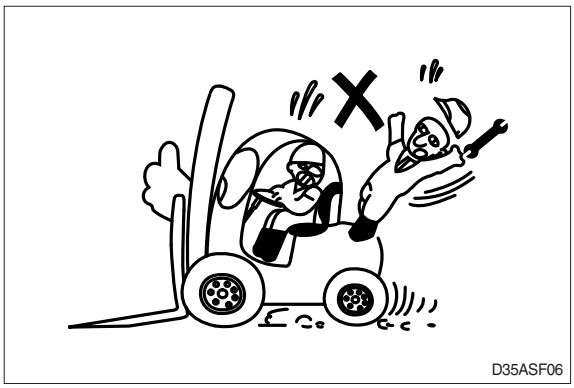

D35ASF04

⚠ 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.

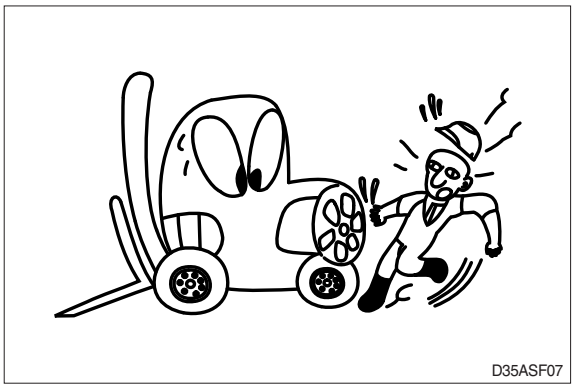

D35ASF05

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


D35ASF06

· 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.

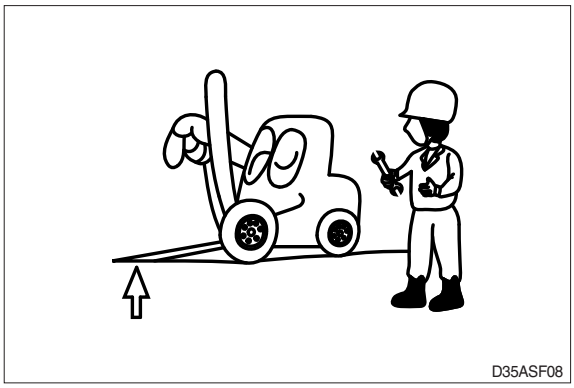
⚠ It is extremely dangerous to try to check the fan belt tension while he engine is running.


D35ASF07

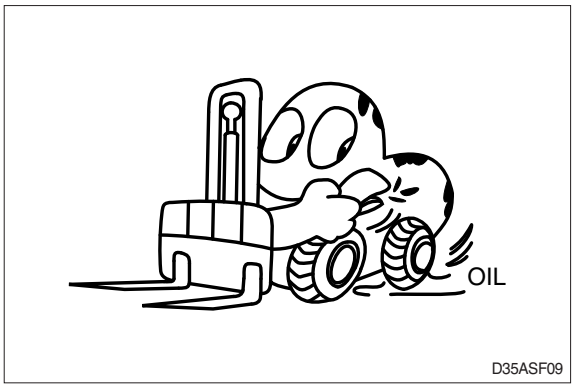
When inspecting the engine is running parts, or near such parts, always stop the engine first.

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

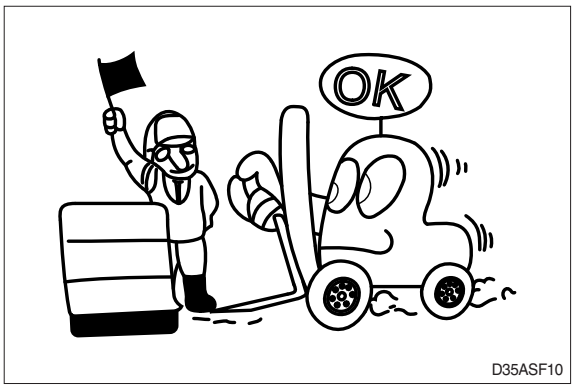
· Park the machine on firm, flat ground.
Lower the fork to the ground and stop the engine.
Return each lever to **NEUTRAL** and apply the brake lock.


D35ASF08

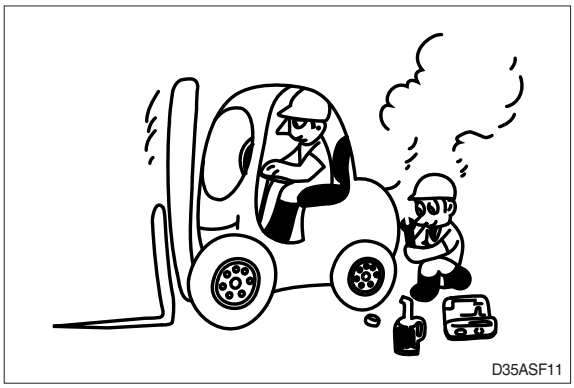
· Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine.



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



· 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.



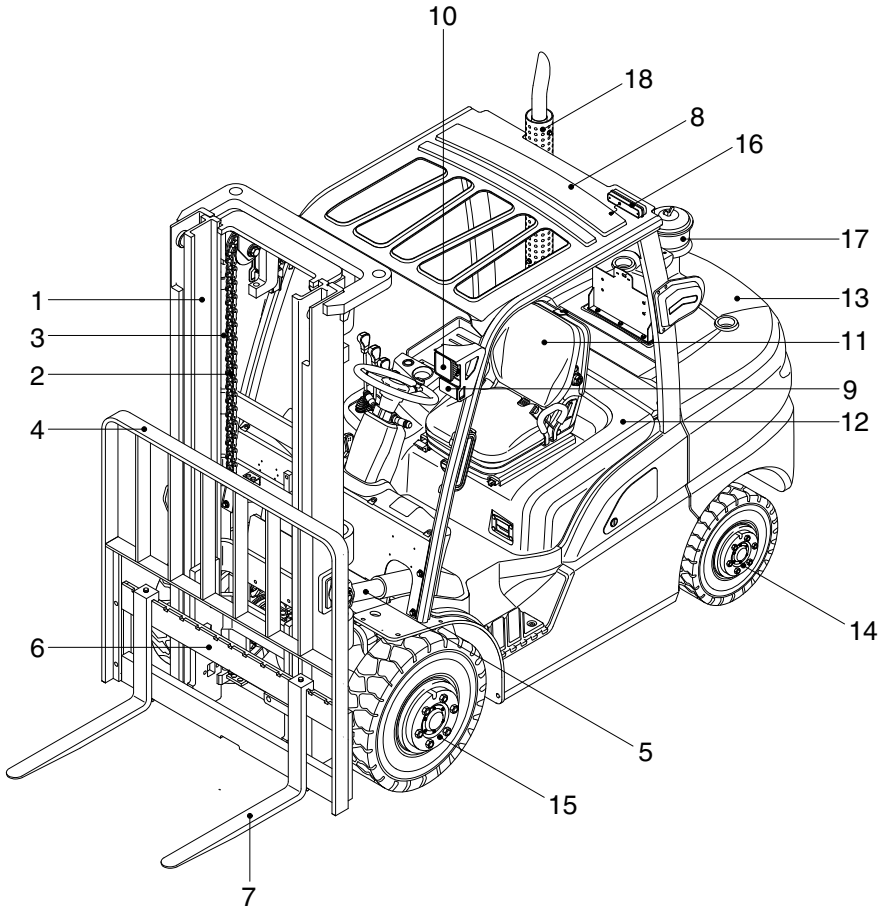
· Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. If maintenance is carried out with the engine running, there must be two men present : one sitting in the operator's seat and the other one performing the maintenance. In such a case,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

- 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

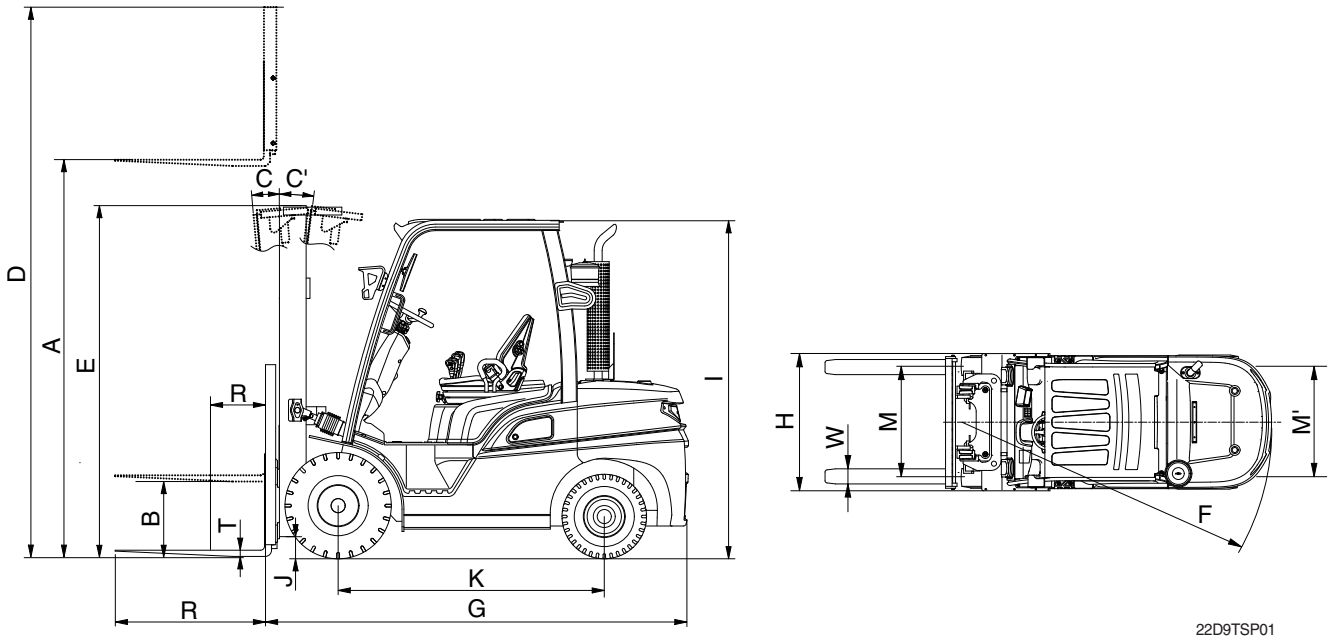
1. GENERAL LOCATIONS



22D9TOM54

1	Mast	7	Forks	13	Counterweight
2	Lift chain	8	Overhead guard	14	Rear wheel
3	Lift cylinder	9	Turn signal lamp	15	Front wheel
4	Backrest	10	Head lamp	16	Rear combination lamp
5	Tilt cylinder	11	Operator's seat	17	Pre-cleaner
6	Lift bracket	12	Bonnet	18	Silencer

2. SPECIFICATIONS



Model			Unit	22D-9S	25D-9S	30D-9S	33D-9S
Capacity			kg (lb)	2200 (4400)	2500 (5000)	3000 (6000)	3300 (6500)
Load center		R	mm (in)	500 (24")	←	←	←
Weight (Unloaded)			kg (lb)	3625 (7990)	3935 (8680)	4604 (10150)	4658 (10270)
Fork	Lifting height	A	mm (ft·in)	3305 (10' 10")	←	←	←
	Free lift	B	mm (in)	155 (6.1")	←	←	←
	Lifting speed (Unload/Load)		mm/sec	520/500	520/490	500/460	500/470
	Lowering speed (Unload/Load)		mm/sec	450/500	←	←	←
	L × W × T	L,W,T	mm (in)	1050×100×45 (41.3×3.9×1.8)	←	1050×122×45 (41.3×4.8×1.8)	←
Mast	Tilt angle (forward/backward)	C/C'	degree	6/10	←	←	←
	Max height	D	mm (ft·in)	4485 (14' 9")	←	←	←
	Min height	E	mm (ft·in)	2175 (7' 2")	←	2190 (7' 2")	2260 (7' 5")
Body	Travel speed (Unload)		km/h	18.4	←	19.8	←
	Gradeability (Load)		%	47.2	42	32.4	29.9
	Min turning radius (Outside)	F	mm (ft·in)	2286 (7' 6")	2342 (7' 8")	2413 (7' 11")	2463 (8' 1")
ETC	Operating pressure		kgf/cm²	200	←	←	←
	Hydraulic oil tank		ℓ (usgal)	36	←	38	←
	Fuel tank		ℓ (usgal)	60	←	←	←
Overall length		G	mm (ft·in)	2577 (8' 5")	2607 (8' 7")	2676 (8' 9")	2732 (9' 0")
Overall width		H	mm (ft·in)	1160 (3' 10")	←	1230 (4' 0")	1228 (4' 0")
Overhead guard height		I	mm (ft·in)	2160 (7' 1")	←	2180 (7' 2")	←
Ground clearance		J	mm (in)	130 (3.1")	←	145 (5.7")	←
Wheel base		K	mm (ft·in)	1650 (5' 5")	←	1700 (5' 7")	←
Wheel tread front/rear		M/M'	mm (ft·in)	999/980 (3' 3"/3' 3")	←	1005/980 (3' 6"/3' 3")	←

3. SPECIFICATION FOR MAJOR COMPONENTS

1) ENGINE

Item	Unit	Specification
Model	-	KUBOTA V3600
Type	-	Vertical, water-cooled, 4-cycle diesel
Cooling Method	-	Water cooling
Number of cylinders and arrangement	-	4 cylinders, in-line
Firing order	-	1-3-4-2
Combustion type	-	Spherical type (E-TVCS)
Cylinder bore X stroke	mm (in)	98×120 (3.9×4.7)
Piston displacement	cc (cu in)	3620 (221)
Compression ratio	-	22.6
Rated gross horse power	ps/rpm	65.4/2300
Maximum gross torque at rpm	kgf · m/rpm	22.5/1700
Engine oil quantity	ℓ (U.S.gal)	13.2 (3.5)
Dry weight	kg (lb)	272 (600)
High idling speed	rpm	2570
Low idling speed	rpm	900±50
Rated fuel consumption	g/ps.hr	173
Starting motor	V-kW	12-3
Alternator	V-A	14-45
Battery	V-AH	12-100
Fan belt deflection	mm (in)	10~12 (0.39~0.47)

2) MAIN PUMP

Item	Unit	Specification
Type	-	Fixed displacement gear pump
Capacity	cc/rev	32
Maximum operating pressure	bar	250
Rated speed (Max/Min)	rpm	2700/500

3) MAIN CONTROL VALVE

Item	Unit	Specification
Type	-	Sectional
Operating method	-	Mechanical
Main relief valve pressure	kg/cm^2	200/165
Flow capacity	lpm	80

4) POWER TRAIN DEVICES

Item			Specification
Torque converter	Model		KAPEC 280 DB
	Type		3 Element, 1 stage, 2 phase
	Stall ratio		2.90
Transmission	Type		Power shift
	Gear shift(FWD/REV)		1/1
	Control		Solenoid ON/OFF type
	Overhaul ratio	FWD	1.143
		REV	1.143
Axle	Type		Front-wheel drive type, fixed location
	Gear ratio		14.2 : 1
	Gear		Spiral bevel gear type
Wheels	Q'ty (FR/RR)		Single : 2/2, Double : 4/2
	Front (drive)	2.2/2.5	Single : 7.00-12-14 PR (STD), 8.15-15-14 PR (OPT)
			Double : 6.00-15-10 PR
		3.0/3.3	Single : 8.5-15-14 PR
			Double : 6.00-15-10 PR
	Rear (steer)	2.2~3.3	Single : 6.50-10-14 PR
			Double : 6.50-10-12 PR
Brakes	Travel		Front wheel, wet disk brake
	Parking		Wet disk (negative brake)
Steering	Type		Full hydraulic, power steering
	Steering angle		78.9˚ to both right and left angle, respectively

4. TIGHTENING TORQUE FOR MAJOR COMPONENTS

No.	Items		Size	kgf · m	lbf · ft
1	Engine	Engine mounting bolt (bracket-frame)	M12×1.75	12.8±3	92.6±21
2		Engine mounting bolt (engine-bracket)	M12×1.25	9.7±1.9	70±13
3		Radiator mounting bolt, nut	M 8×1.25	2.5±0.5	18±3.6
4		Torque converter mounting bolt (8EA)	M10×1.25	7.4±1.5	53.5±10
5	Hydraulic system	MCV mounting bolt	M10×1.5	4±0.5	29±3.6
6		Steering unit mounting bolt	M10×1.5	4±0.5	29±3.6
7		Pump mounting bolt	M10×1.5	5.3±0.5	38.3±3.6
8	Power train system	Transmission mounting bolt, nut	M16×2.0	7.5	54
9		Drive axle mounting bolt, nut	M20×1.5	65±3	470±21
10		Steering axle mounting bolt	M20×2.5	58±8.5	420±61
11		Front wheel mounting nut	M20×1.5	40±10	289±72
12		Rear wheel mounting nut	M16×1.5	18±2	130±14
13	Others	Counterweight mounting bolt	M30×3.5	199±30	1439±217
14		Operator's seat mounting nut	M 8×1.25	2.5±0.5	18.1±3.6
15		Head guard mounting bolt, nut	M12×1.75	12.3±1.2	89.0±8.7

5. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · 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	19.5 ~ 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 × 3.0	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	
	kg · m	lb · ft	kg · m	lb · 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	13.2 (3.5)	★SAE 5W-40 SAE 30 SAE 10W SAE 10W-30 SAE 15W-40
Torque converter transmission	Transmission oil	10 (2.6)	ATF DEXRON III
Axle	Gear oil	5 (1.3)	Shell DONAX TD
Hydraulic tank	Hydraulic oil	40 (10.6)	★ISO VG 15 ISO VG 46 ISO VG 68
Fuel tank	Diesel fuel★1	60 (15.9)	★ASTM D975 NO.1 ASTM D975 NO.2
Fitting (Grease nipple)	Grease	-	★NLGI NO.1 NLGI NO.2
Brake reservoir tank	Brake oil	0.5 (0.13)	★AZOLLA ZS10 (ISO VG10) AZOLLA ZS32 (Hydraulic oil, ISO VG32)
Radiator	Antifreeze : Soft water★2	9.4 (2.48)	Ethylene glycol base permanent type (50:50) ★Ethylene glycol base permanent type (60 : 40)

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 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 If any engine oil of API service class CF is used instead of class CH4 engine oil, the frequency of oil change must be doubled.

★ : Cold region
Russia, CIS, Mongolia

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

★2 : Soft water
City water or distilled water

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.	Description	Period of replacement
1	Master cylinder and wheel cylinder caps, dust seals	Every 1 year
2	Brake hose or tube	Every 1 or 2 years
3	Brake reservoir tank and tube	Every 2 to 4 years
4	Power steering hose	Every 2 years
5	Stop lamp switch (Oil pressure type)	Every 2 years
6	Fuel hose	Every 2 to 4 years
7	Packing, seal and O-ring of steering cylinder	Every 2 to 4 years
8	Lift chain	Every 2 to 4 years
9	Lift, tilt, side shift cylinder hose	Every 1 or 2 years
10	Hydraulic pump hose	Every 2 years