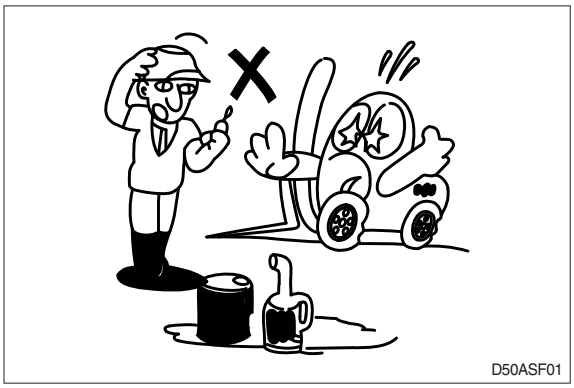
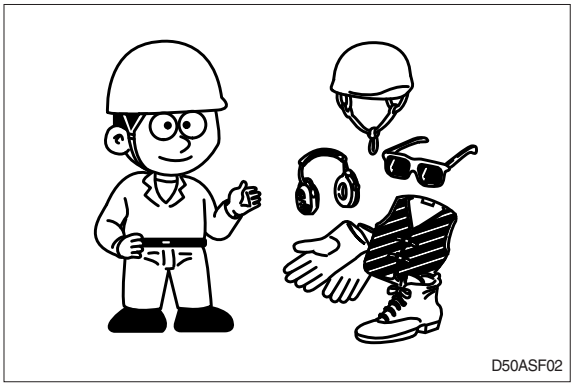
SECTION 1 GENERAL

GROUP 1 SAFETY HINTS

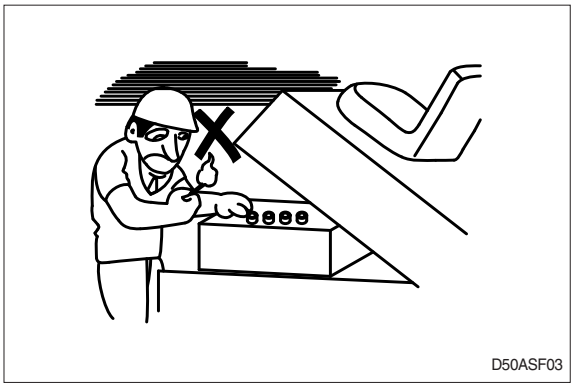
Careless performing of the easy work may cause injuries.
Take care to always perform work safely, at least observing the following.


D50ASF01

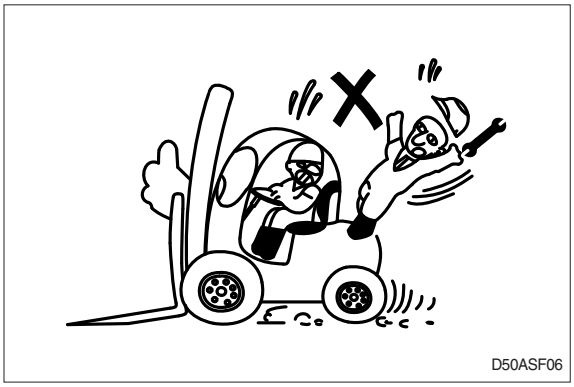
- Oil is a dangerous substance. Never handle oil, grease or oily clothes in places where there is any fire of flame.
  As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire fighting equipment.


D50ASF02

- 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.

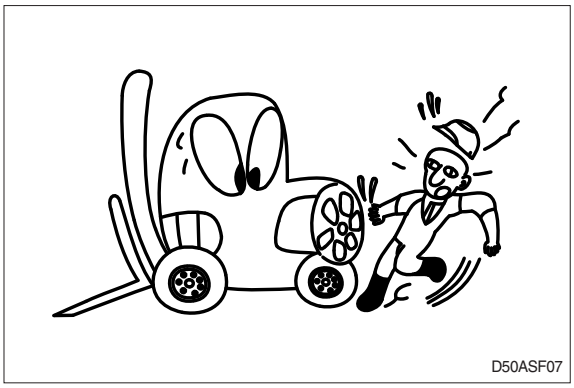

D50ASF03

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


D50ASF06

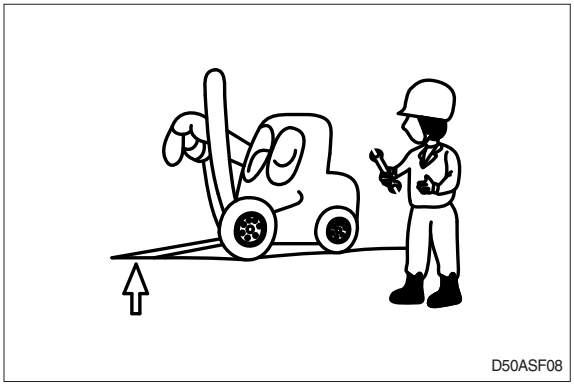
- When working on top of the machine, be careful not to lose your balance and fall.

· 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.

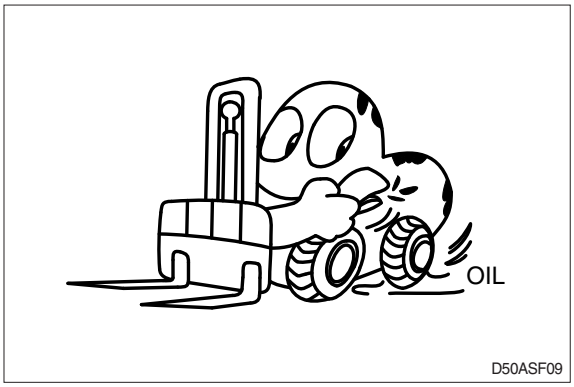

D50ASF07

When inspecting running parts or near such parts, always stop the machine 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.

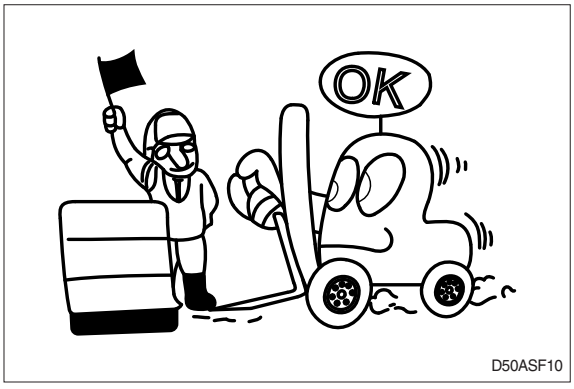

D50ASF08

· 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.



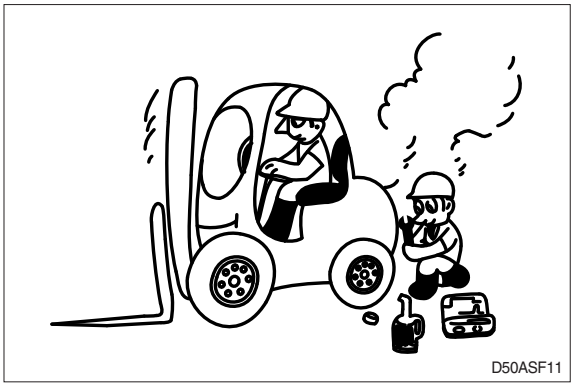
D50ASF09

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



D50ASF10

· 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.

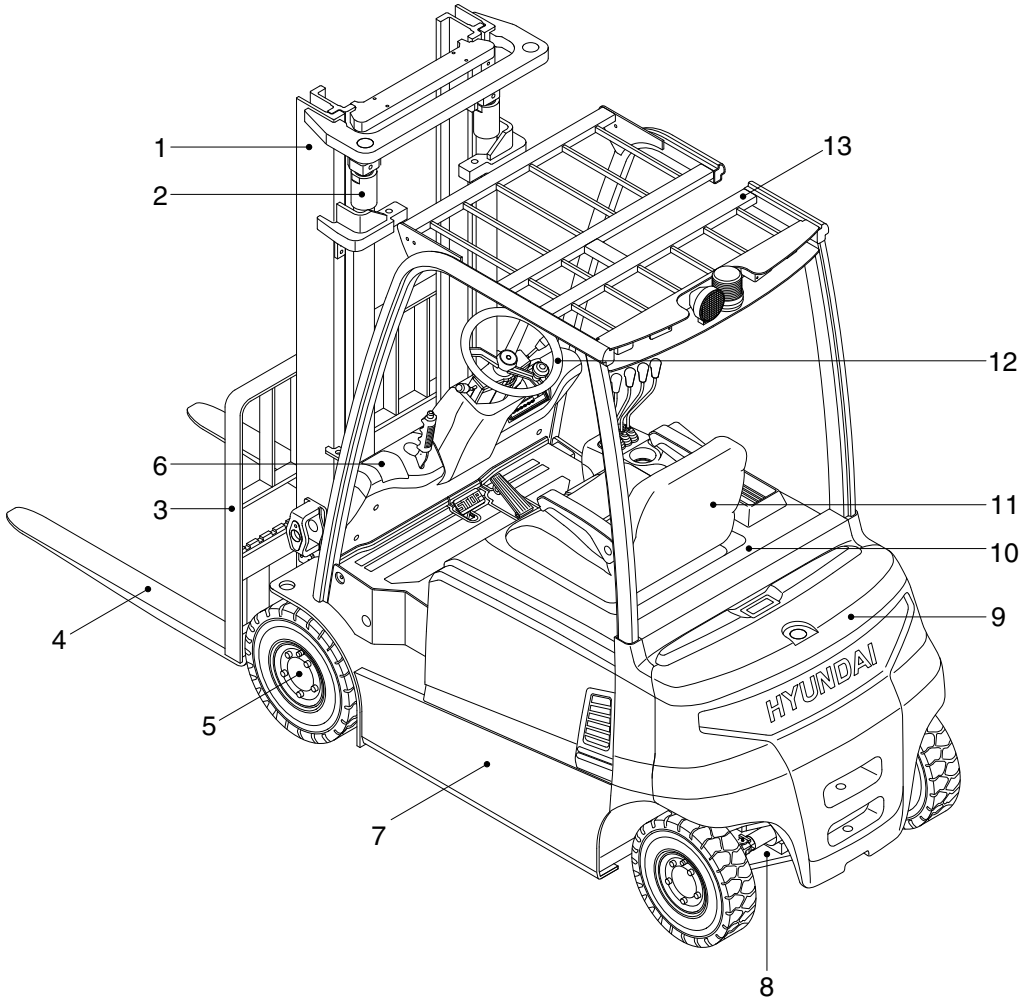

D50ASF11

· Unless you have special instructions to the contrary, maintenance should always be carried out with the machine stopped. If maintenance is carried out with the machine 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 40C.
· 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

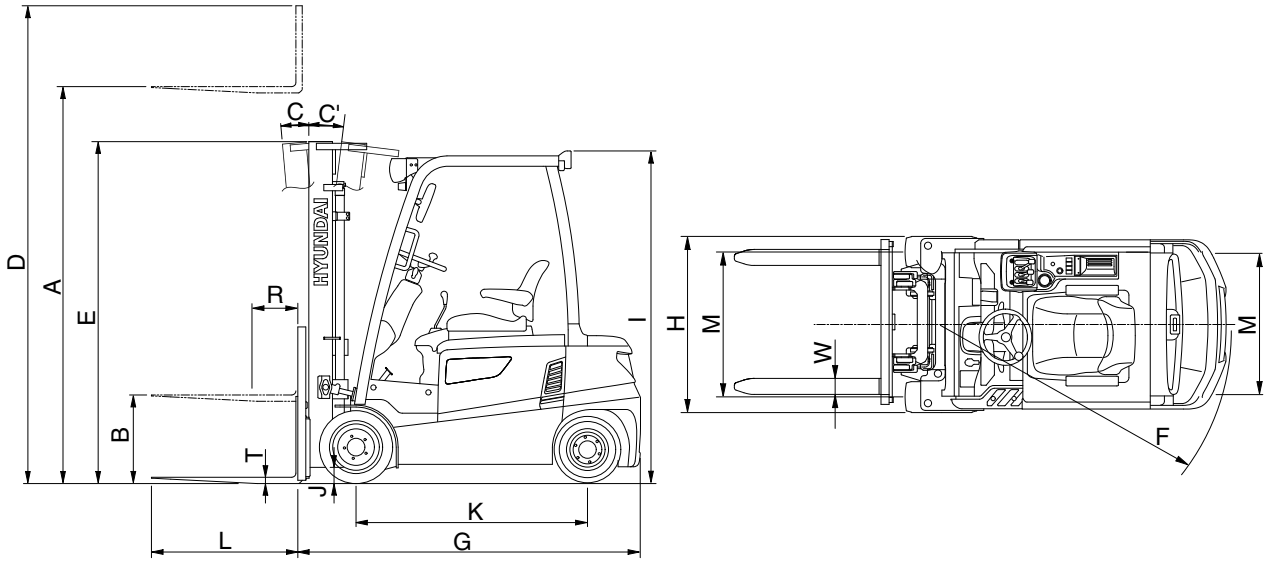
1. GENERAL LOCATIONS



16B9OM113

1	Mast	6	Dash board	11	Seat
2	Lift cylinder	7	Frame	12	Steering wheel
3	Carriage and backrest	8	Steering axle	13	Overhead guard
4	Forks	9	Counterweight		
5	Drive unit	10	Battery cover		

2. SPECIFICATIONS



16B9SP01

Model			Unit	16B-9	18B-9	20B-9
Capacity			kg (lb)	1600 (3200)	1800 (3500)	2000 (4000)
Load center		R	mm (ft-in)	500 (24")	←	←
Weight			kg (lb)	3150 (6950)	3275 (7220)	3480 (7670)
Fork	Lifting height	A	mm (ft-in)	3025 (9' 11")	←	3030 (9' 11")
	Free lift	B	mm (in)	35 (1.4")	←	40 (1.6")
	Lifting speed [Unload/Load]		mm/sec	600/410	←	←
	Lowering speed [Unload/Load]		mm/sec	450/500	←	←
	L × W × T	L,W,T	mm (in)	900 × 100 × 35 (35.4 × 3.9 × 1.4)	←	900 × 100 × 40 (35.4 × 3.9 × 1.6)
Mast	Tilt angle forward/backward	C/C'	degree	5/7	←	←
	Max height	D	mm (ft-in)	4020 (13' 2")	←	←
	Min height	E	mm (ft-in)	1970 (6' 6")	←	1979 (6' 6")
Body	Travel speed [Unload/Load]		km/h	17	←	←
	Gradeability [Load]		%	29.5	27.5	24.5
	Min turning radius [Outside]	F	mm(ft-in)	1710 (5' 7")	1795 (5' 11")	1810 (5' 11")
ETC	Max hydraulic pressure		kgf/cm^2	190	←	←
	Hydraulic oil tank		l(usgal)	16.5 (4.4)	←	←
verall length		G	mm (ft-in)	2035 (6' 8")	2120 (6' 11")	2130 (7' 0")
Overall width		H	mm (ft-in)	1074 (3' 6")	1105 (3' 8")	←
Overhead guard height		I	mm (ft-in)	2065 (6' 9")	←	←
Ground clearance (Mast)		J	mm (in)	85 (3.3")	←	94 (3.7")
Wheel base		K	mm (ft-in)	1335 (4' 5")	1440 (4' 9")	←
Wheel tread front/Rear		M	mm (ft-in)	895/880 (2' 11"/2' 11")	905/880 (3' 0"/2' 11")	←

3. SPECIFICATION FOR MAJOR COMPONENTS

1) CONTROLLER

Item	Unit	Traction motor controller	Pump motor controller
Model		DUAL AC2	AC2
Type	-	MOSFET	←
Dimension	mm	322×200×149	200×250×148
Current limit	A	330A+330A	450A
Communication	-	CAN	←

2) MOTOR

Item	Unit	Traction	Pump
Model	-	AMDN4001	ABDD4002
Type	-	AC	AC
Rated voltage	Vac	32	30
Output	kW	4.7	14.0
Insulation	-	Class F	Class F

3) BATTERY

Item	Unit	16B-9	18/20B-9
Rated voltage	V	48	←
Dimension(W×L×H)	mm	978×545×635	978×630×635
Min. Battery weight	kg	780	950
Max. Battery weight	kg	980	1140
Connector(CE spec)	-	SB 350 or SR350 (SBE 320)	

4) CHARGER

Item	Unit	16B-9	18/20B-9
Type	-	Constant current, constant voltage	
Battery capacity for charge	V-AH	48-440~520	48-530~600
AC input	V	Triple phase 410	
		Single phase 220	
		Triple phase 220/380	
		Triple phase 440	
DC output	V	64±1	
Charge time	hr	6±2	
Connector (CE spec)	-	SB 350 or SR350 (SBE 320)	

5) GEAR PUMP

Item	Unit	Specification
Type	–	Fixed displacement gear pump
Capacity	cc/rev	19.6
Maximum operating pressure	bar	210
Rated speed (max/min)	rpm	3000/500

6) MAIN CONTROL VALVE

Item	Unit	Specification
Type	–	3 spool, 4 spool
Operating method	–	Mechanical
Main relief valve pressure	bar	190
2nd relief valve pressure	bar	130

7) DRIVE UNIT

Item	Unit	Specification	
		Standard	★Option
Max. axle load	kg (lb)	2700 (5953)	3850 (8818)
Max. input speed	rpm	5000	
Max. output torque (wheel)	N·m	2260	1320
Gear ratio	–	20	26.75
Weight without fluid (1EA)	kg (lb)	35 / 77	31 (68)
Oil quantity	ℓ (U.S. gal)	0.35 (0.37)	

★ : Machine Serial No. 16B-9 : #1202-, 18B-9 : #0406-, 20B-9 : #2350-

8) WHEELS

Item	16B-9	18B-9	20B-9
Type (STD/OPT)	SOLID/NON MARKING		
Quantity (front/rear)	2/2		
Front-drive	18×7-8	200/50-10	←
Rear-steering	16×6-8	←	←

9) BRAKES & STEERING

Item		Specification
Brakes	Travel	Front wheel, wet disc brake
	Parking	Ratchet type
Steering	Type	Full hydraulic, power steering
	Steering angle	90° to both right and left angle, respectively

4. TIGHTENING TORQUE FOR MAJOR COMPONENTS

No.	Descriptions		Size	Torque	
				kgf·m	lbf·ft
1	Electric system	Hyd pump motor mounting bolt	M10×1.5	6.9±1.4	50±10
2		Traction motor mounting bolt	M 8 ×1.25	2.5±0.5	18.1±3.6
3	Hydraulic system	Hydraulic pump mounting bolt	M10×1.5	5±1.0	36.5±7.2
4		MCV mounting bolt, nut	M 8 ×1.25	2.5±0.5	18.1±3.6
5		Steering unit mounting bolt	M10×1.5	6.9±1.4	50±10
7		Brake cylinder mounting bolt	M10×1.5	8±0.5	57.8±3.6
9	Power train system	Drive unit mounting bolt	M14×2.0	13.8±1.2	99.8±8.7
10		Steering axle mounting bolt, nut	M20×2.5	62±3.0	448±21.7
11		Front wheel mounting nut	M14×1.5	14±1.5	101±10.8
12		Rear wheel mounting nut	M12×1.5	10±1.0	72.3±7.2
13	ETC	Counterweight mounting bolt	M24×3.0	100±15	723±108
14		Seat mounting nut	M 8 ×1.25	2.5±0.5	18.1±3.6
15		Head guard mounting bolt	M12×1.75	12.8±3.0	92.6±21.7

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)
Axle	Gear oil	0.6 (0.16)	MOBIL FLUID 424
Hydraulic oil tank	Hydraulic oil	20 (5.2)	★ISO VG 15 ISO VG 46 ISO VG 68
Brake system	Brake oil	0.5 (0.13)	★HYDRAULIC OIL ISO VG10 (AZOLLA ZS10) HYDRAULIC OIL ISO VG32 (AZOLLA ZS32)
Fitting (Grease nipple)	Grease	0.1 (0.03)	★NLGI No.1 NLGI No.2

- API : American Petroleum Institute
- SAE : Society of Automotive Engineers
- ISO : International Organization for Standardization
- NLGI : National Lubricating Grease Institute

★ : 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.

※ **Replacement of consumable service parts is not covered under warranty.**

No.	Description	Period of replacement
1	Hydraulic oil	Every 1 year
2	Brake fluid	Every 1 year
3	Differential oil	Every 1 year
4	Gear oil	Every 1 year
5	Wheel bearing grease	Every 1 year
6	Power steering hose	Every 1 year
7	Parking, seal and O-ring of steering cylinder	Every 2 year
8	Parking, seal and O-ring of lift and tilt cylinder	Every 2 year
9	Reservoir tank tube	Every 1 year
10	Lift chain	Every 2 year
11	Hydraulic equipment hose	Every 2 year
12	Brake hose or tube	Every 1 or 2 year