TAKEUCHI®

Service manual

WHEEL LOADER SERIES TW50

ISSUE:08-08-07

ATLAS WEYHAUSEN

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I. Preface

This machine has been manufactured in accordance with today's technical standards and all known safety regulations.

However, using it may still pose a danger.

To prevent such dangers and to avoid putting people at risk and damaging the machine, the user must know how the machine works and how it is operated.

It is therefore important to strictly adhere to the

Safety regulations

and

Instructions

for operating the machine.

As the components of the machine are undergoing continuous development, we reserve the right to make changes.

Please do not hesitate to contact us with any queries that you may have:

Order No. 8015739

II. Table of Contents

0 INTRODUCTION

Qualification of personnel

This manual has been written for service personnel trained by TAKEUCHI to complete maintenance and repair work on their wheel loaders.

Product

This manual documents a TAKEUCHI production series product with construction status complying with the date of issue.

Service

The maintenance and repair measures for machines may require different working procedures or setting and test data from that described here as a result of further technical developments to the product.

Therefore, we recommend you have your TAKEUCHI wheel loader inspected by service personnel whose practical and theoretic training is constantly brought up-to-date by our customer service personnel.

Repair work carried out by TAKEUCHI service stations is also covered by the warranty within the scope of the current contractual conditions.

Damage caused as a result of work being completed improperly and unprofessionally by personnel not authorized by the manufacturer, and any consequential costs, are excluded from any contractual liability.

This also applies to the failure to use original spare parts from TAKEUCHI.

– TAKEUCHI Service –

0.1 User Information on the Service Manual

NOTE	This Service Manual is intended for service personnel trained by us. All the work described here may only be performed by this group of personnel.

To all manual users

The use of this Service Manual should help you to localize sources of faults quicker and easier, and to eliminate them by performing the repair work described.

If your equipment becomes defect, localize the fault according to the procedures described here.

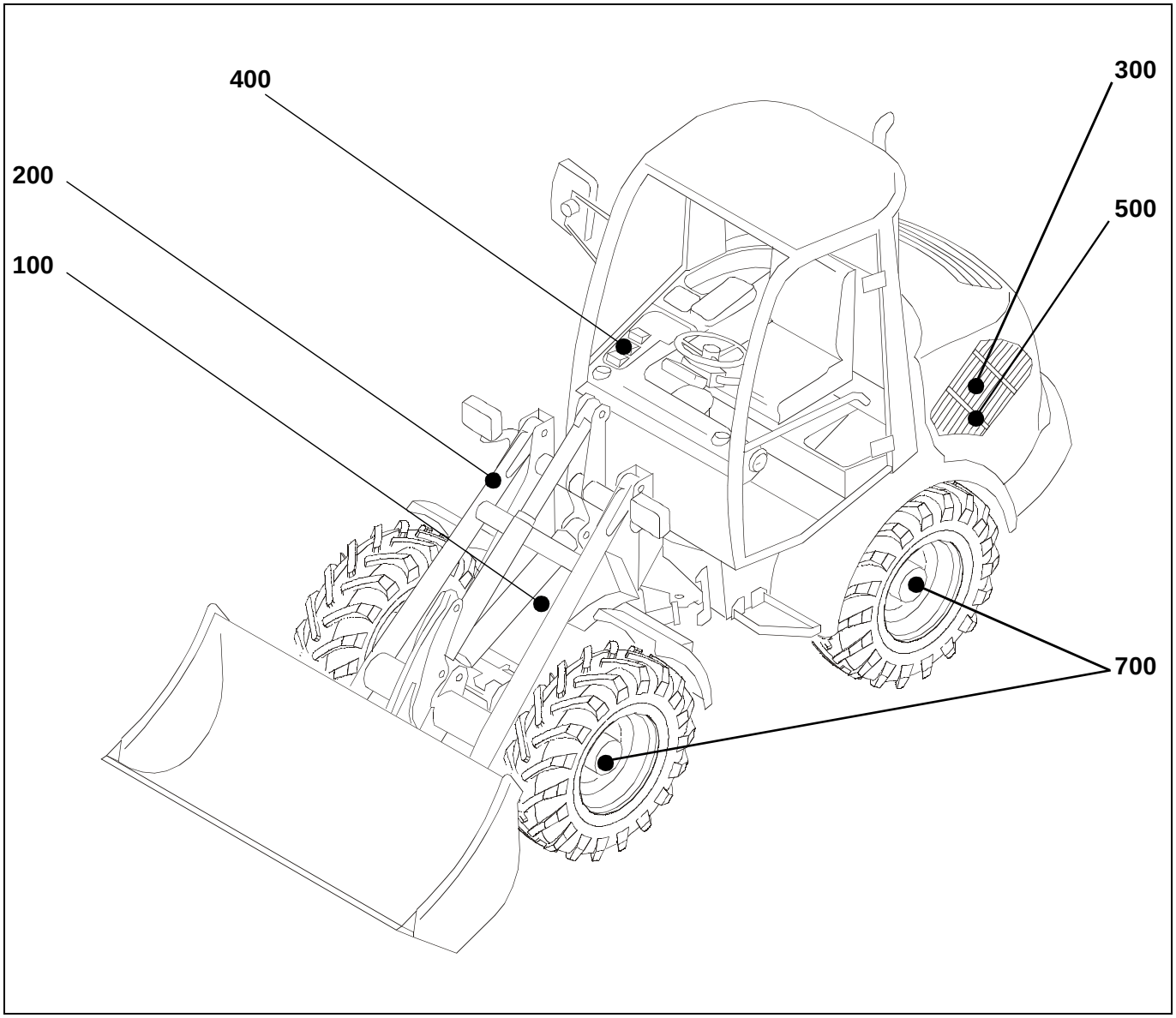
Years of experience gained by our service technicians in the repair of wheel loaders represent the basis of the contents of this Service Manual.

Using the manual

The manual provides a basis for:

- A quick reference of possible faults and how to clear them.
- Clear descriptions of all the adjustment and setting values.
- Chronological descriptions of the various repair work, disassembly and assembly of components.
- Overview of the tools necessary.
- Simple, unambiguous identification of spare parts.
- Quick access to overviews and circuit diagrams concerning the hydraulic and electric systems.
- Basic information on the hydraulic system, electrical installations and vehicle construction.
- Details on consumables and emissions.
- Vehicle and technical data.

0.2 Breakdown of Assembly Groups and Chapter Overview



MAIN GROUPS	DESCRIPTION	PAGE
100	Front and Rear Carriage	23
200	Hoisting Gear and Hoisting Gear Hydraulics	43
300	Hydraulic System	57
400	Electrical System	159
500	Diesel Engine	189
600	not applicable for wheel loader models with standard electric	-
700	Axles and Brakes	207
800	Operator's Cab	235

0.3 Technical Description of the Wheel Loader

Definition of a wheel loader

A wheel loader is a construction site machine for transporting loads close to the ground, predominantly bulk material.

A working cycle is comprised of filling, raising, transporting and depositing the material.

Deployment options

The possibility of changing attachments quickly and easily by means of a hydraulic Quick Disconnect Coupler (QDC) means that a wheel loader, which has just been used to transport bulk material, can be converted to a transport vehicle for pallets loaded with bricks or other materials.

Constructional design

The connection of the front carriage and rear carriage by means of an articulated pendulum joint ensures the wheel loader can be well maneuvered and steered on off-road terrain.

- The angular movement is ±12°.
- The full lock of the steering wheel per side (jack-knifing) is 40°.

The hoisting gear for the loading movement is fitted on the front carriage.

The shovel size and the maximum load depend on the attachment selected.

The rear carriage contains the components for the drive, diesel engine, hydraulic system, electrical installations and operator's cab.

The front carriage consists of the front axle, hoisting gear and loading circuit.

Hydraulic system

The diesel engine installed in the rear carriage drives a combined pump set directly.

This pump set supplies all the hydraulic circuits with the necessary quantity of hydraulic oil. All driving and loading movements of the wheel loader are generated and controlled hydraulically. The wheel loader is equipped with a central, hydrostatic drive which acts on all four wheels.

Operator's workplace

The operator is provided with a generous sized operator's cab equipped with large windows and well-arranged operator controls.

The operator's cab is made of a welded steel frame construction and is a roll-over protected structure (ROPS) in compliance with DIN/ISO 3471.

The operator receives vehicle information via an operating and display console on the steering column.

Heating and ventilation

The interior of the cab is provided with a multistage ventilation device which draws in fresh air, filtered, from outside.

The air for the interior of the cab can be heated by continuously variable thermoregulators. Heat is supplied by means of heated engine oil from the diesel engine.

Operator's seat and joystick

An adjustable, sprung, operator's seat, complying to safety requirements, protects the operator from vehicle jolting.

The joystick (control lever) is located in the adjustable armrest to the right of the operator's seat. The joystick is used to control the movements induced by the loading circuit.

Switches in the joystick switch the drive functions such as forwards/reverse, cross-country reduction gear and differential lock.

A further control lever beside the joystick controls the functions of the Quick Disconnect Coupler (QDC) or 4th section.

0.4 Safety Regulations for Work on the Wheel Loader

NOTE	All the safety precautions and operating instructions necessary to operate the wheel loader are provided in the relevant wheel loader operating manual.
⚠ **WARNING**	The safety and warning information provided in this Service Manual must be observed prior to starting the repair work and during its completion.
NOTE	It is essential to observe any overriding laws and directives applicable in your country concerning the deployment and use of construction site machines. Familiarize yourself with them and their content and check that they are observed.
NOTE	Apply warning and danger signs to the wheel loader on which repairs are to be carried out. Take applicable measures to ensure that the wheel loader **cannot** be started up.

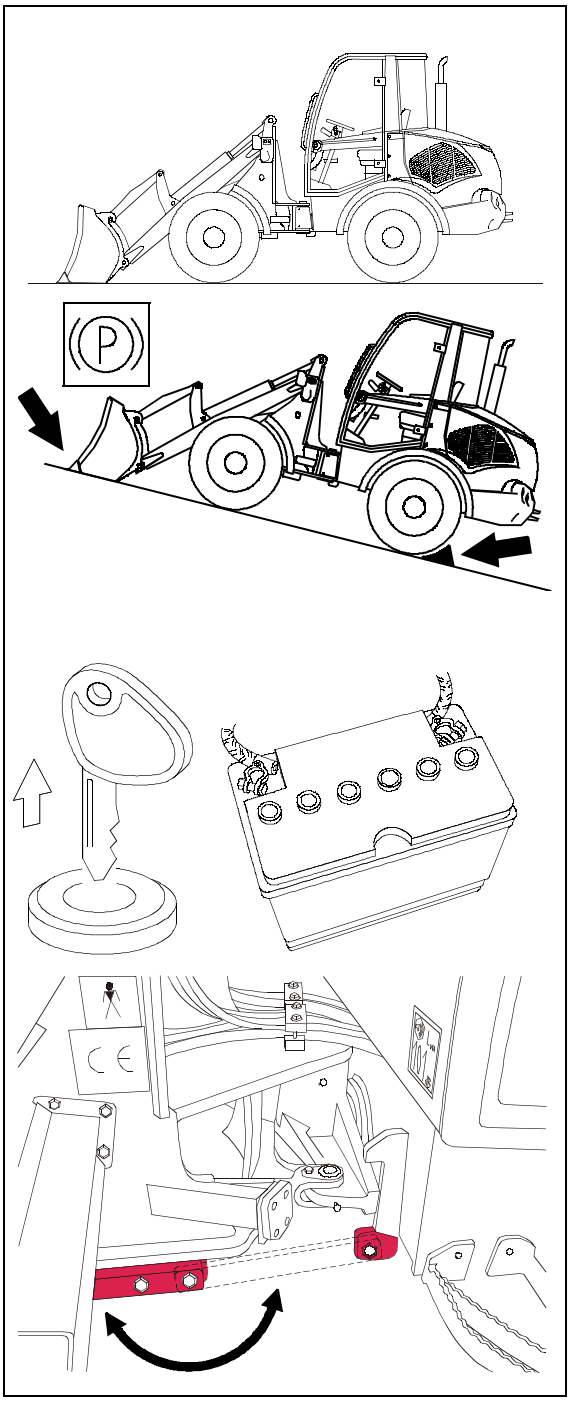
0.5 Safety Regulations in the Service Manual

The Service Manual contains attention and warning symbols indicating risks.

These attention and warning symbols are intended to make you aware of situations which could lead to personal injury and property damage.

⚠ DANGER	Sources of danger which could lead to fatal or severe personal injury.
⚠ CAUTION	Activities or lack of concentration during work which could lead to fatal or severe personal injury.
⚠ WARNING	Activities or lack of concentration during work which could lead to personal injury or property damage.
NOTE	Indication of special technical features to be observed during disassembly or assembly of components to prevent machine damage.

0.6 Securing the Wheel Loader Prior to Beginning Work



Securing measures

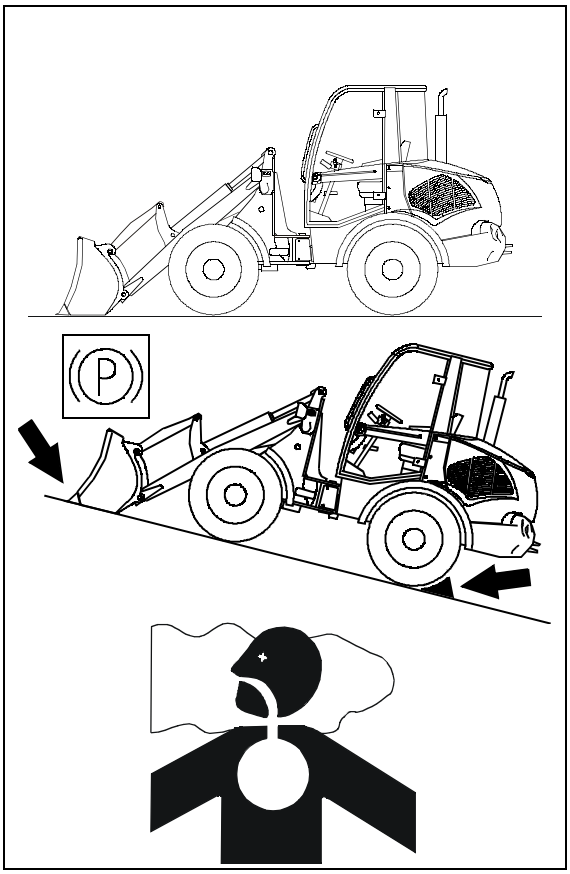
- Lower the attachment to its home position.
- Stop the diesel engine and prevent it from being switched on again by removing the ignition key.
- Apply the hand brake.
- Place wheel chocks under the wheels to secure them.
- Check the hydraulic circuit is depressurized.
- Put the electrical system out of service by disconnecting the minus or plus pole of the battery.
- When working on the front carriage, front axle, brake system or steering, always install the articulation lock.

Tools and aids

Always work using the tools and aids described in the repair instructions.

⚠ WARNING	Makeshift solutions and tools often lead to injuries to personnel and damage to the equipment.
NOTE	In the descriptions of the adjustment and repair work, pay attention to the measuring instruments and test devices prescribed and to any information on the use of special tools.

0.7 Site Where Repair Work is Completed



Working on construction sites

If repair work must be completed at the construction site, find a safe working base:

- Pay attention the wheel loader is parked on solid ground.
- Apply the hand brake.
- Place wheel chocks under the wheels to secure them.
- Protect the working area from moisture and dirt.

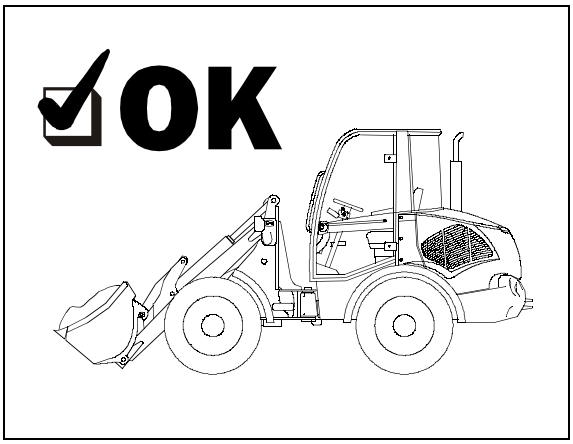
Working in workshops:

If the wheel loader can be repaired in a workshop, clean the wheel loader before starting the work.

DANGER

Risk of toxication!
Ensure sufficient ventilation if the diesel engine is run inside closed rooms.

- Ensure sufficient ventilation of the hall if the diesel engine is run for longer periods.
- If the diesel engine is run for longer periods in the hall, a gas extractor must be installed.
- If the wheel loader is driven over an inspection pit, pay attention the wheels are a safe distance from the edges of the pit.



After completing the repair work

Restore the wheel loader to a safe operating condition.

- After starting up the wheel loader, check for leaks in the hydraulic system.
- Test the functions of the wheel loader.

0.8 International Measuring Units

EUROPE	USA
25,40 mm	1 in (inch)
1 kg (Kilogramm)	2,205 lb (pounds)
9,81 Nm (1 kpm)	7,233 lbf x ft (pound force foot)
1,356 Nm (0,138 kpm)	1 lbf x ft (pound force foot)
1 kg / cm	5,560 lb / in (pound per inch)
1 bar (1,02 kp/cm²)	14,233 psi (pound force per square inch lbf/in²)
0,070 bar (0,071 kp/cm²)	1 psi (lbf/in²)
1 Liter	0,264 Gallon (Imp.)
4,456 Liter	1 Gallon (Imp.)
1 Liter	0,220 Gallon (US)
3,785 Liter	1 Gallon (US)
1609,344 m	1 Mile (land mile)
0°C (Celsius)	32°F (Fahrenheit)
0°C (Celsius)	273,15 Kelvin

0.9 Tightening Torques

0.9.1 Hose connections

TIGHTENING TORQUES M_A IN [Nm] FOR CONNECTIONS						
ROW	**TUBE A. Ø**	**DN**	**THREAD**	**Test Pressure [bar] (1)**	**DKL (2)**	**DKOL (2)**
L	6	5	M12x1.5	375	10-12	8-10
L	8	6	M14x1.5		12-15	10-13
L	10	8	M16x1.5		20-23	18-23
L	12	10	M18x1.5		30-35	27-32
L	15	13	M22x1.5		50-55	45-50
L	18	16	M26x1.5	240	75-85	70-80
L	22	20	M30x2.0		110-120	100-110
L	28	25	M36x2.0	150	160-180	150-160
L	35	32	M45x2.0		240-260	200-220
L	42	40	M52x2.0		320-350	300-320
					DKS (2)	**DKOS (2)**
S	8	5	M14x1.5	960	20-25	18-23
S	10	6	M16x1.5		30-35	27-32
S	12	8	M20x1.5		45-50	40-50
S	14	10	M22x1.5		60-70	50-60
S	16	13	M24x1.5	600	80-100	70-90
S	20	16	M30x2.0		130-150	120-140
S	25	20	M36x2.0		240-270	200-240
S	30	25	M42x2.0	375	360-400	320-360
S	38	32	M52x2.0		600-640	520-560

Counterpart:
Screwed end DIN 3853
Bore form W DIN 3861 Row L+S

(1)Complies with EO nominal pressure + 50%
(2)Union nuts complying with DIN 3870 Form A

0.9.2 Metric headless screws with standard threads

DIMENSIONS x P	TIGHTENING TORQUE M_A [Nm]				
	4.6	5.6	8.8	10.9	12.9
M 4 x 0.7	1,02	1,37	3,3	4,8	5,6
M 5 x 0.8	2.0	2.7	6.5	9.5	11.2
M 6 x 1.0	3.5	4.6	11.3	16.5	19.3
M 8 x 1.25	8.4	11	27.3	40.1	46.9
M 10 x 1.5	17	22	54	79	93
M 12 x 1.75	29	39	93	137	160
M 14 x 2.0	46	62	148	218	255
M 16 x 2.0	71	95	230	338	395
M 18 x 2.5	97	130	329	469	549
M 20 x 2.5	138	184	464	661	773
M 22 x 2.5	186	250	634	904	1057
M 24 x 3.0	235	315	798	1136	1329
M 27 x 3.0	350	470	1176	1674	1959
M 30 x 3.5	475	635	1597	2274	2662
M 33 x 3.5	645	865	2161	3078	3601
M 36 x 4.0	1080	1440	2778	5957	4631
M 39 x 4.0	1330	1780	3597	5123	5994

0.9.3 Metric headless screws with fine threads

DIMENSIONS x P	TIGHTENING TORQUE M_A [Nm]		
	8.8	10.9	12.9
M 8 x 1	29.2	42.8	50.1
M 9 x 1	42.6	62.6	73.3
M 10 x 1	60	88	103
M 10 x 1.25	57	83	98
M 12 x 1.25	101	149	174
M 12 x 1.5	97	143	167
M 14 x 1.5	159	234	274
M 16 x 1.5	244	359	420
M 18 x 1.5	368	523	613
M 18 x 2	348	496	581
M 20 x 1.5	511	728	852
M 22 x 1.5	692	985	1153
M 24 x 1.5	899	1280	1498
M 24 x 2	865	1232	1442
M 27 x 1.5	1304	1858	2174
M 27 x 2	1262	1797	2103
M 30 x 2	1756	2502	2927
M 33 x 2	1352	3350	3921
M 36 x 2	3082	4390	5137
M 39 x 2	3953	5631	6589

0.9.4 RIPP screws with cheese head and hexagon socket

TERMINOLOGY		M5	M6	M8	M10	M12
Across flat dimension	S	4	5	6	8	10
Torque Figures M_A/ Nm	Fkl.	on connecting material steel R_m < 800 / ≥ 800 N/mm²				
	90/80 RG	-	-	-	-	-
	100/10 RG	13/11	24/20	45/42	90/85	150/140
	100/10 FG	-	-	-	-	-
	12.9/12 RG	15/13	28/24	52/50	115/105	180/160
	12.9/12 FG	-	-	-	-	-
RG = Standard thread FG = Fine thread	Fkl.	on connecting material gray cast iron				
	90/80 RG	-	-	-	-	-
	100/10 RG	10	19	39	80	120
	100/10 FG	-	-	-	-	-
	12.9/12 RG	12	22	48	95	140
	12.9/12 FG	-	-	-	-	-

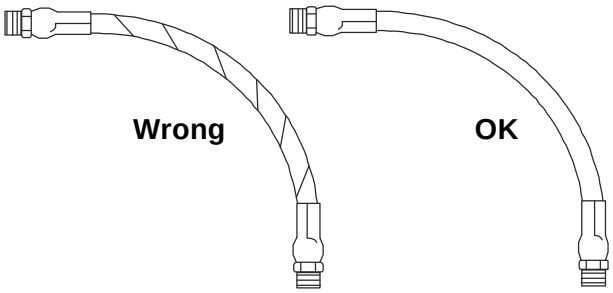
0.9.5 RIPP screws and nuts with cheese head and hexagon head

TERMINOLOGY		M5	M6	M8	M10	M12	M14	M16
Across flat dimension	S	8	10	13	15	17	19	22
Torque Figures M_A/ Nm	Fkl.	on connecting material Rm steel <800/ > 800 N/mm²						
	90/80 RG	-	-	-	-	-	-	-
	100/10 RG	11/10	19/18	42/37	85/80	130/120	230/215	330/310
	100/10 FG	-	-	45/40	95/90	145/138	250/240	370/350
	12.9/12 RG	13/12	22/20	50/45	100/90	165/155	275/255	410/390
	12.9/12 FG	-	-	55/50	110/ 105	175/165	300/290	440/420
RG = Standard thread FG = Fine thread	Fkl.	on connecting material gray cast iron						
	90/80 RG	-	-	-	-	-	-	-
	100/10 RG	9	16	35	75	115	200	300
	100/10 FG	-	-	38	85	130	230	335
	12.9/12 RG	11	18	43	85	150	240	380
	12.9/12 FG	-	-	48	100	160	275	400

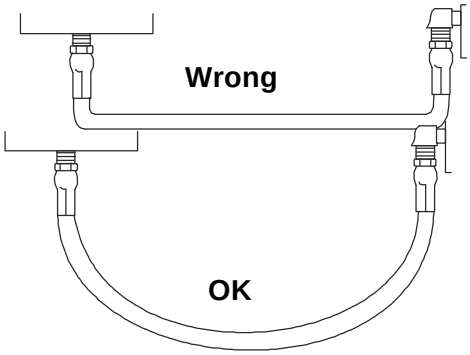
0.9.6 Self-locking screws and nuts with hexagon head

TERMINOLOGY		M5	M6	M8	M10	M12	M14	M16
Across flat dimension	S	8	10	13	15	17	19	22
Torque Figures M_A/ Nm	Fkl.	on connecting material steel						
	90/80 RG	9	16	34	58	97	155	215
	100/10 RG	12	21	44	75	120	185	280
	100/10 FG	-	-	-	-	-	-	-
	12.9/12 RG	14	25	52	90	145	220	340
	12.9/12 FG	-	-	-	-	-	-	
RG = Standard thread FG = Fine Thread	Fkl.	on connecting material gray cast iron						
	90/80 RG	7	13	28	49	83	130	195
	100/10 RG	9.5	16	36	64	105	170	260
	100/10 FG	-	-	-	-	-	-	-
	12.9/12 RG	11	19	43	72	125	200	320
	12.9/12 FG	-	-	-	-	-	-	-

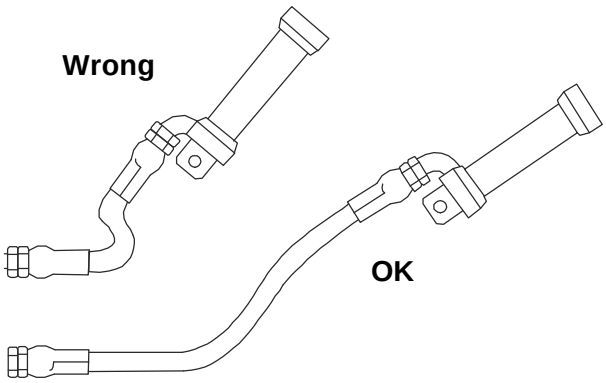
0.10 Positioning of Hydraulic Hose



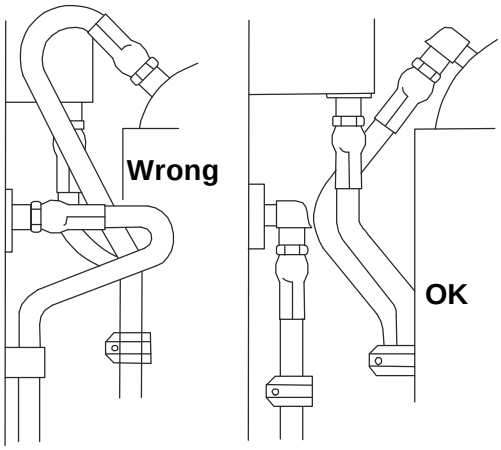
Torsion of hoses is to be avoided because the restoring torque under load may lead to detachment of the connection or cause a defect on the hose line.



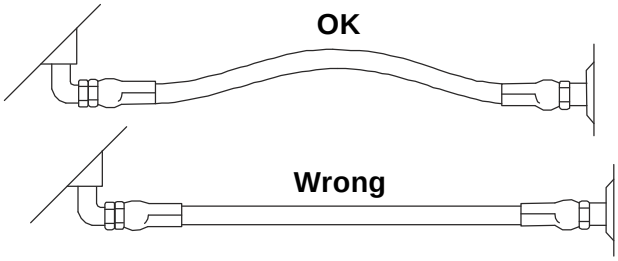
Run hoses in elbows of sufficient diameters in order to prevent kinks or a tear-out under pressure. Narrow elbows flatten the hose and thus obstruct the free flow. In addition, the life expectancy of the hose is shortened considerably.



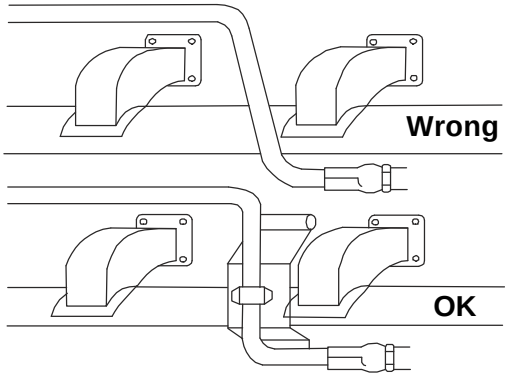
The installation of hose lines on moving parts is to be planned very carefully. Bending radius, torsional strain and a sufficient hose length are to be determined in such a way that none of them falls below the specified values.



The hose length can be kept shorter when using elbow fittings, adapters and hose clamps, which has the additional advantage of a clear arrangement and better appearance. Special attention has to be paid of course to the bending and change of length of the hose.



When fitting hose lines, a tensile load caused by the change of length of the hose is to be avoided in all operating conditions, this does not apply to the hose's own weight.



In case of high ambient temperatures hose lines must be installed in such a way that a safe distance is kept to hot components. Use a heat protection or a fire protecting hose.

1 FRONT AND REAR CARRIAGE

1.1 General Data

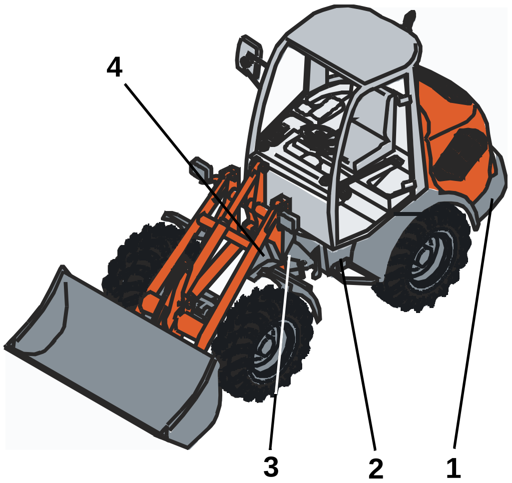


Fig.1.1 Breakdown of assembly groups

Breakdown of assembly groups

The front and rear carriages of the wheel loader are comprised of 4 assembly groups:

1 Counterweight
2 Rear carriage (base frame)
3 Articulated pendulum joint
4 Front carriage

These four components form the wheel loader chassis.

1.2 Front Carriage

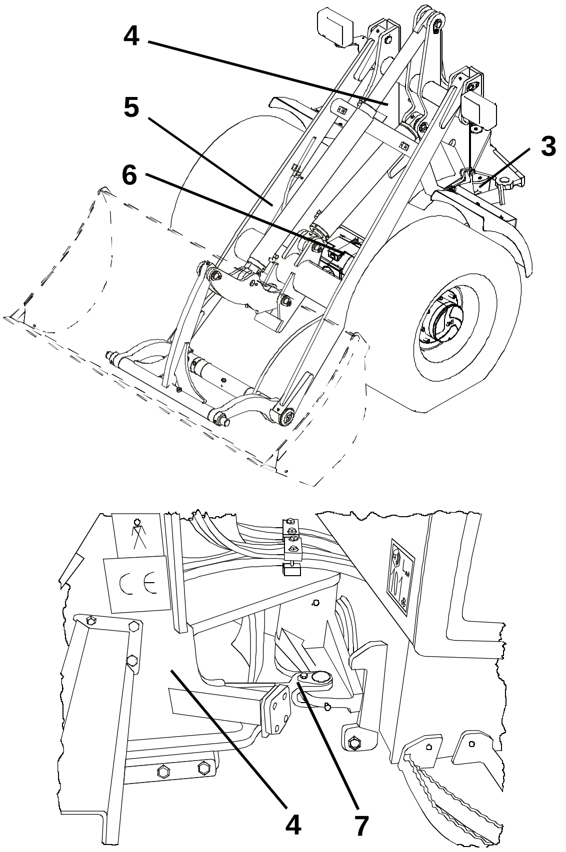


Fig.1.2 Front carriage

Design

The front carriage (4) is made of a steel construction.

The front carriage forms the base for the hoisting gear (5) with lifting cylinders.

The front axle (6) is located below the front carriage.

The articulated pendulum joint (3) connects the front carriage and rear carriage.

The articulation of the front carriage produces the steering of the wheel loader.

Articulation is produced by the steering cylinder (7) extending and retracting.

1.3 Repairing the Front Carriage

Check the screw fittings between the front axle and front carriage within the scope of an inspection or visit to the workshop.

NOTE

Tighten the screw connections according to the prescribed torque.
The necessary torque is listed in the table **Tightening Torques for Screws**.

1.4 Checking the Articulated Pendulum Joint

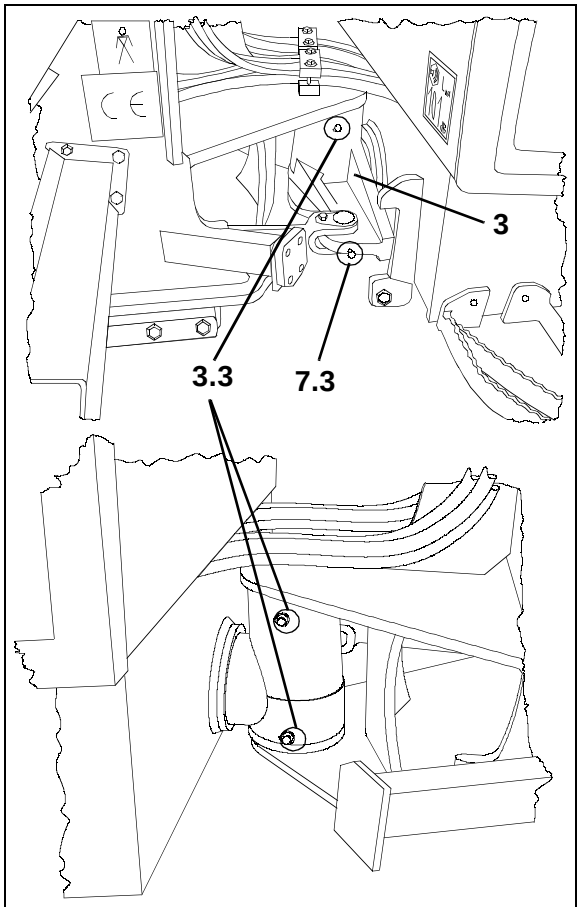


Fig.1.3 Greasing the articulated pendulum joint

Design

The articulated pendulum joint (3) is comprised of two individual joint components:

- articulated joint,
- pendulum joint.

The articulated joint enables the front carriage to be turned 40° to each side.

The pendulum joint enables an angular movement of ±12° between the front and rear carriage.

Maintenance work

The articulated pendulum joint must be greased at regular intervals.

- Check the greasing condition of the articulated pendulum joint.
- Use a grease gun to grease the three greasing points (3.3) of the articulated pendulum joint daily.
- At the same time, check the greasing condition of the steering cylinder.
- Grease the greasing points (7.3) of the steering cylinder once a month.

1.4.1 Faults in the articulated pendulum joint

Faults

- If noises occur during the full lock of the steering wheel which cannot be cleared through cleaning or greasing, check the articulated joint of the wheel loader.
- If noises occur during angular movements of the wheel loader or the angular movements are jerky, check the pendulum bearing.

1.4.2 Checking the assembly dimensions

The compensating disks in the articulated joint could be worn as a result of wear or deficient greasing.

If this happens, or the articulated joint causes noises when turning the steering wheel, check the assembly dimension.

NOTE

Before checking and restoring the assembly dimensions of the articulated joint, park the wheel loader on a level surface and secure it.

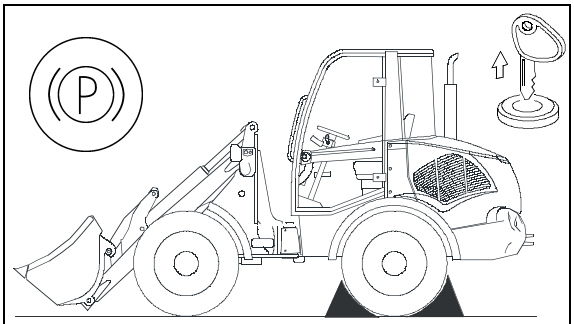


Fig.1.4 Securing the wheel loader

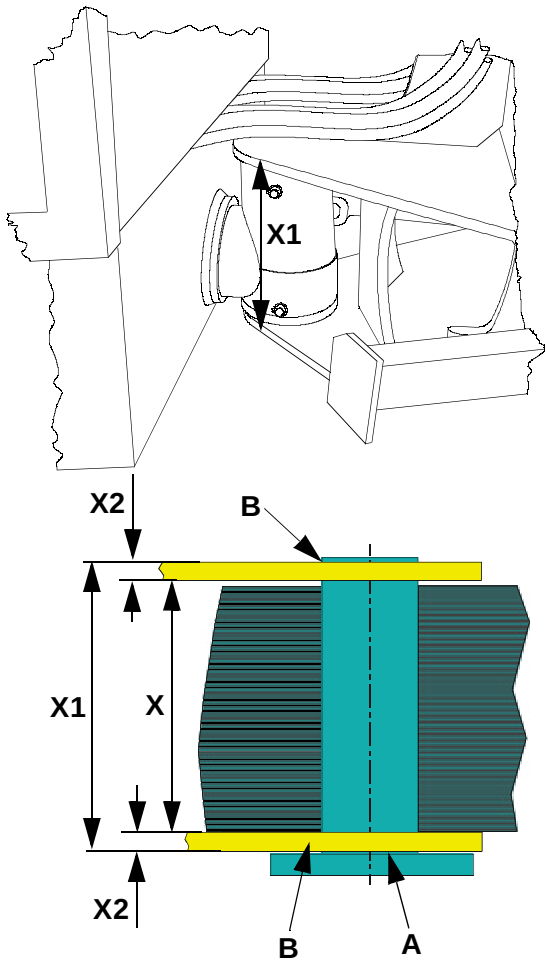


Fig.1.5 Assembly dimension articulated joint

Checking the assembly dimension, left

Determine the dimension **X** = #### between the top and bottom bore holes **B** in the front carriage.

- To determine the dimensions, articulate (steer) the front carriage fully to the right when on a level surface.
- Then secure the wheel loader.
- Clean the section around the articulated joint.
- First, determine dimension **X1** from the top edge of the top bore hole **B** to the bottom edge of the bottom bore hole **B** in the front carriage using applicable sliding calipers.
- Measure the material thickness **X2** of the top and bottom bore hole **B** in the front carriage mounting.
- From the previously measured total dimension **X1**, subtract the material thickness of the **two** bolt holes **X2**.
- Note down dimension **X** calculated in this way.

Checking the assembly dimension, right

Carry out the same measurement on the opposite side of the articulated joint.

- To do this, start the wheel loader and articulate it fully to the left.
- Then secure the wheel loader again.
- Carry out the measurement as described previously and determine dimension **X** for this side.

Determining assembly dimension deviation

Use the dimensions to determine the deviations, refer to example calculation:

- 1. Left-hand dimension X = 287.7 minus 287 = 0.7 mm
- 2. Right-hand dimension X = 287.5 minus 287 = 0.5 mm
- Add the two values calculated and divide the result by 2.
- The value established determines the thickness of the shim **A** to insert.
  - **A** from 0.1 to 0.5 mm = 0.5-mm shim.
  - **A** over 0.5 mm = 1.0-mm shim.

1.4.3 Repairing the articulated pendulum joint

NOTE

The repair work described here may only be carried out in the workshop.

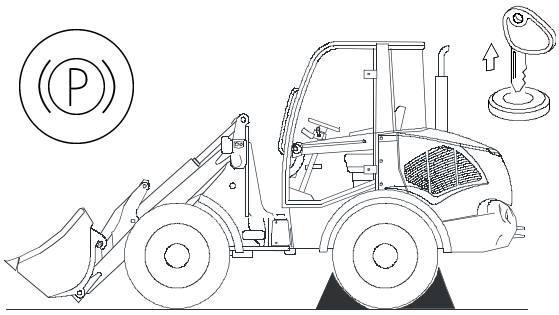


Fig.1.6 Securing the wheel loader

Securing the wheel loader

To disassemble the articulated pendulum joint, the front carriage must be separated from the rear carriage; secure the wheel loader to do this.

- Lower the attachment to its home position, refer to the operating manual.
- Stop the diesel engine and prevent it from being switched on again by removing the ignition key.
- Apply the hand brake.
- Place wheel chocks under the wheels to secure them.
- Check the hydraulic circuit is depressurized; depressurize it, if necessary.

Disassembling the cardan shaft on the front axle

⚠ WARNING

After disassembling the cardan shaft, the hand brake no longer affects the rear axle.
Place sufficient wheel chocks under the tires to secure the rear wheels.
Secure all four wheels of the wheel loader with wheel chocks.

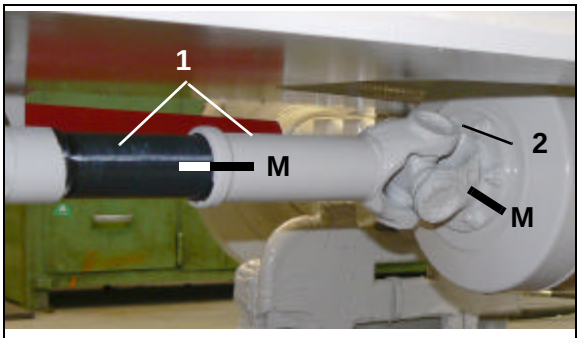
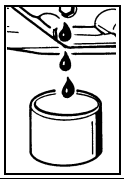


Fig.1.7 Disassembling the cardan shaft on the front carriage

- In order to be able to reassemble the cardan shaft (1) in the correct position **M** following repair, mark the cardan shaft flange position and junction point.
- Loosen the nuts (2) on the flange connection cardan shaft-front axle and screw off the nuts.
- Slide the cardan shaft (1) together sufficiently far until the front axle is free.
- To ensure the front section of the cardan shaft does not fall off, fix the cardan shaft (1) to the base frame.
- Release the hand brake.

Disconnecting the front carriage from the rear carriage

NOTE



When hydraulic components, such as hydraulic hoses, hydraulic cylinders or valves are unscrewed, hydraulic oil escapes from the opening.
Collect escaping hydraulic oil in suitable containers or clear up with cleaning cloths.
Pay attention that hydraulic oil never escapes onto open ground.

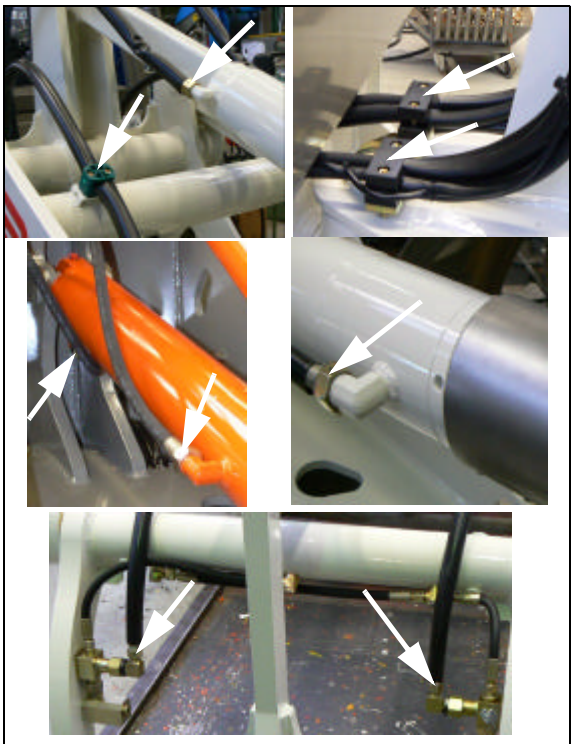


Fig.1.8 Hoisting gear hydraulic connections

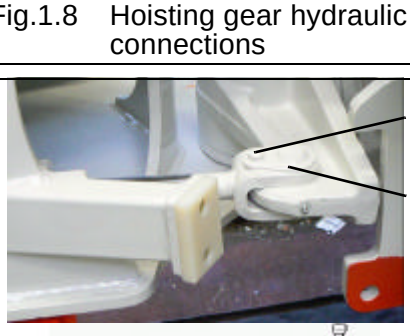


Fig.1.9 Disassembling the steering cylinder

1 Disassembling the hydraulic hoses

- Mark all the hydraulic hoses and cabling to ensure easy reassembly later.
- Disassemble the six hydraulic connections on the hydraulic cylinders (hoisting gear and working cylinder) and the QDC (Quick Disconnect Coupling).
- Seal the hoses and connections using seal plugs and caps.
- Clear up any escaping oil immediately with cleaning cloths.
- Open the hose clamping devices and pull out the hoses with casing.
- Loosen the two hose clamping devices above the articulated joint.
- Bind the hoses together and fix the hose bundle to the rear carriage.

2 Disassembling the steering cylinder

- If the articulated joint needs to be disassembled, disassemble the steering cylinder.
- Unscrew the hydraulic connections from the steering cylinder **4.4**.
- Seal the hoses and connections using seal plugs and caps.
- Unscrew the safety screw (1.1) in the piston rod bolt (1) out of the piston rod.
- Press the piston rod bolt (1) out of the articulated pendulum joint.
- Support the steering cylinder in the front carriage.

3 Disconnecting the electrical connections

NOTE

Before beginning work on the electrical installation, always remove the positive pole from the battery using an insulated wrench.

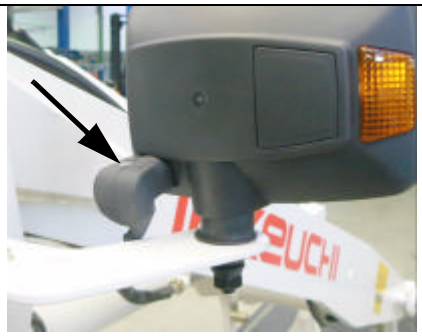


Fig.1.10 Connector, headlights

- Mark the cables so that they can be correctly assigned again during reassembly.
- Disconnect the electrical connections from the headlights.
- Open the cable clips.
- Bundle the cables together, tie them and fix the bundle to the hose bundle.

1.4.4 Disconnecting the front carriage from the rear carriage

NOTE

This repair work can only be carried out in a workshop.

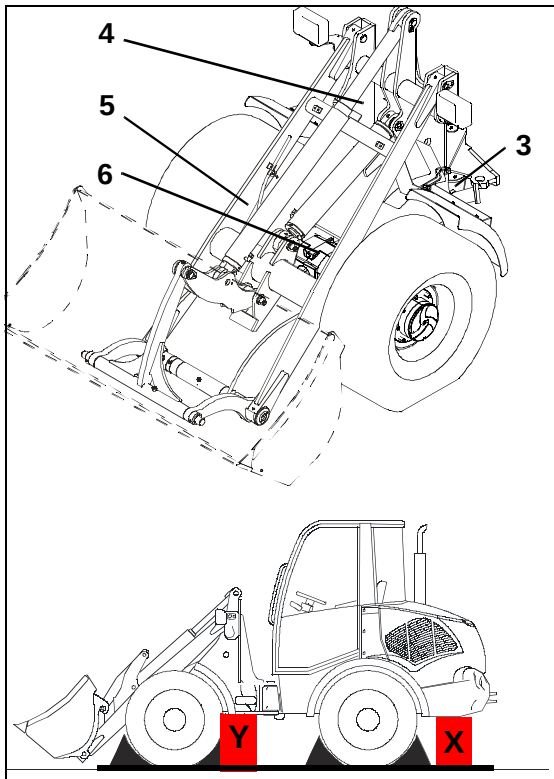


Fig.1.11 Disconnecting the front and rear carriages

Securing the front carriage and rear carriage

- Ensure the crane or hoisting system has a sufficient lifting capacity.
- Before separating the front and rear carriages, place supports under them.
- Prop the rear carriage and place jacks or blocks under the rear carriage's counterweight **X**.
- If necessary, prop the front carriage underneath the front carriage mounting **Y**.

Determining the separating point

Separation of the front carriage from the rear carriage is affected according to which bearing is replaced.

NOTE	The work is completed from underneath the wheel loader. Drive the wheel loader over an inspection pit. If no inspection pit is available, secure the wheel loader sufficiently with wheel chocks.

NOTE	If repairs are necessary on the articulated bearing or bolt, disconnect the front and rear carriages at the articulated joint, otherwise at the pendulum joint.

1.4.5 Checking the pendulum joint

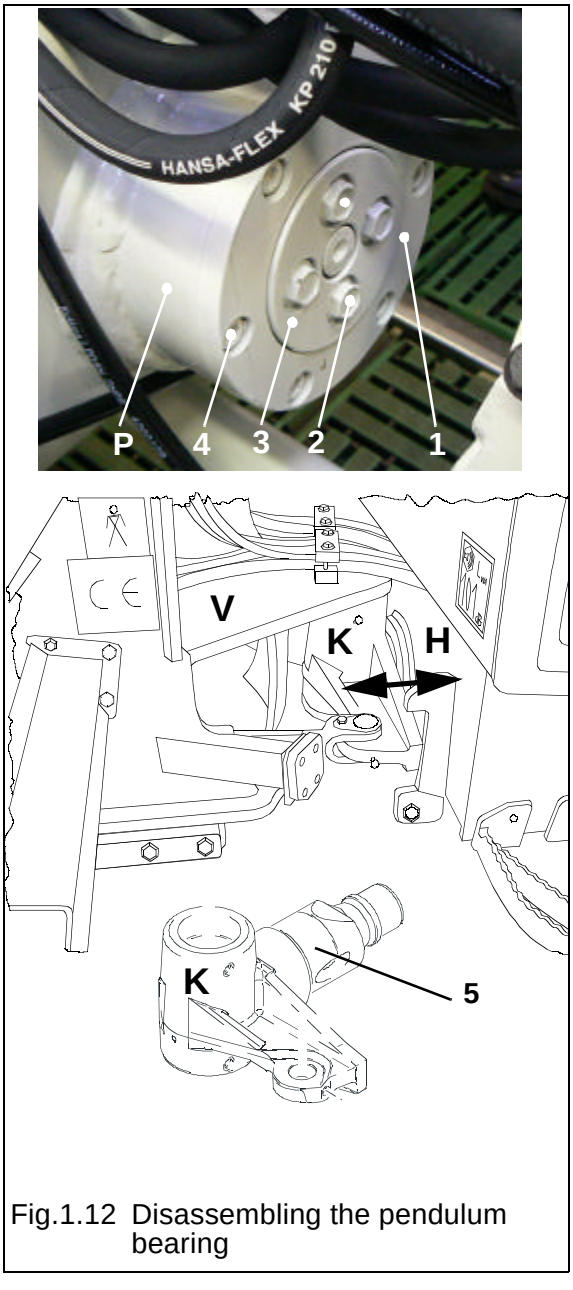


Fig.1.12 Disassembling the pendulum bearing

To separate the front carriage using the pendulum joint or to repair the pendulum bearing, disassemble the pendulum bearing and pull the front carriage away.

Disassembling the pendulum bearing

- Loosen (do not remove) the hexagon socket screws (4) in the bearing retaining disk (1).
- Unscrew the hexagon head screws (2) from the retaining disk (3) of the bearing journal (5).
- Remove the retaining disk (3).
- Insert a hydraulic jack between the articulated pendulum joint **K** and rear carriage **H**.
- Remove the wheel chocks from the front wheels.
- Use the hydraulic jack to force the front carriage **V** from the rear carriage **H** until the bearing journal (5) of the articulated pendulum joint **K** is pressed out of the rear carriage **H**.

Replacing the pendulum bearing components

- Unscrew the hexagon socket screws (4) out of the bearing retaining disk (1) and remove the disk.
- Use the extractor to pull the pivot bearing (6) out of the bearing tube (7).
- Also use an extractor to pull the bearing bush (8) out on the front carriage side.
- Pull the distance ring (9) from the pendulum bearing journal (5).
- Clean all the individual parts and bearing journal (5) and rinse out the bearing tube (7).

NOTE	In the event of larger bearing play or damage, always replace the entire pendulum bearing and distance ring.

NOTE	Before installing a new bearing bush (8), allow it to cool down (shrinking). Store the bearing bush for a longer period at a temperature of -18° C. Only remove the bearing bush from the freezer shortly before it is to be installed.

- Apply Loctite 270 to the new bearing bush (8) and press it in the bearing tube (7).
- Pay attention that the slot for greasing is aligned to the greasing hole of the greasing line.
- Grease the pivot bearing (6) thinly and press it in the bearing tube (7) from the rear carriage side.
- Screw the bearing retaining disk (1) in the bearing tube (7) with the hexagon socket screws (4) and tighten slightly.

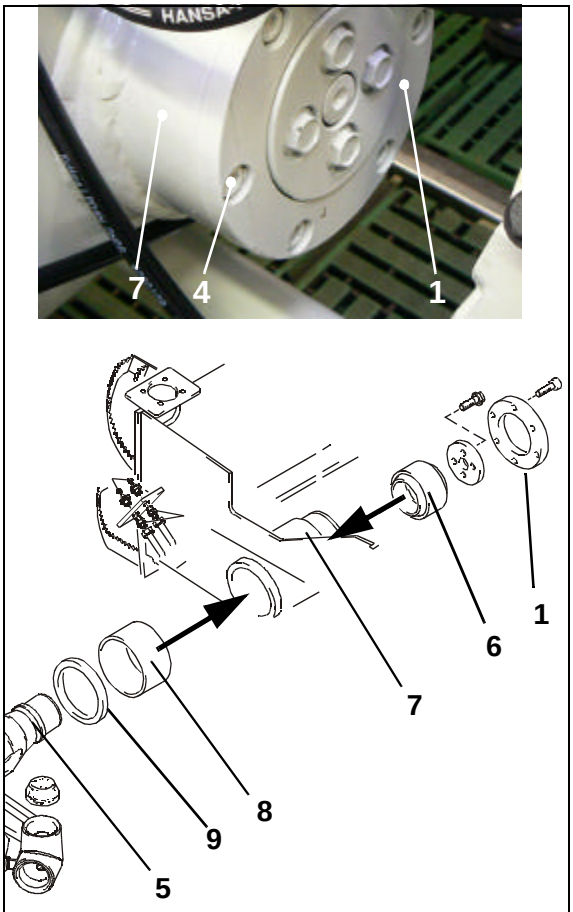


Fig.1.13 Replacing the pendulum bearing