

SHOP MANUAL

KOMATSU

HA 250

HA 270

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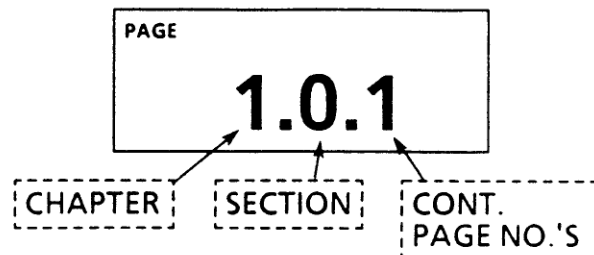
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FOREWORD

The Shop Manual is prepared as an aid in quality repairs by giving the service man an understanding of the dump truck, and showing him the correct way of perform repairs and make judgements. Make sure that you understand the manual and use it at every available opportunity. The manual will also be a good help to office personel and other persons which are involved with the dump truck in one way or another.

HOW TO READ THE PAGE REFERENCE:



The manual is divided into following sections:

STRUCTURE AND FUNCTION (-.1.0):

This section explains how the components are build and how they works.

TESTING AND ADJUSTING (-.2.0):

This section explains checks to be made before and after performing repairs as well as adjustments to be done at the completion of the checks and repairs.

DISASSEMBLY AND ASSEMBLY (-.3.0):

This section describes how to remove, install, disassemble, repair and assemble components, and the work order. Special tools are listed at the end of each chapter. The special tools are an excellent aid in the work shop. By using special tools, the job will be easier to perform and in some cases a special tool is required to carry out the work. List of all special tools for the complete truck are listed in the "Special Tool Guide".

MAINTENANCE STANDARD (0.4.0):

This section gives the judgement standards when inspecting disassembled parts.

TROUBLE SHOOTING (-.5.0):

This section is an first aid when a fault is detected, before the practical searching starts. A skilled and trained mechanic together with the Shop Manual is the best trouble shooter when a repair instruction is needed.

This manual is originally produced by MOXY TRUCKS AS, 6440 Elnesvågen, Norway and partially modified by KOMATSU, Tokyo, Japan.

THIS MANUAL MUST NOT BE REPRODUCED, TRANSLATEED OR MADE AVAILABLE TO A THIRD PARTY, FULLY OR PARTIALLY, WITHOUT OUR WRITTEN PERMISSION.

TYPES OF SEALING- / LOCKING COMPOUNDS AND LUBRICANTS.

- LOCTITE 242: Middle strength.
For locking of screws, bolts and nuts.
- LOCTITE 270: High strength.
For locking of screws bolts and nuts.
- LOCTITE 601: High strength.
For locking of bearings, bushings, etc.
- LOCTITE 638: Extra high strength.
For locking of bearings, bushings, etc.
- LOCTITE 574: Master gasket as floating gasket.
- LOCTITE 572: For sealing between cylinder liner and engine.
- MOLYCOTE 321R*: For greasing of thrust rings, bearing rings,
shafts and bushings before assembly.
- WÜRTH 210: For protection against corrosion on electrical wires
and components.

WEIGHTS AND MEASURES:

Length	m - meter km, (dm), (cm), mm, m	1000 m = 1 km 1 km = 0,621 mile 1 m = 1,094 yd 1 m = 3,281 ft 1 m = 39,37 in	yard foot inch
Area	m ² - square meter dm ² , cm ² , m ²	1 m ² = 1,20 yd ² 1 m ² = 10,76 ft ² 1 dm ² = 15,5 in ²	square yard square foot square inch
Volume	m ³ -, cubic metre dm ³ , cm ³	1 m ³ = 35,32 cu ft 1 dm ³ = 1 l 1 dm ³ = 0,220 gal (UK) 1 dm ³ = 0,264 gal (US) 1 dm ³ = 61,02 cu in	cubic foot litre English gallon US gallon cubic inch
Weight	kg - kilogram	1 t = 1 tonne (metric) 1 t = 0,984 ton (UK) 1 t = 0,902 ton (sh.tn.) 1 t = 19,68 cwt 1 kg = 2,20 lb 1 kg = 35,27 oz	hundred weight pound ounce
Output	kW - kilowatt	1 kW = 1,36 hk 1 kW = 1,34 hp	hestekraft horse power
Force	N - Newton	10 N = 1,02 kp 10 N = 2,25 lbf	(≈ 1 kp) pound-force
Force moment	Nm - Newton meter	10 Nm = 1,02 kpm 10 Nm = 7,38 lbf ft	(≈ 1 kpm) pound-force foot
Pressure	bar	1 bar = 1,02 kp/cm ² 1 bar = 14,5 lbf/in ² 1 bar = 100 kPa	psi kiloPascal
Temperature	°C (grad Celsius)	°C = 5 × (°F - 32)	grad Fahrenheit

TORQUE LIMIT TABLE

This tables indicates standard torque limits in Nm for the various screw and bolt qualities and dimensions. The torques are valid for not oiled bolts. If nothing special torque setting is indicated, select correct torque limit from the following tables:

MF (Fine metric threads):			
Quality class:	8.8	10.9	12.9
Dimension	M (Nm)	M (Nm)	M (Nm)
M 8×1	25	35	42
M10×1,25	48	68	81
M10×1	49	70	84
M12×1,5	83	117	140
M12×1,25	85	120	144
M14×1,5	135	190	288
M16×1,5	204	287	344
M18×1,5	294	413	496
M20×1,5	408	574	688
M22×1,5	546	768	921
M24×2	696	979	1170
M27×2	1000	1410	1690
M30×2	1390	1950	2340
M33×2	1860	2610	3130
M36×2	2350	3310	3970

M (Metric threads):			
Quality class:	8.8	10.9	12.9
Dimension	M (Nm)	M (Nm)	M (Nm)
M 8	24	33	40
M10	47	65	79
M12	81	114	136
M14	128	181	217
M16	197	277	333
M18	275	386	463
M20	385	541	649
M22	518	728	874
M24	665	935	1120
M27	961	1350	1620
M30	1310	1840	2210
M33	1770	2480	2980
M36	2280	3210	3850

UNF (Unified fine threads):			
Quality class:	8.8	10.9	12.9
Dimension	M (Nm)	M (Nm)	M (Nm)
3/8" UNF	41	59	73
7/16" UNF	66	93	115
1/2" UNF	99	141	175
9/16" UNF	142	201	250
5/8" UNF	197	279	347
3/4" UNF	344	486	606
7/8" UNF	547	772	963
1" UNF	814	1150	1430
1 1/8" UNF	1170	1660	2060
1 1/4" UNF	1620	2290	2850
1 3/8" UNF	2170	3070	3820
1 1/2" UNF	2840	4000	5000

UNC (Unified course threads):			
Quality class:	8.8	10.9	12.9
Dimension	M (Nm)	M (Nm)	M (Nm)
3/8" UNC	38	54	68
7/16" UNC	61	87	108
1/2" UNC	93	131	163
9/16" UNC	133	187	234
5/8" UNC	183	259	323
3/4" UNC	322	455	568
7/8" UNC	516	729	909
1" UNC	772	1090	1360
1 1/8" UNC	1090	1550	1930
1 1/4" UNC	1530	2160	2690
1 3/8" UNC	2020	2850	3550
1 1/2" UNC	2650	3750	4680
1 3/4" UNC	4190	5930	7390
2" UNC	6290	8890	11100
2 1/4" UNC	9090	12800	16000
2 1/2" UNC	12500	17600	21900

$$1 \text{ Nm} = 0,102 \text{ kpm} = 8.85 \text{ lb} \cdot \text{in} = 0738 \text{ lb} \cdot \text{ft}$$

SAFETY IN SERVICE WORK SHOPS.

GENERAL

Purpose

This section is intended as general information about dangers in various types of workshop activities.

Follow the workshop manual

The workshop manual provides instructions about work methods and equipment that reduces the risk of accident. We make the assumption that such instructions are followed.

Mechanical skill

is a very important factor to consider. We assume that the Moxy-mechanic is skilled and well trained for his job.

If a mechanic does not have such qualities the risk are much greater and more difficult to anticipate.

Common sense....

...is another characteristic that should form the basis of the activities in the workshop.

Negligence and carelessness can not be allowed.

Work with a safety margin

Always expect something to go wrong during the work.

Always work with a safety margin where there are risks.

Legislation and local rules

In most countries there is legislation and local rules that apply to safety at work. Follow them always.

Warnings on parts or packages

Always read and follow warnings and instructions.

Do not trust your own knowledge of the risks. The properties of a part or the chemical composition of a product could have been changed.

BE AWARE OF THE RISKS AROUND YOU

You have to know where the risks are . . .

. . . otherwise you cannot avoid them.

In many cases the risks are that obvious that you do not have to search for them, e.g. carbon monoxide - true it is invisible, but you know that it is lethal. Thus you protect yourself.

The hidden dangers

Dangers are found in all work environments and the most serious danger is in not being aware of the risks.

The three demands of safety

- Knowledge: You have to know your job and also where the risks are.
- Apprehension: You must be aware that you are exposed to risks, or at least to suspect that you are.
- Caution: You have to protect yourself, DO NOT TAKE CHANCES.

Incidents are warning signals

An incident is an unforeseen event without injury or damage.

The next time the consequence of the same happening may be worse.

An incident demonstrates that there is a risk. Every incident must be taken as a warning signal - exactly as if there had been an accident or someone taken ill.

Look out!

Do not trust others to point out the risks. It is difficult to remember all pointers and exhortations. New and unexpected risks may also occur.

Thus: **Look out. !**

As a guide we will in the following give a number of examples of risks. It is not to be regarded as a comprehensive listing.

VIBRATIONS

When using vibrating tools e.g. chisel hammer, impact drill, impact nut runner, grinder injuries may be sustained by transition of tool vibrations to the hands.

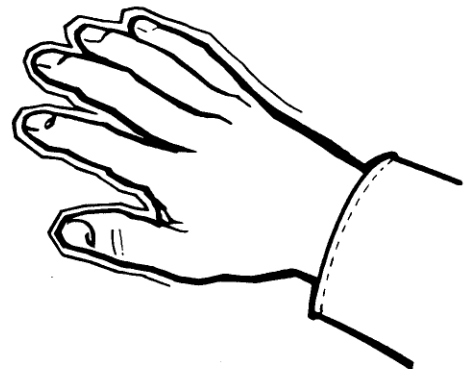
Risks

Vibrations may cause vascular spasms (prickling and pain) in the surface veins. The fingers turn white, cold and senseless. Also nerves, muscles, bones, sinews and joints may be injured.

The risk of injury is believed to increase by smoking and also by low temperatures e.g. if the tool is cold or if the hands are exposed to chilling air.

The injuries become apparent especially when the fingers are cold, often when not working.

Vibration injuries are curable if taken care of in time.



Protective measures

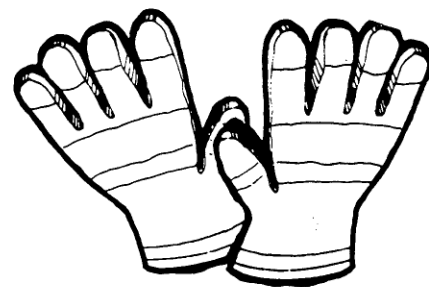
Use heavy gloves. Gloves provide some protection against vibrations and low temperatures.

Alternate between vibration-free and vibrating jobs to provide the body with a possibility to rest from vibrations.

By varying the work posture and grips the body is not one-sidedly exposed to vibrations.

Avoid smoking before and during the work to help the blood circulation as much as possible.

If you notice any signs of vibration injury consult a doctor.



Protection against vibrations:

- Heavy gloves.
- Alternate jobs.
- Change work posture.
- Do not smoke before and during the work.

NOISE

Injurious noise?

Rule of thumb: Noise that is louder than 85 db (A) and that prevails for more than 8 hours is classed as injurious. (Some countries have other limits.) High frequency noise (high-pitched) is more injurious than low frequency noise (low-pitched) of the same amplitude.



Risks

Partial deafness, in difficult cases impaired hearing beyond cure.

It is impossible to train your tolerance to noise. You may believe that you are doing that if you notice less of the noise after some time. IN THAT CASE YOU ARE REALLY IN DANGER. Probably your sense of hearing is already impaired.

Protective measures

With noise absorbers on roof and walls and screens between work places it is easier to limit the propagation of noise.

But the possibilities are limited. Against injurious noise you have to protect yourself with ear muffs. Ear muffs have to be tested and approved.



Protection against noise:

- Use ear muffs.

ORGANIC SOLVENTS

What are organic solvents?

Organic solvents are mixtures of organic liquids (differently from e.g. water) that dissolve grease, paint, varnish, wax, oil, glue, rubber etc.

Examples:

- | | |
|----------------------|-----------------------------------|
| - Petroleum spirits | - Toluene |
| - Trichlore ethylene | - Thinner |
| - Petrol | - Alcohols |
| - Xylen | - Plastics and appertaining glues |

Risks

Solvents release fumes. Fumes may cause dizziness, loss of balance, headache and nausea. Fumes may also irritate the wind pipes.

To be affected by a solvent may also lead to injury to the central nervous system. This may result in insomnia, depressions, nervousness, poor memory and a general sense of feeling tired.

When solvents come in direct contact with the skin it will become dry and cracked. The risk of skin allergies increases and, additionally, there is a risk of a solvent causing dermatitis.

Many solvents are flammable.

Protective measures

As a first measure, arrange for ventilation that prevents fumes from mixing with the air you breathe. Note that the ventilation has to be fire-proof if a solvent is flammable.

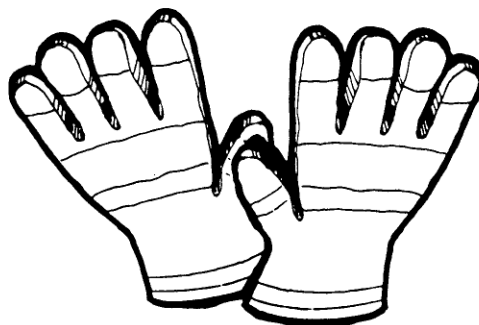
If a problem cannot be resolved with ventilation it is necessary to wear either a face mask or breathing protector with filter against dust and organic fumes.

Never leave tins with paint or solvent without cover.

Use solvent with low content of aromatics. This reduces the risk.

Ensure that solvents do not come into contact with the skin and do not use them as detergent.

Use plastic gloves when working. Gloves of certain materials can be penetrated by a solvent or even dissolved by such solvents. Make certain.



Protection against organic solvents:

- Fireproof ventilation
- Face mask or breathing protection with filter.
- Put back cover!
- Use as harmless solvents as possible
- Avoid contact with the skin.
- Do not wash the skin with solvent.
- Use gloves.

COOLANT

Risks

The cooling system is over-pressurized when the coolant is hot. Coolant that leaks or bursts out may cause scalding.

Coolant consists of water and corrosion inhibitor, and if necessary, anti-freeze. The anti-freeze may consist of ethylene glycol.

Ethylene glycol and corrosion inhibitor are injurious and dangerous to consume. Splashes in the eyes are dangerous and in contact with the skin such substances can penetrate and cause dermatitis.

Coolant may also consist of other mixtures that may imply other risks.

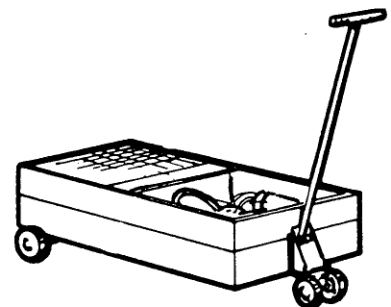
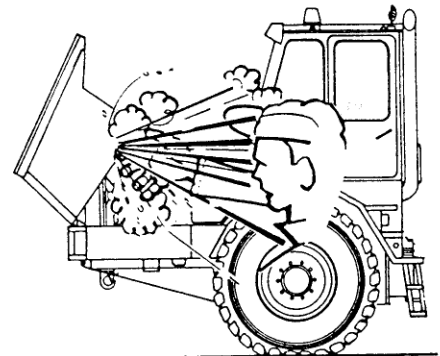
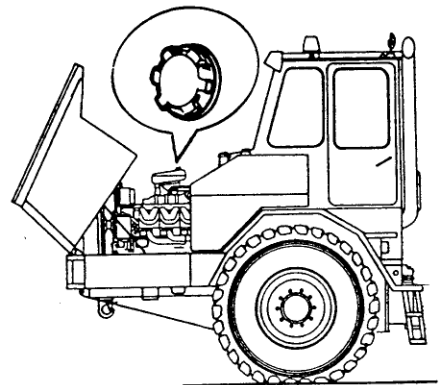
Protective measures

If possible, avoid working with coolant lines and containers when coolant is still hot.

First remove the filler cap carefully to release the over-pressure. Hot steam and coolant may burst out.

If there is a risk of splashing you must use rubber gloves and protective goggles. Change clothes if coolant has splashed on them. Contact with the skin may be dangerous.

Use special equipment for draining and filling e.g. a cart with container and pump. It is not permitted to dump coolant in sewer systems or on the ground.



Protection against coolant:

- Preferably wait until coolant has become cold.
- Remove filler cap carefully.
- Use rubber gloves and protective goggles.
- Use special equipment for draining and filling.

REFRIGERANT

Refrigerants are used in various thermal equipment e.g. air conditioning in vehicles.

Risks

Refrigeration equipment operates under pressure. A refrigerant that is leaking may cause frost-bite.

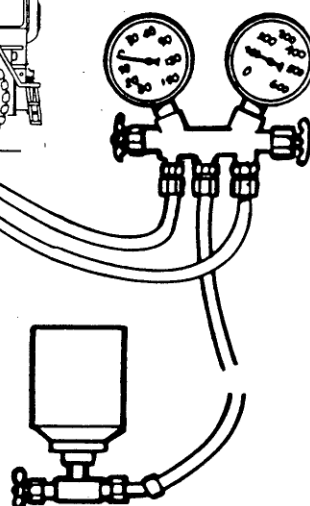
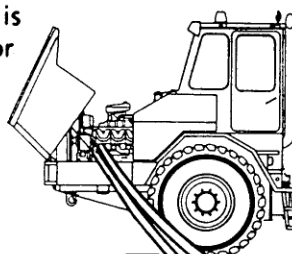
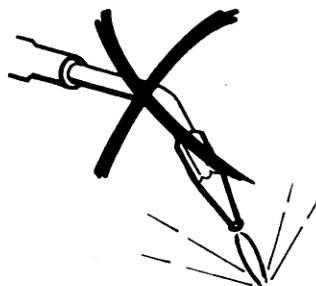
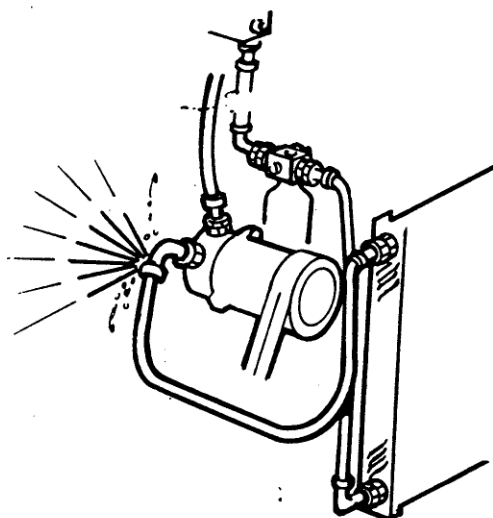
A refrigerant that is leaking and exposed to heat e.g. by a welding flame or cigarette becomes very dangerous to breathe.

Protective measures

Always use special equipment when draining or filling refrigeration equipment. This reduces the risk of leakage.

Do not loosen connections on refrigeration equipment without first draining the system or reducing the pressure.

Avoid welding and smoking when carrying out work that implies a risk of leakage. A leaking refrigerant is not noticed as the gas is practically odourless. The gas is heavier than air and therefore a portable air evacuator at floor level is suitable.



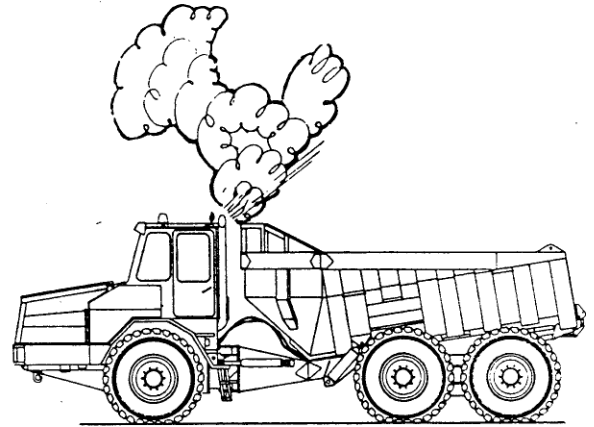
Protection against refrigerant:

- Use special equipment for draining and filling
- Drain system before loosening connections
- Avoid smoking and naked flame
- Use portable air ventilator

AIR POLLUTION

Examples:

- Carbon monoxide - present in exhaust fumes
- Nitric oxide - present in exhaust fumes
- Welding fumes, especially fumes from galvanized or painted metals
- Oil mist (e.g. in anti-corrosion treatment)
- Sulphuric acid mist (e.g. when charging batteries)
- Grinding dust and fumes formed when grinding and heating plastic, varnish, anti-corrosive, lubricants, paint etc.



Risks

Carbon monoxide reduces the ability of the blood to supply the brain and other parts of the body with oxygen.

Carbon monoxide poisoning = "Internal asphyxiation".

Nitric oxides and gases and the fumes from plastic, varnish, anti-corrosive, lubricants, paint etc may damage the lungs.

Oil mist from certain oils may cause skin problems such as blemishes, boils and eczema.

Sulphuric acid mist is erosive and may damage the windpipes.