

# SHOP MANUAL

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# W90-3

## WHEEL LOADER

SERIAL NUMBERS

WA90-3 - 70001 and up



### — WARNING —

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept inside the cab for reference and periodically reviewed by all personnel who will come into contact with the machine.

# KOMATSU

# SHOP MANUAL

**KOMATSU**

# W90-3

MACHINE MODEL    SERIAL No.

**W90-3**



**70001 and up**

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## IMPORTANT SAFETY NOTICE

Proper service and repair is extremely important for the safe operation of machine. The service and repair techniques recommended by Komatsu and described in this manual are both effective and safe methods of operation. Some of these operations require the use of tools specially designed by Komatsu for the purpose.

To prevent injury to workers, the symbols  and  are used to mark safety precautions in this manual. The cautions accompanying these symbols should always be followed carefully. If any dangerous situation arises or may possibly arise, first consider safety, and take the necessary actions to deal with the situation.

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## FOREWORD

This shop manual has been prepared as an aid in improving the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every available opportunity.

### Organization

This shop manual mainly contains the necessary technical information for operations performed in a service workshop. For ease of understanding, the manual is divided into chapters for each main group of components, these chapters are further divided into the following sections:

#### Structure and function

This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

#### Testing and adjusting

This section explains checks to be made before and after performing repairs, as well as adjustments to be made at completion of the checks and repairs. Troubleshooting charts correlating "Diagnoses" to "Causes" are also included in this section.

#### Disassembly and assembly

This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

#### Maintenance standards

This section gives the judgement standards when inspecting disassembled parts.

## USING THE SHOP MANUAL

### Volumes

Shop manuals are issued for carrying out repairs.

They are divided as follows

**Chassis volume:**           **issued for every machine model**

Engine volume            issued for each engine series

Electrical volume

Fuel system volume

Attachments volume

} each issued as one volume to cover all models

In addition, the following volumes are issued for high level rebuilding techniques to cover all models

Engine volume

The following volumes are issued for inspection and tests after repairs:

Guidance for reusable parts volume

Bench test methods volume

These various volumes are designed to avoid duplicating the same information. Therefore to deal with all repairs for any model, it is necessary to have the shop manual for that model as well as the relevant engine volume, the fuel system volume and the electrical volume.

This shop manual is **chassis volume**.




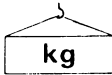
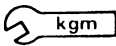



### Distribution and Updating

Recipients of shop manuals are recorded at the Komatsu Head Office. Any additions, amendments or other changes will be sent to all recipients without fail, so someone should be appointed to be in charge of manuals. In this way, pages can be added or removed immediately and the manuals kept up to date and easy to use.



Symbols

So that the shop manual can be of sufficient practical use, we have marked important places for safety and quality with the following symbols

SYMBOL	ITEM	REMARKS
	Safety	Special safety precautions are necessary when performing the work
		Extra special safety precautions are necessary when performing the work because it is under internal pressure
	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work
	Weight	Weight of parts or systems Caution necessary when selecting hoisting wire, or when working posture is important, etc
	Tightening torque	Places that require special care with the tightening torque when assembling
	Coat	Places to be coated with adhesives, etc. when assembling
	Oil, water	Places for filling with oil, etc Oil capacity
	Drain	Places for draining oil, etc Quantity to be drained.



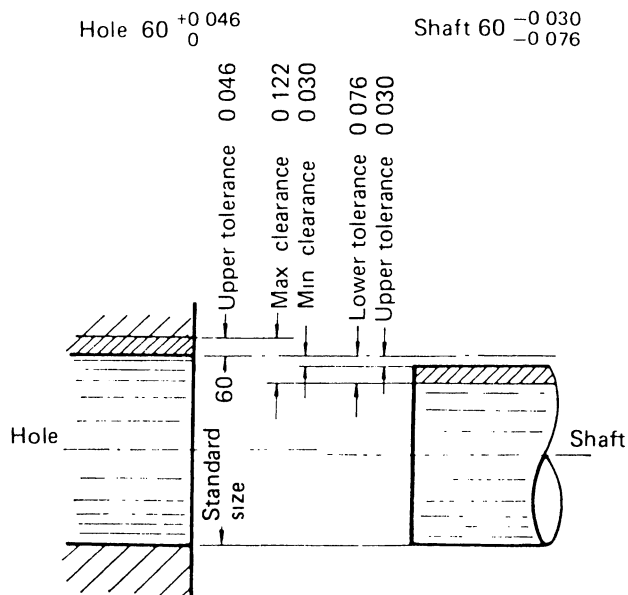
## DEFINITION

### Standard Size, Tolerance

The dimensions of finished parts each differ a little. Therefore, when determining the finished dimensions of parts, a dimension that will be standard is determined provisionally, and then the difference allowed from it is indicated. The former is called the **standard size**, and the latter the **tolerance**. The way to show this is by a plus or a minus sign with the tolerance in smaller numerals to the right the standard size.

**Example.**  $120 \begin{smallmatrix} -0.022 \\ -0.126 \end{smallmatrix}$  (The same meaning as 119.874 – 119.978)

Moreover, when expressing the dimensions of a hole and the shaft that goes inside it, for the sake of convenience, the standard size for the hole and the shaft usually taken as the same, and the tolerances changed to indicate the tightness of the fit. For example, the fit of revolving shaft is indicated as follows, and is shown in the drawing.



**Standard Size** This is the standard value at the time of design, the finished dimension of new parts

**Repair Limit** This is the limit in dimension up to which the part can be used. (The size of parts changes due to wear or distortion during use). When parts exceed the repair limit, they must be repaired or replaced as specified.

**Standard Clearance** This is the clearance between two new parts after assembly, shown as a range between minimum clearance and maximum clearance. In general, parts are adjusted to this clearance after repair.

**Clearance Limit** This is the maximum clearance allowed between parts. (The clearance increases due to wear, etc. during use.)  
When the clearance exceeds the clearance limit, the parts must be repaired or replaced as specified.

**Maintenance Standard** This is the number given to items in diagrams of individual components. The same number is given in the left-hand column for ease of identification.

				Unit mm	
No	Check item	Criteria			Remedy
1		Serial No	Standard size	Repair limit	

						Unit mm	
No	Check item	Criteria				Remedy	
10		Serial No	Standard size	Tolerance		Standard clearance	Clearance limit
				Shaft	Hole		

# SHOP MANUAL

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## **W90.3**

SERIAL NO. 70001 and up

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## **01 GENERAL**

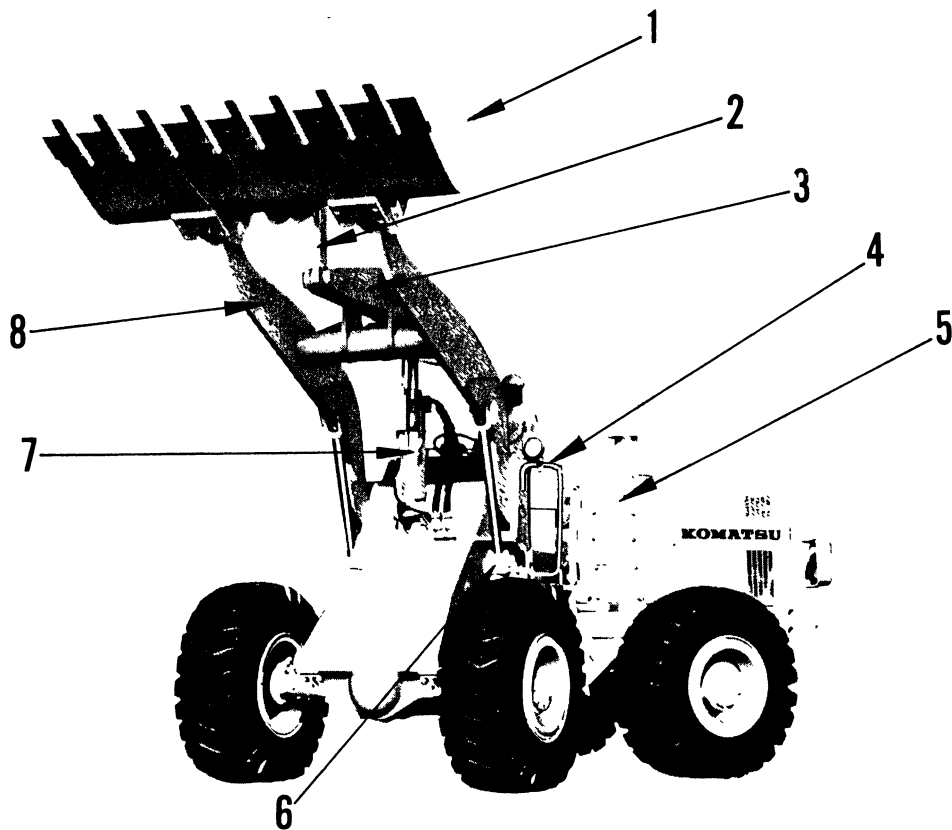
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# GENERAL

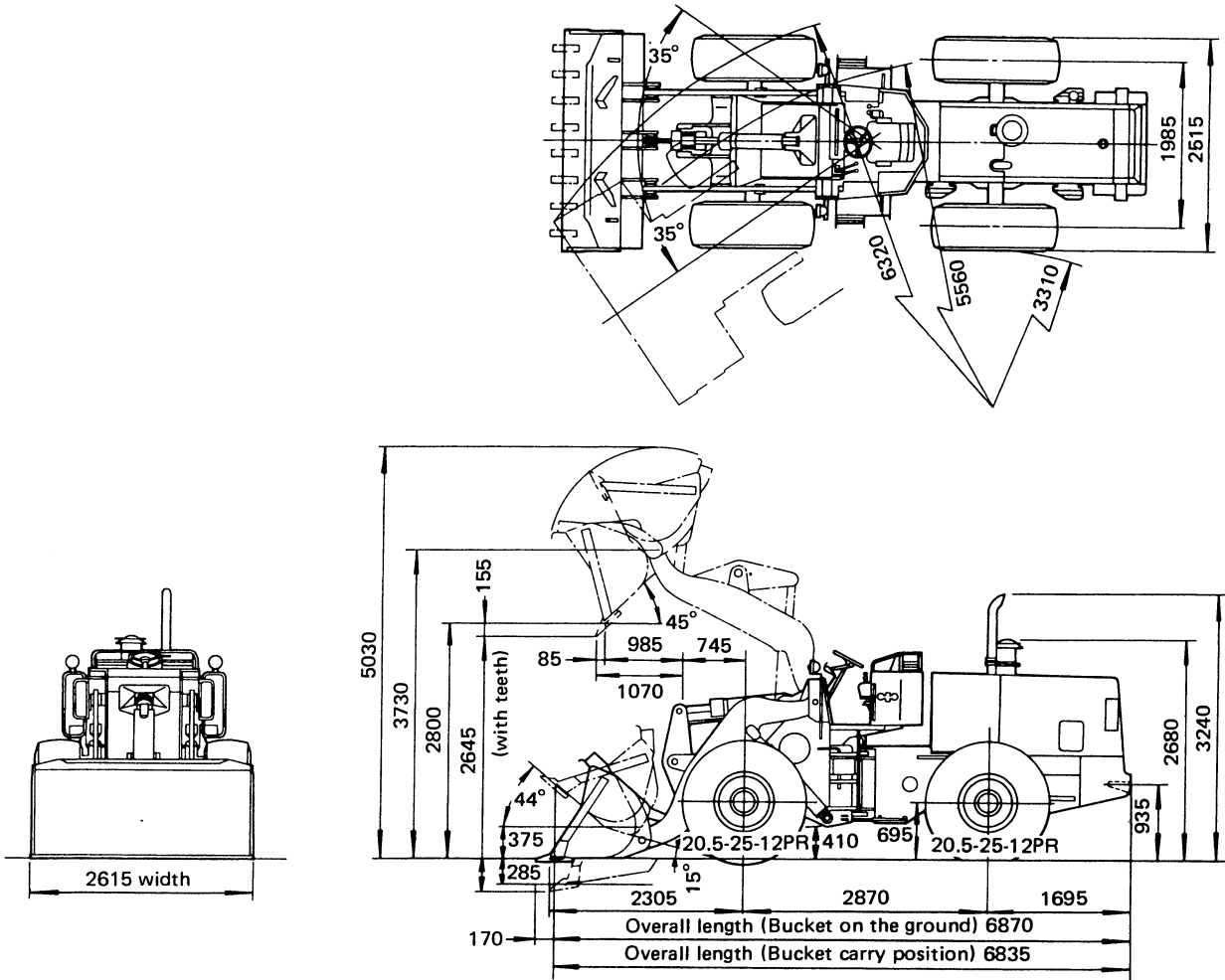
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## GENERAL VIEW



1. Bucket
2. Link
3. Lever
4. Hydraulic tank
5. Battery box
6. Boom cylinder
7. Bucket cylinder
8. Boom

# GENERAL ASSEMBLY DRAWING



## SPECIFICATIONS

Machine name and model			W90-3		
Serial numbers			70001 ~		
Weight	Operating weight		kg	12,200	
	Front wheel loading		kg	5,620	
	Rear wheel loading		kg	6,580	
Dimensions	Overall length (tooth length excluded)		mm	6,870	
	Overall width	Overall width of machine		mm	2,515
		Overall width of bucket		mm	2,615
	Overall height	Top edge of canopy		mm	3,330
		During bucket ascent		mm	5,030
	Wheel base		mm	2,870	
	Tread		mm	1,985	
	Bucket hinge pin height		mm	3,730	
	Dumping clearance (bucket base)		mm	2,800	
	Dumping reach (bucket base)		mm	985	
	Bucket dump angle		°	45	
	Bucket tilt angle (traveling posture)		°	44.2	
	Excavation depth (10° dump)		mm	285	
	Minimum height above ground		mm	410	
Performance	Bucket capacity		m <sup>3</sup>	2.3	
	Operating load		kg	4,000	
	Bucket ascent time		sec	6.0	
	Bucket descent time		sec	3.5	
	Maximum traction force		kg	11,800	
	Gradeability		°	25	
	Mini. turning radius	At outside of machine		mm	6,320
		Travel speed	Forward	1st speed	km/h
	2nd speed			km/h	0 ~ 13.3
	3rd speed			km/h	0 ~ 30.4
	Reverse	1st speed	km/h	0 ~ 8.0	
2nd speed		km/h	0 ~ 14.2		
3rd speed		km/h	0 ~ 32.3		

Machine name and model		W90-3
Serial numbers		70001 ~
Engine	Name	Komatsu S6D105
	Model	4-cycle direct injection, turbocharged diesel
	Number of cylinders – Bore x Stroke	6 – 105 mm x 125 mm
	Overall displacement	6,490 cc
	Rated output	152HP/2,500 rpm
	Maximum torque	53.5 kgm/1,800 rpm
	Fuel consumption	178 g/HP.h
	Starting motor	24V, 5.5KW
	Battery	24V(12V x 2) – 140 Ah
Power train	Torque converter	Niigata 6F-1307, 3-element, single stage, single phase
	Transmission	Full power shift, counter shaft type
	Reduction unit	Hypoid gear
	Differential	Straight bevel gear
	Final drive	Planetary gear
Shaft and wheel	Drive system	Four wheel drive
	Front wheel shaft	Fixed frame, full floating
	Rear wheel shaft	Center pin support, full floating
	Tire	23.5-25-12PR
Brake	Foot brake	Air over hydraulic actuated on four wheels with separate axle-by-axle, dry single disc.
	Hand brake	Drum, air release, apply spring
Steering unit		Full hydraulic power, smooth steering at any engine speed
Hydraulic units	Work equipment pump discharge	116ℓ/min. / 2,500 rpm, 145ℓ/min. / 2,500 rpm
	Work equipment valve set pressure	193 kg/cm <sup>2</sup>
	Steering valve set pressure	140 kg/cm <sup>2</sup>
	Cylinder (Number – Bore x Stroke)	Boom cylinder
Bucket cylinder		1 – 160 mm x 493 mm
Steering cylinder		2 – 80 mm x 413 mm



## WEIGHT OF COMPONENTS PARTS



This weight table is a guide for use when transporting or handling components.

	Unit: kg
Engine ass'y (Komatsu S6D105)	550
Radiator ass'y (with grille support)	100
Torque converter ass'y	100
Transmission ass'y (with bracket)	380
Transmission control valve	25
Transmission 1st clutch pack ass'y	25
Transmission F & R clutch pack ass'y	35
Transmission 2nd & 3rd clutch pack ass'y	45
Front axle ass'y	700
Rear axle ass'y	700
Planetary carrier ass'y (1)	45
Front differential ass'y	90
Rear differential ass'y	110
Tire (with wheel, 20.5-25-12PR) (1)	330
Front frame (without accessory)	1100
Rear frame (without accessory)	900

	Unit: kg
Counter weight	1600
Bolster	150
Engine hood	110
Operator's compartment	130
Operator's seat	35
Bulkhead ass'y (with two batteries)	260
Hydraulic tank	170
Boom cylinder ass'y (1)	110
Bucket cylinder ass'y	120
Boom ass'y	920
Bucket lever	170
Bucket link	40
Bucket 2.3 m <sup>3</sup> (with teeth)	100
Fuel tank	210
Battery (Wet) (1)	45

## SYSTEM CAPACITY

Location	Capacity (ℓ)		Remark
	Initial fill	Refill	
Engine cooling water	38	—	Water (incl. radiator)
Fuel tank	226	—	Diesel oil ASTM D975 No. 2 or No. 1
Engine oil pan	24	—	EO30-CD or EO10W-CD
Transmission system (w/torque converter and cooler)	32	—	EO30-CD = EO10W-CD or EO20W20-CD (TCO, DEXRON ® A.T.F.)
Axle (diff. & planetary, each axle)	28	—	Gear oil #90 or #140
Brake oil	1.5	—	SAEJ-1703e
Hydraulic system	113	—	EO30-CD, EO10W-CD or EO20W20-CD

# GENERAL INSPECTION AND TEST

- Check disassembled parts to see if they will be re-usable, or it repaired. If the part failed due to an external source, determine the cause and correct before assembly.

## 1. GENERAL PRECAUTION

- Visually inspect parts for cracks, pitting, corrosion, scoring, ridging, etc. For proper inspection, every part should be correctly cleaned before inspection.
- If the cause of part defect can be found out, it will be great help to analyze the part condition; whether the defect will progress or not, or the possibility of future trouble.  
Knowing the cause of the defect, the service man can give good advice to the user to prevent him from having the same trouble again.
- Visual inspection can not find minute or hidden damage. Other methods of inspection are as follows;
  - a) Water-pressure or air-pressure test
  - b) Color check or magnetic damage test

## 2. CRACKS

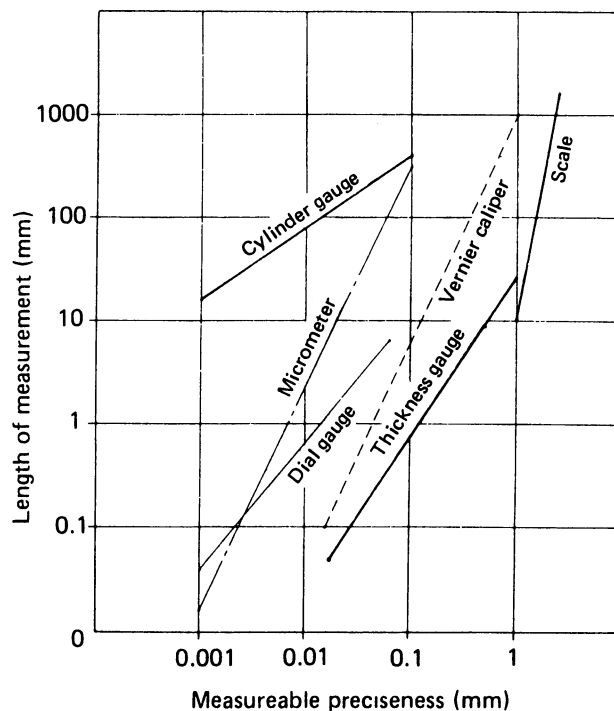
- If the part is found to be cracked by visual inspection it should be replaced or repaired.
- If the length or depth of crack exceeds 1/3 of thickness of the part, it should be replaced and not repaired.
- A part having an internal crack should be replaced.

## 3. PITTING

- a) Pitting by cavitation**  
In most cases, cavitation is accompanied by chemical corrosion. After removing rust or scale, carefully inspect the depth of pitting.
  - When the pitting can not be repaired within the allowable limit, replace the part.
  - If pitting is not deep, resurface the part after removing the rust or scale.
- b) Pitting due to removal of surface**
  - If ball bearing is pitted, replace it.
  - If more than 1/3 of contact face is pitted, the part should be replaced.
  - If pitting is not serious, resurface the part.

## 4. TEST BY MEASURING DEVICE

- To avoid measuring error, measure 2 to 3 times. If the readings are not constant, repeat the measuring.
- When checking inside diameter or outside diameter, measure at 2 points at right angle. Measurements should be carried out at several portions along the whole length of the part.
- The accuracy of the measurement is assured only by the minimum unit of the reading on the measuring tool used.
- The measuring tool used should be determined according to the allowable limit.  
When determining the kind of measuring tool, use the following table as reference.



## 5. PART INSPECTION

### a) Bearing inspection

- Check bearing case for rust, scoring, or other damage and remove if damaged.
- After cleaning the bearing, rotate it with the fingers to check it rotates freely and smoothly.

When the bearing does not rotate smoothly, internal scoring or dirt and foreign material may be the cause.

- After installation, rotate the bearing with the fingers and sense if the torque is even.  
If the feeling is uneven, installation may be defective.

### b) Gear inspection

- Check gear tooth for scored, pitted, and spalled areas. Repair damage before reassembly.
- If pitting on gear tooth is found, it is necessary to check gear backlash, tooth contact and end play.
- If backlash and end play are not in the specified range, change the gear. If the gear tooth contact area is less than 1/3 of whole tooth, change the gear. If pitted area is more than 1/3 of whole area, change the gear.

These are general guidelines.

Experience and judgement must also be applied.

- When gear tooth broken, replace the gear.

### c) Seal ring inspection

- If rubber is hardened, do not use it even if it is new.
- If oil seal lip is damaged, replace it with new.
- Rubber rings may become hard, losing sealing capacity when stored for long periods of time, or in hot place.

## GENERAL PRECAUTIONS FOR DISASSEMBLY

### 1. PREPARATION BEFORE REPAIR

#### a) Washing before moving to a repair shop

Wash off soil, sand and dirt thoroughly before moving the machine to the repair shop.

Soil, sand or dirt remaining on the machine in the shop could result in poor washing efficiency, damage to the components and intrusion of dust or dirt into the interior of the assembled machine.

#### b) Advance check

Before beginning of work, make a check and keep records on the following items, as it will greatly help to reduce component costs, save labor and provide proper guidance to the user to prevent the occurrence of further troubles.

- Machine model, machine serial number and service meter reading.
- Reason for repairs (check the actual condition, cause and location of trouble. Make a second check if necessary).
- Check for dirty air cleaner elements, air leaks, etc.
- Check for oil quantity, dirty oil (viscosity, color, impurities etc.)
- Check for water in the oil, oil leak and clogged oil filter element.
- Check of standard adjustment values.
- Check damage to components and loose bolts.
- If possible, operate the machine to know conditions.

#### c) Preparation for repair

To save labor, provide sufficient space, the repairs shelves for keeping the dismantled parts and tools. Keep the space clean.

### 2. CAUTION DURING DISASSEMBLY

#### a) Dismounting the parts.

- Check the conditions and positions (front, rear, left, right, upper or lower) of the parts and the disassembly procedure.
- Check the alignment marks showing the correct mounting positions and make identification marks in the necessary places to prevent assembling errors
- Use special tools for specified parts.
- If a part is tight fitted after the removal of the bolts or nuts, check for any trouble without applying undue force and dismount after the trouble is remedied.
- Put similar components together and identify them with fiber pens or tags.
- If possible, keep the standard parts, such as bolts, nuts, etc. with the mounting positions, number of parts etc. should be taken into consideration.

#### b) Checking and inspection during dismounting

- The causes of trouble are often discovered during disassembly so take care to check for burning, and interference of sliding parts.
- Measure the end clearance, backlash, protuberance etc. and record them for detecting the possible cause of trouble, as they can be measured only during disassembly.

#### c) Removal of shims and washers

Shims and washers used for adjusting clearances should be carefully stored together so that they can be mounted under the same conditions.

#### d) Removal of linkage

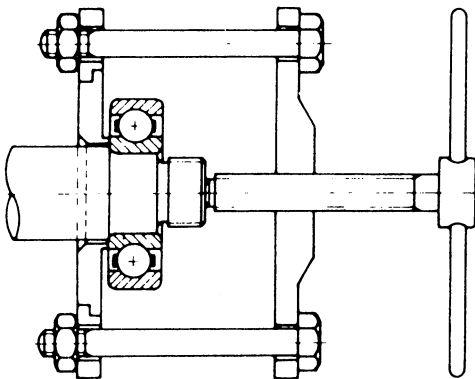
Keep adjustable rods as they are removed. If it is necessary to change the adjustment, measure the length before dismounting and keep records so that the length will be the same after assembling.

**e) Dismounting tapered or fitted parts**

If a tapered or fitted part that should be a tight fit can be easily removed, inspect the part in question and look into the cause of the trouble, lest the same trouble should take place at the time of assembling

**f) Bearing removal**

When removing bearings, do not apply undue force. Use a puller as shown in the sketch below.



 **SAFE OPERATION**

- Be sure to keep the work area clean and in proper order
- When loosening bolts and nuts, use a wrench of a proper size.

Do not take inch for mm or use a wrench of an inadequate size, or loosen the bolts or nuts while pushing them away from you, as the wrench may slip.

**3. AFTER DISASSEMBLY****a) Washing**

- Wash the disassembled parts thoroughly and store them so they can be easily located when needed. Carefully, remove dust and sludge from oil ports of the components and the insides of pipes
- Washing efficiency may be improved by using two vessels for the cleaning fluid, one for dirt removal and one for finishing wash.
- For washing the bearings or other precision parts, use clean kerosene or light oil which does not contain water.
- When washing large casting in a washing tank, wash for 5 to 10 minutes with a washing solution adjusted to a pH of 10 to 12 and maintained at 50 to 70°C. Wash thoroughly with water.
- When using special washing agents, learn how to handle them properly so that the washing solution does not splash on skin or into eyes. Don't discard waste liquid into sewage.

**b) Dirt and dust prevention**

- Cover the washed parts to prevent the adhesion of dirt. Put a cap on pipe holes etc.
- Take temporary measures or preventing rust formation if assembling takes too much time.

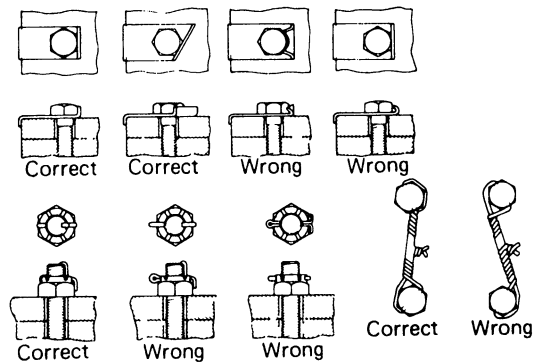
# GENERAL PRECAUTION FOR ASSEMBLY

## 1. CAUTION DURING ASSEMBLY

### a) Assembly of the parts

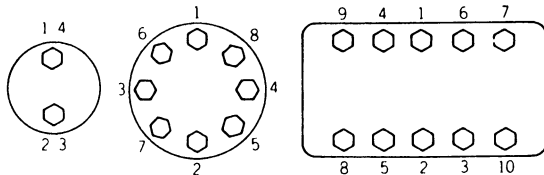
- Clean all parts before operation and remove any burrs, flaws or dents. As dust and dirt affect the sliding parts and lower the service life of the machine, keep dust and dirt from entering.
- If a part is new and provided with a rust-resisting coating, remove the coating with light oil or 1-1-1-trichloroethane before installation.
- If a part has an alignment mark, mount it with the mark correctly aligned with the machine alignment mark.
- When mounting bearings, bushings or oil seals, use a press and/or driving tool.
- Apply molybdenum disulfide grease to the surface of press-fit parts.

- Use wire or plate to securely lock the bolts or nuts as shown.



### b) Tightening bolts and nuts

- Tighten left and right bolts or nuts and upper and lower bolts or nuts alternately so that a clamping pressure may be applied evenly.



- The bolts located at the important portions should be tightened by using a "temperate method". The temperate method is the way to tighten the bolts or nuts step by step or to loosen once before final torque to increase the better clamping pressure or uniform tightening.
- Apply machine oil to threads of bolts with a specified torque so the threads will not drag and give a false torque value.

- If a "Loctite" agent is used for a bolt (this agent may be identified by a white residue on the threads), wash the bolt with light oil or 1-1-1-trichloroethane, dry, and apply two or three drops of the "Loctite" on the threads, and tighten.

### c) Inspection during assembly

Be sure that the end clearance, end play, protuberance, step, backlash etc. that may be checked only during assembling are measured and correct before proceeding to the next operation. Record them if necessary.

### d) Assembly of the adjustable clearance portions

Shims and washers used for adjusting the clearance should be assembled in the same state as before. Ascertain the clearance value after assembling.

### e) Assembling of linkage

Assemble the rod with the same clearance as before dismounting, unless there is some trouble.



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