EX1800-3
Workshop Manual

SECTION 1
GENERAL INFORMATION

—CONTENTS—

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PRECAUTIONS FOR DISASSEMBLING AND ASSEMBLING

Precautions for Disassembling and Assembling

- Clean the Machine

  Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.

- Inspect the Machine

  Be sure to thoroughly understand all disassembling/assembling procedures beforehand, to help avoid incorrect disassembling of components as well as personal injury.
  Check and record the items listed below to prevent problems from occurring in the future.

  - The machine model, machine serial number, and hour meter reading.
  - Reason for disassembly (symptoms, failed parts, and causes).
  - Clogging of filters and oil, water or air leaks, if any.
  - Capacities and condition of lubricants.
  - Loose or damaged parts.

- Prepare and Clean Tools and Disassembly Area

  Prepare the necessary tools to be used and the area for disassembling work.

- Precautions for Disassembling

  - To prevent dirt from entering, cap or plug the removed pipes.
  - Before disassembling, clean the exterior of the components and place it on a work bench.
  - Before disassembling, drain gear oil from the reduction gear.
  - Be sure to provide appropriate containers for draining fluids.
  - Use matching marks for easier reassembling.
  - Be sure to use the specified special tools, when instructed.
  - If a part or component cannot be removed after removing its securing nuts and bolts, do not attempt to remove it forcibly. Find the cause(s), then take the appropriate measures to remove it.
  - Orderly arrange disassembled parts. Mark and tag them as necessary.
  - Store common parts, such as bolts and nuts with reference to where they are to be used and in a manner that will prevent loss.
  - Inspect the contact or sliding surfaces of disassembled parts for abnormal wear, sticking, or other damage.
  - Measure and record the degree of wear and clearances.

- Precautions for Assembling

  - Be sure to clean all parts and inspect them for any damage. If any damage is found, repair or replace it.
  - Dirt or debris on the contact or sliding surfaces may shorten the service life of the machine. Take care not to contaminate any contact or sliding surfaces.
  - Be sure to replace O-rings, backup rings, and oil seals with new ones once they are disassembled. Apply a film of grease before installing.
  - Be sure that liquid-gasket-applied surfaces are clean and dry.
  - If an anti-corrosive agent has been used on a new part, be sure to thoroughly clean the part to remove the agent.
  - Utilize matching marks when assembling.
  - Be sure to use the designated tools to assemble bearings, bushings and oil seals.
  - Keep a record of the number of tools used for disassembly/assembly. After assembling is complete, count the number of tools, so as to make sure that no tools are missing.

Bleeding Air from Hydraulic System

When hydraulic oil is drained, the suction filter or the suction lines are replaced, or the removal and installation of the pump, swing motor, travel motor or cylinder is done, bleed air from the hydraulic system in the following procedures:

- Bleeding Air from Hydraulic Pump

IMPORTANT: If the engine is started with air trapped in the hydraulic pump housing, damage to the pump may result. Be sure to bleed air before starting the engine.

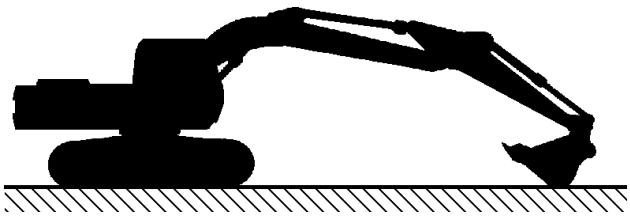
- Remove the air bleeding plug from the top of the pump and fill the pump housing with hydraulic oil.
- After the pump housing is filled with hydraulic oil, temporarily tighten the plug. Then, start the engine and run at slow idle speed.
- Slightly loosen the plug to bleed air from the pump housing until hydraulic oil oozes out.
- After bleeding all the air, securely tighten the plug.

- Bleeding Air from Travel Motor/Swing Motor

- With the drain plug/hose on travel motor/swing motor removed, fill the motor case with hydraulic oil.

- Bleeding Air from Hydraulic Circuit

- After refilling hydraulic oil, start the engine. While operating each cylinder, swing motor and travel motor evenly, operate the machine under light loads for 10 to 15 minutes. Slowly start each operation (never fully stroke the cylinders during initial operation stage). As the pilot oil circuit has an air bleed device, air trapped in the pilot oil circuit will be bled while performing the above operation for approx. 5 minutes.
- Reposition the front attachment to check hydraulic oil level.
- Stop the engine. Recheck hydraulic oil level. Replenish oil as necessary.



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Floating Seal Precautions

1. In general, replace the floating seal with a new one.
   If the floating is to be reused, follow these procedures:

   (1) Keep seal rings together as a matched set with seal ring faces together. Insert a piece of cardboard to protect surfaces.

   (2) Check seal ring face (C) for scuffing, scoring, corrosion, deformation or uneven wear.

   (3) Check O-ring (B) for tears, breaks, deformation or hardening.

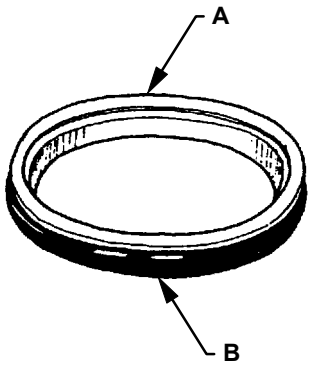
2. If incorrectly assembled, oil leakage or damage will occur. Be sure to do the following, to prevent trouble.

   (1) Clean floating seal (A) and seal mounting bores with cleaning solvent.
   Use a wire brush to remove mud, rust or dirt.
   After cleaning, thoroughly dry parts with compressed air.

   (2) Clean the floating seal and seal mounting bores, as dust on them tends to enter the floating seal when installing it.

   (3) Check that the O-ring is not twisted, and that it is installed correctly on the seal ring.

   (4) After installing the floating seal, check that seal face (C) is parallel with seal mounting bores ring face (D) by measuring the distances (C) and (D) at point (a) and (b), as illustrated. If these distances differ, correct the O-ring seating.



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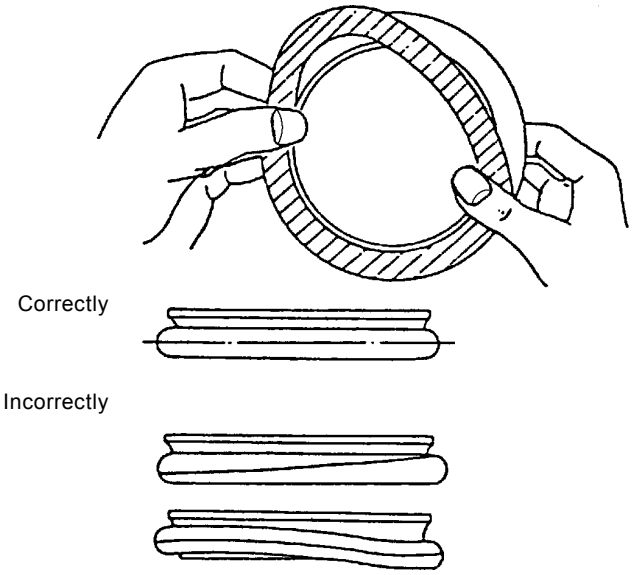

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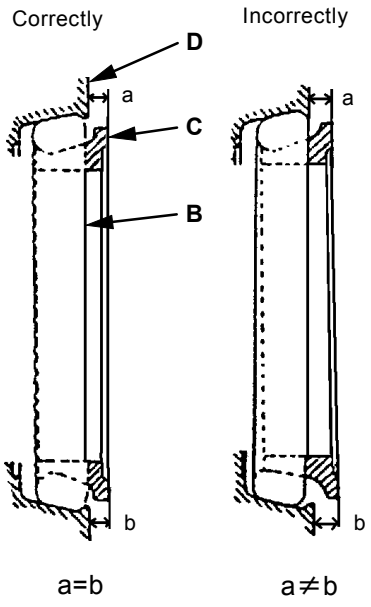

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MAINTENANCE STANDARD TERMINOLOGY

“Standard”

1. Dimension for parts on a new machine.

2. Dimension of components or assemblies adjusted to specification.

Both dimensions are shown with tolerances as necessary.

“Allowable Limit”

1. Normal machine performance cannot be accomplished after exceeding this limit.

2. Repair or replacement is required before reaching this limit.

Machine performance will decrease, and maintenance and down time expense will increase as machine operating hours accumulate. It is recommended that parts are repaired or replaced before reaching the **“Allowable Limit”**.

TIGHTENING TORQUE SPECIFICATIONS

No.	Descriptions	Bolt Dia mm	Q'ty	Wrench Size (mm)	Torque		
					N·m	kgf·m	lbf·ft
1	Engine cushion rubber mounting bolt	33	4	50	2550	260	1880
		22	4	32	740	75	540
2	Engine bracket mounting bolt	27	24	41	1030	105	760
		18	4	27	390	40	290
3	Hydraulic oil tank mounting bolt	30	8	46	1420	145	1050
4	Fuel tank mounting bolt	30	12	46	1420	145	1050
5	Pump transmision mouting bolt	1/2-13UNC	28	19	118	12	87
6	Pump device mounting bolt	20	24	Hexagonbar wrench 17	390	40	290
7	Gear pump mounting bolt	14	4	Hexagonbar wrench 12	137	14	101
8	Air-con. Compressor drive pump mounting bolt	14	4	Hexagonbar wrench 12	137	14	101
9	Control valve mounting nut	20	8	30	390	40	290
10	Swing device mounting bolt	33	48	50	2550	260	1880
		24	48	36	690	70	510
11	Swing motor mounting bolt	20	8	30	390	40	290
12	Battery mounting bolt	10	16	17	19.5	2	14.5
13	Cab mounting bolt	18	8	27	295	30	215
14	Cab bed mounting bolt	16	36	24	205	21	152
15	Swing bearing mounting bolt to upperstructure	45	58	70	4710	480	3470
	Swing bearing mounting bolt to undercarriage	45	60	70	4710	480	3470
16	Counterweight mounting nut	45	7	70	3920	400	2890
17	Radiator mounting nut	27	8	41	1030	105	760
18	Travel device mounting bolt (A)	22	32	32	740	75	540
	(B)	33	64	50	2550	260	1880
	(C)	30	60	46	1910	195	1410
19	Travel motor mounting bolt	20	8	30	390	40	290
20	Upper roller mounting bolt	20	25	30	390	40	290
21	Lower roller mounting bolt	30	64	46	1910	195	1410
22	Track guard mounting bolt	30	12	46	1910	195	1410
23	Track shoe bolt	33	392	50	3190	325	2350
24	Side frame mounting bolt	45	68	70	4710	480	3470
25	Loader front pin-retaining bolt (A)	20	32	30	390	40	290
	Loader front pin-retaining bolt (B)	16	4	24	205	21	152
	Loader front pin-retaining bolt (C)	24	4	36	690	70	510
26	Backhoe front pin-retaining bolt (A)	20	24	30	390	40	290
	Backhoe front pin-retaining bolt (B)	16	12	24	205	21	152

NOTE: (1) Apply lubricant (e.g. white Zinc B dissolved into spindle oil) to bolts and nuts to stabilize friction coefficient of them.

(2) Make sure bolt and nut threads are clean before installing.

TORQUE CHART

CAUTION: Use tools appropriate for the work to be done. Makeshift tools and procedures can create safety hazards. For loosening and tightening nuts and bolts, use the correct tools. Avoid bodily injury caused by slipping wrenches.

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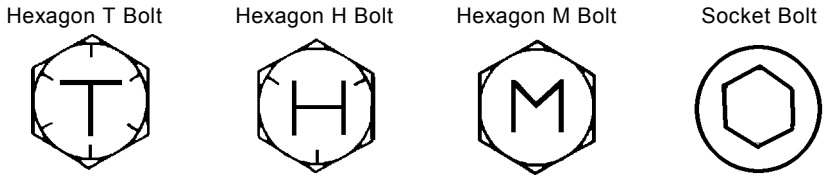
Bolt Types

Tighten nuts or bolts correctly to torque specifications. Four kinds of bolts, hexagon bolts T, H, M and socket bolt, each made of different material, are used. Make sure to employ the correct bolts and tighten them to specification when assembling the machine or components.



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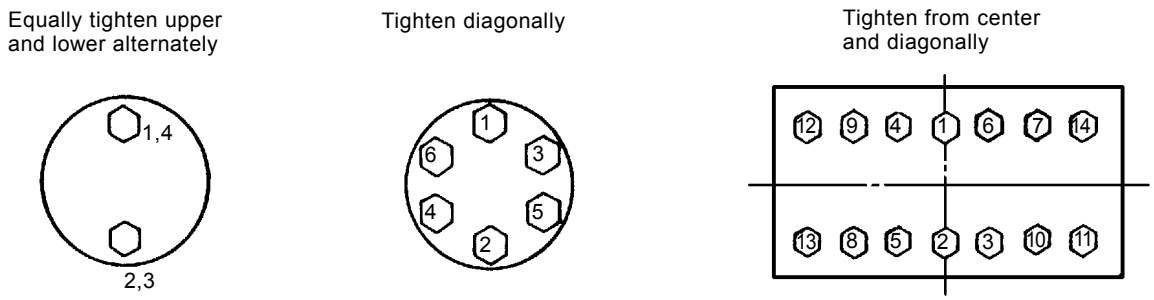
Specified Tightening Torque Chart

Bolt Dia.	Wrench Size	Hexagon Wrench Size	T Bolt, Socket bolt			H Bolt			M Bolt		
			N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M 8	13	6	29.5	3	22	19.5	2	14.5	9.8	1	7.2
M 10	17	8	64	6.5	47	49	5	36	19.5	2	14.5
M 12	19	10	108	11	80	88	9	65	34	3.5	25.5
M 14	22	12	175	18	130	137	14	101	54	5.5	40
M 16	24	14	265	27	195	205	21	152	78	8	58
M 18	27	14	390	40	290	295	30	220	118	12	87
M 20	30	17	540	55	400	390	40	290	167	17	123
M 22	32	17	740	75	540	540	55	400	215	22	159
M 24	36	19	930	95	690	690	70	505	275	28	205
M 27	41	19	1370	140	1010	1030	105	760	390	40	290
M 30	46	22	1910	195	1410	1420	145	1050	540	55	400
M 33	50	24	2550	260	1880	1910	195	1410	740	75	540
M 36	55	27	3140	320	2310	2400	245	1770	930	95	690

IMPORTANT: (1) Apply lubricant (i. e. white zinc B dissolved into spindle oil) to nuts and bolts to stabilize their friction coefficients.
(2) Torque tolerance is ±10 %.
(3) Be sure to use bolts of correct length. Bolts that are too long cannot be tightened, as the bolt tip comes into contact with the bottom of the bolt hole. Bolts that are too short cannot develop sufficient tightening force.
(4) The torques given in the chart are for general use only.
Do not use these torques if a different torque is given for a specific application.
(5) Make sure that the nut and bolt threads are clean before installing. Remove dirt or corrosion, if any.

Bolt Tightening Order

When tightening two or more bolts, tighten them alternately, as shown, to ensure even tightening.



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Service Recommendations for Split Flange

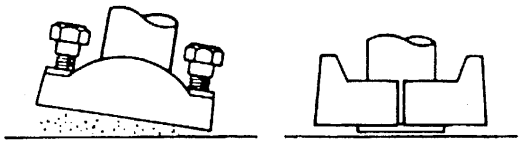
IMPORTANT: (1) Be sure to clean and inspect sealing surfaces. Scratches/roughness cause leaks and seal wear. Unevenness causes seal extrusion. If defects cannot be polished out, replace the component.

(2) Be sure to use only specified O-rings. Inspect O-rings for any damage. Take care not to file O-ring surfaces. When installing an O-ring into a groove, use grease to hold it in place.

(3) Loosely assemble split flange halves. Make sure that the split is centrally located and perpendicular to the port. Hand-tighten the bolts to hold the parts in place. Take care not to pinch the O-ring.

(4) Tighten bolts alternately and diagonally, as shown, to ensure even tightening.

(5) Do not use air wrenches. Using an air wrench often causes tightening of one bolt fully before tighten the others, resulting in damage to O-rings or uneven tightening of bolts.



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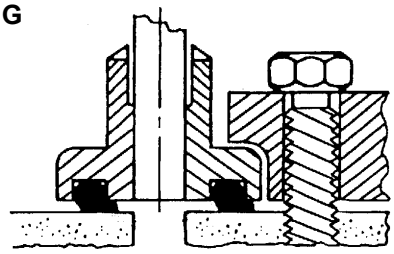
WRONG



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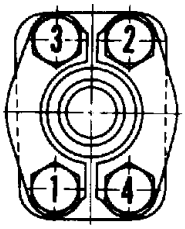

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Nut and Bolt Lockings

- Lock Plate

IMPORTANT: Do not reuse lock plates. Do not try to bend the same point twice.

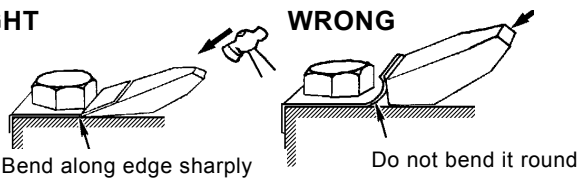
- Cotter Pin

IMPORTANT: Do not reuse cotter pins. Match the holes in the bolt and nut while tightening, not while loosening.

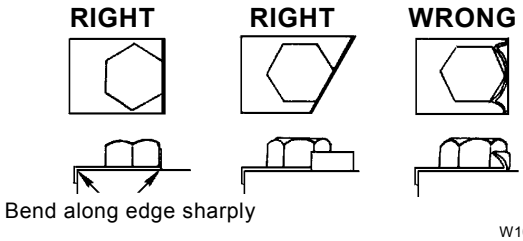
- Lock Wire

IMPORTANT: Apply wire to bolts in the bolt-tightening direction, not in the bolt-loosening direction.

RIGHT WRONG



RIGHT RIGHT WRONG



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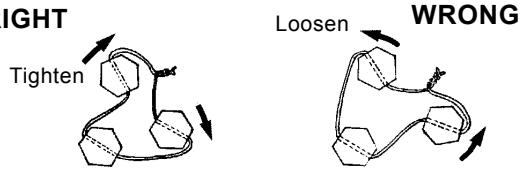
RIGHT RIGHT WRONG

RIGHT Loosen WRONG



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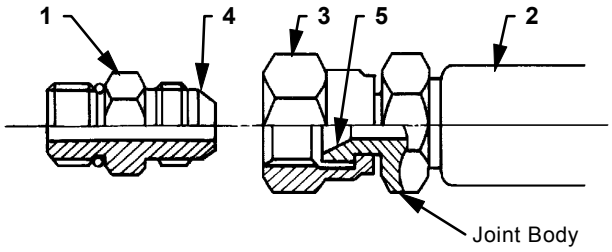
PIPING JOINT

Pipe Thread Connection/Union Joint Tightening Torque Specifications

Union Joint

Metal sealing faces (4) and (5) of adaptor (1) and hose (2) fit together to seal pressure oil. Union joints are used to join small-diameter lines.



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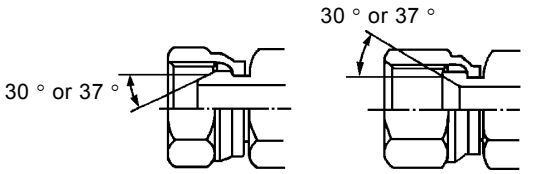

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IMPORTANT: (1) Do not over-tighten union nut (3). Excessive force will be applied to metal sealing surfaces (4) and (5), possibly cracking adaptor (1). Be sure to tighten union nut (3) to specifications.

(2) Scratches or other damage to sealing surfaces (4) or (5) will cause oil leakage at the joint. Take care not to damage them when connecting/disconnecting.

Type	Wrench Size		Tightening Torque		
	Union Nut	Joint Body	N·m	kgf·m	lbf·ft
30 ° Male Union Joint	19	19	59	6	43
	22	22	98	10	72
	27	27	118	12	87
	36	36	235	24	134
	41	41	295	30	215
	50	50	490	50	360
	60	60	670	68	490
	70	70	980	100	720
37 ° Female Union Joint	19	17	44	4.5	32.5
	22	19	59	6	43
	27	22	118	12	87
	36	30, 32	235	24	134
	41	36	295	30	215
	50	46	490	50	360

NOTE: Tightening torque for the non-union type 37° male joint is the same as the 37° female union joint.

O-ring Seal Joint

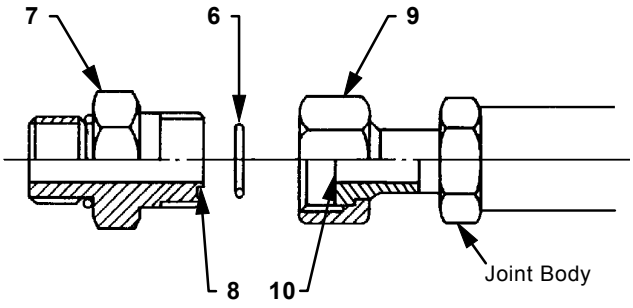
O-ring (6) seats against the end face of adaptor (7) to seal pressure oil.

IMPORTANT: (1) Be sure to replace O-ring (6) with a new one when reconnecting.

(2) Before tightening union nut (9), confirm that O-ring (6) is seated correctly in O-ring groove (8). Tightening union nut (9) with O-ring (6) displaced will damage O-ring (6), resulting in oil leakage.

(3) Take care not to damage O-ring groove (8) or sealing face (10). Damage to O-ring (6) will cause oil leakage.

(4) If union nut (9) is found to be loose, causing oil leakage, do not tighten it to stop the leak. Instead, replace O-ring (6) with a new one, then tighten union nut (9) after confirming that O-ring (6) is securely seated in place.



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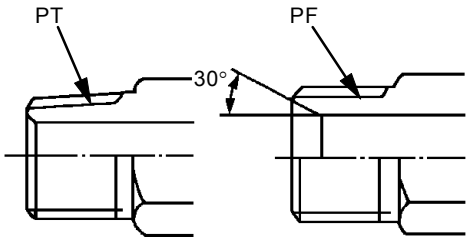
Wrench Size		Tightening Torque		
Union Nut	Joint Body	N·m	kgf·m	lbf·ft
19	17	59	6	43
22	19	98	10	72
27	22	118	12	87
36	30, 32	235	24	134
41	36	295	30	215
50	46	490	50	360

Screwed-In Connection

IMPORTANT: Many types of screwed-in connections are used for hose connections. Be sure to confirm that the thread pitch and thread type (tapered or straight) are the correct type before using any screw-in connection.



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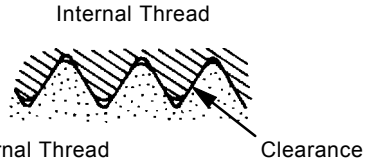
Male Tapered Thread			
Wrench	Tightening Torque		
Joint Body	N·m	kgf·m	lbf·ft
17, 19	59	6	43
19, 22	98	10	72
27, 22	118	12	87
36, 32	235	24	134
41	295	30	215
50	490	50	360
60	670	68	490
70	980	100	720

Seal Tape Application

Seal tape is used to seal clearances between male and female threads, so as to prevent any leakage between threads.
Be sure to apply just enough seal tape to fill up thread clearances. Do not overwrap.



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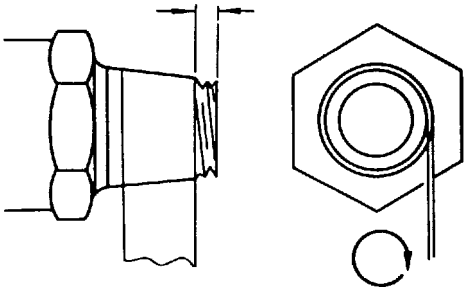
- Application Procedure

  Confirm that the thread surface is clean, free of dirt or damage.
  Apply seal tape around threads as shown. Wrap seal tape in the same direction as the threads.

Leave one to two pitch threads uncovered



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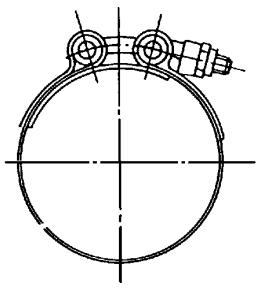
Low-Pressure-Hose Clamp Tightening Torque

Low-pressure-hose clamp tightening torque differs depending on the type of clamp.
See below for correct tightening torque of each type of low-pressure-hose clamp.

T-Bolt Type Band Clamp:
4.4 N·m (0.45 kgf·m, 3.25 lbf·ft)
Worm Gear Type Band Clamp:
5.9 to 6.9 N·m (0.6 to 0.7 kgf·m, 4.3 to 5.1 lbf·ft)

T-Bolt Type



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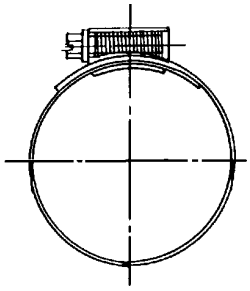
Worm Gear Type



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Connecting Hose

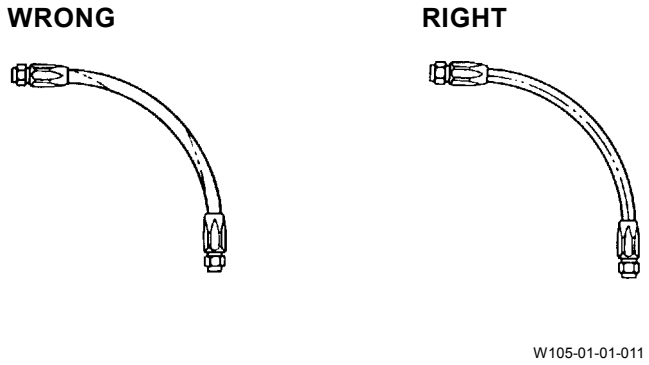
CAUTION:

(1) When replacing hoses, be sure to use only genuine Hitachi service parts. Using hoses other than genuine Hitachi hoses may cause oil leakage, hose rupture or separation of fitting, possibly resulting in a fire on the machine.

(2) Do not install hoses kinked. Application of high oil pressure, vibration, or an impact to a kinked hose may result in oil leakage, hose rupture or separation of fitting. Utilize print marks on hoses when installing hoses to prevent hose from being installed kinked.

(3) If hoses rub against each other, wear to the hoses will result, leading to hose rupture. Take necessary measures to protect hoses from rubbing against each other.

Take care that hoses do not come into contact with moving parts or sharp objects.



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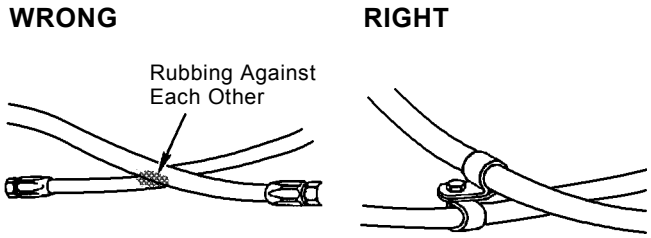

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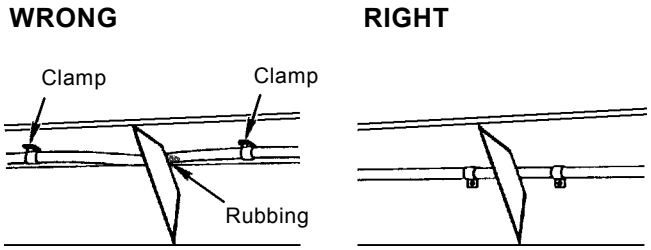

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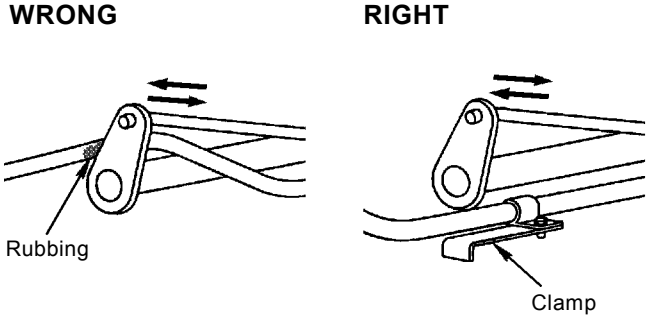

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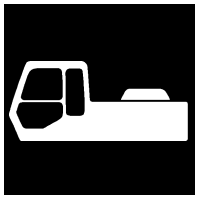
SECTION 2
UPPERSTRUCTURE



—CONTENTS—

Group 7 Solenoid Valve

Group 8 Fuel Cooler Fan Motor

Group 9 Compressor Drive Motor

Group 10 Air Conditioner

Group 11 Shuttle Valve