

Workshop Manual

20F

20FS

WHEEL LOADER

**KOMATSU
HANOMAG**

Workshop Manual

**Wheel Loader
20F 20FS**

VEBM200100



How to use the present publication

The present workshop manual and training handbook doubles as material for the theoretical part of our service training courses and as reference book for skilled construction equipment mechanics in the workshop and in the field.

The present publication breaks down into two sections :

Section 1

Corresponds to the operators manual and includes a description of the inspection and maintenance operations and technical instructions.

Section 2

Comprises functional descriptions and repair instructions.

For repair instructions of units and part assemblies that go beyond the scope of the present handbook refer to the relevant repair manuals that are available when attending the relevant training course.

All technical data, descriptions of units and illustrations are based on information applicable at the time of printing of this publication or any amendment to it.

Specifications are subject to change without notice, to make allowance for continuous product development.

No claim whatever can be derived from the information contained in this publication.

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DESCRIPTION OF THE MACHINE

This wheel loader is a result of continuous product development and extension of our line of tried and tested advanced-design wheel loaders.

The machine consists of a front and a rear frame which are connected by an oscillating joint to allow wide articulation to either side. Steering of the machine is by a hydrostatic power steering system. The front frame supports the working equipment. The rear frame with integrated hydraulic oil tank supports the engine, the hydrostatic drive and the operator's cab.

The water-cooled diesel engine uses a direct injection fuel system and provides economy and reliability of operation.

Engine power is transferred to the drive axles through a hydrostatic drive system using a variable-displacement pump and a variable-displacement motor. The single-stage transfer gear is mounted at the rear axle. Directional changes are effected by reversing the direction of delivery of the variable-displacement pump. Control of the two-stage drive system is electric with full power shifting.

The service brake is designed as a hydrostatic brake. Operation of the brake pedal (inching pedal) produces the braking action by means of a reduction of oil flow. The inching valve can be used to achieve modulated deceleration of the machine, independent of speed and rolling resistance. Additional braking action is produced by hydraulically actuated multiple-disc brakes mounted in the rear axle. The parking brake acts mechanically using the same disc pack.

The machine is equipped with rugged planetary rigid axles featuring self-locking differentials.

The high breakout forces can be attributed essentially to the Z-bar linkage geometry. In tough applications (breakout and tilt back), oil pressure is exerted on the larger piston area of the bucket cylinder to produce high breakout forces. When the bucket is dumped, however, pressure is exerted on the smaller piston area so that a higher dumping speed can be attained.

The wheel loader is one of the new generation of small loaders. Universal application, high performance and economy make the machine a real all-rounder. Because of its excellent manoeuvrability and wide variety of attachments, it will be the right machine in all material handling applications, be it in building firms, large enterprises, wholesale firms, warehouses, industry, municipalities, or in landscaping works.

MACHINE IDENTIFICATION

In order for us to provide you, the customer, with an efficient and speedy after-sales service, please quote the following information when communicating with our After Sales Service organization on any matter regarding operation, maintenance and servicing of the machine:

Machine Model: _____

Serial Number: _____

Engine Number: _____

Machine delivery date: _____

Service hours completed: _____

Enter the details in the spaces provided above so that they are readily available whenever required.

Identification plate and number locations

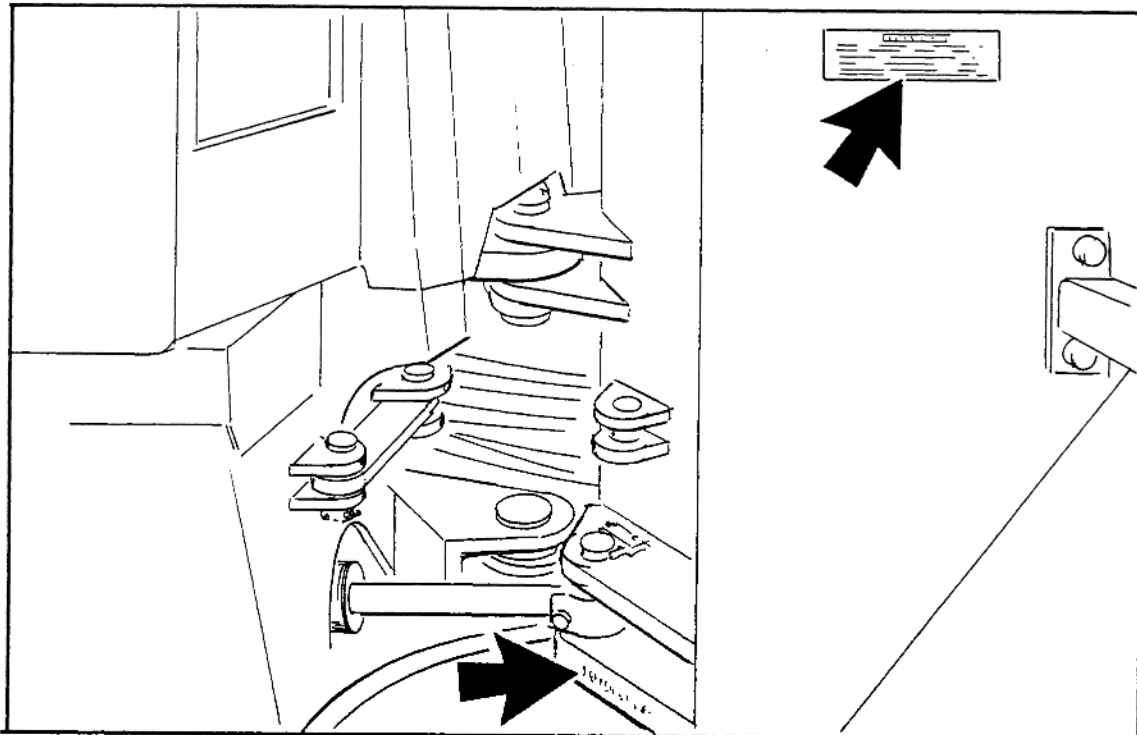
Fig. R 490

Model identification plate

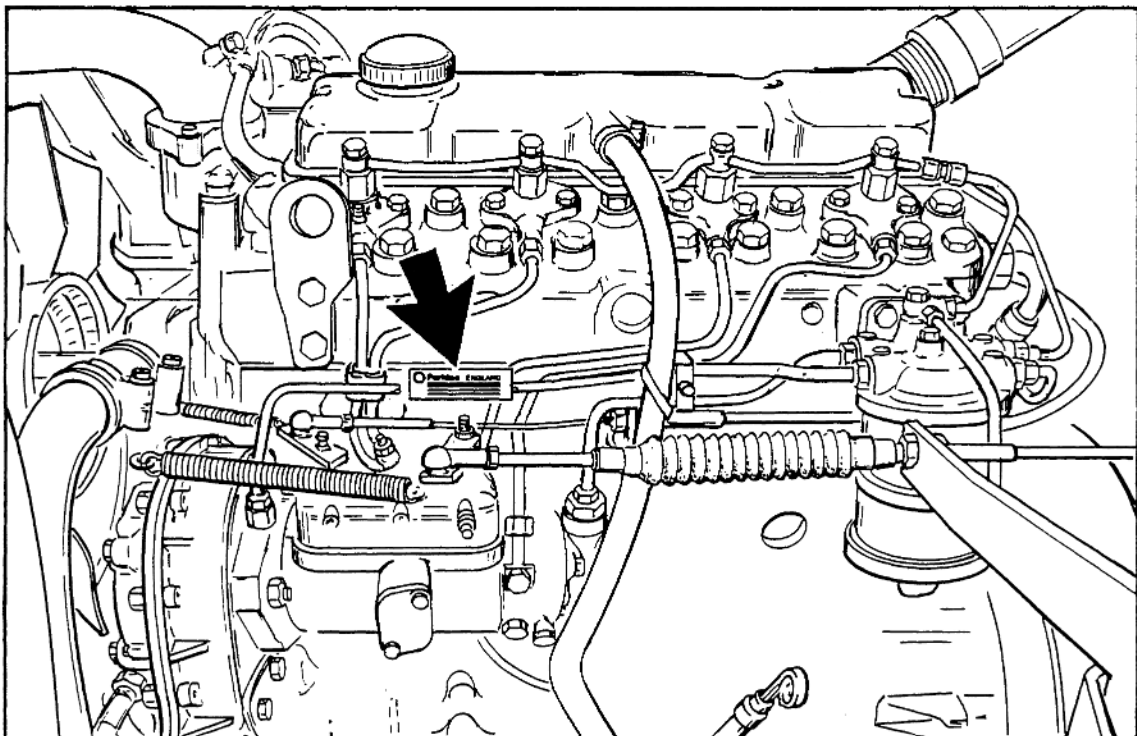
Machine serial number

Fig. R 491

Engine number



R 490



R 491

NOISE EMISSION LEVELS

The EC directive requires attachment of two plates indicating the machine noise levels:

According to EC directive 86/662:

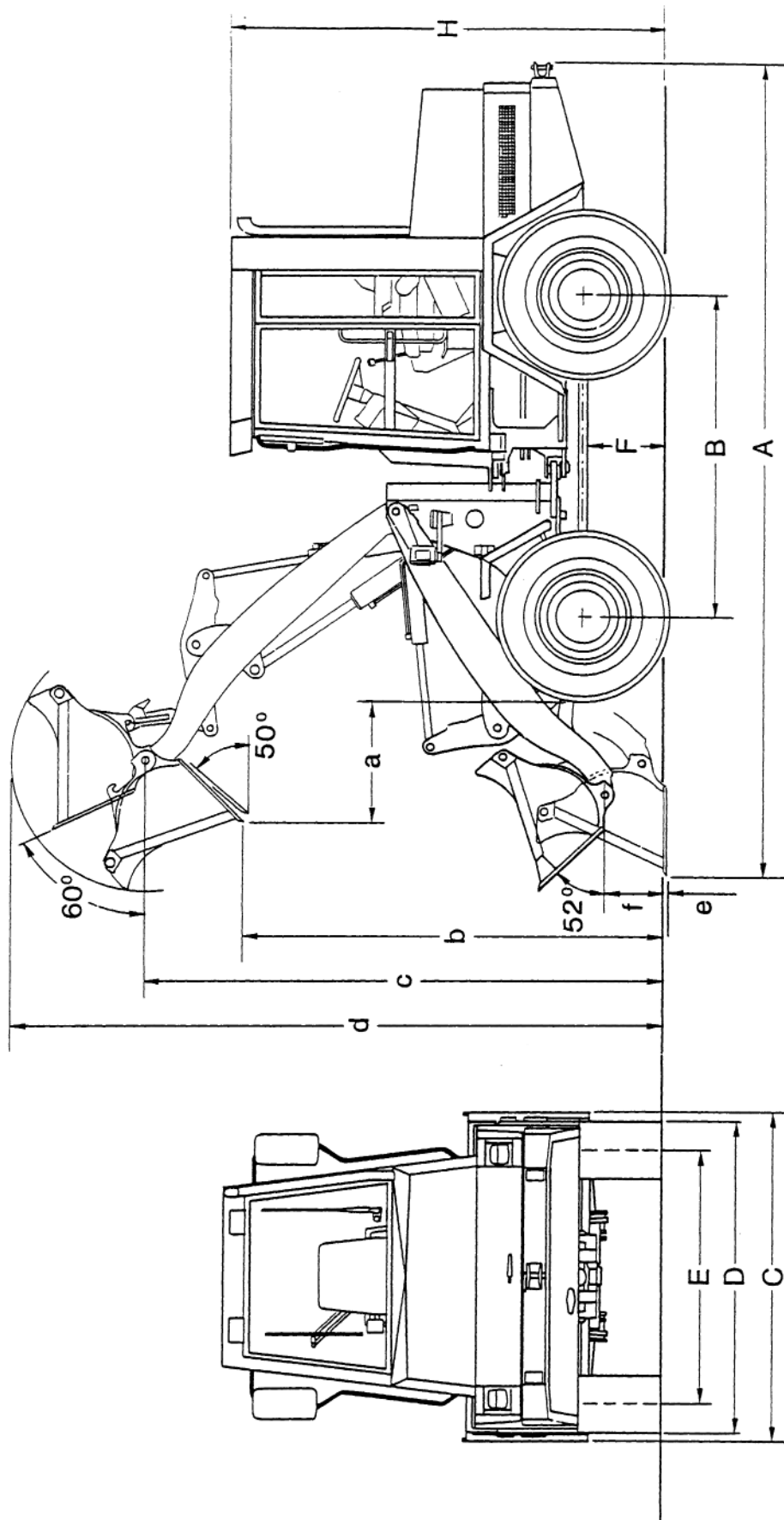
1 plate for the sound pressure level	L_{pA}	=	78 dB/A
1 plate for the sound power level	L_{WA}	=	98 dB/A

According to RAL UZ 53:

1 plate for the sound pressure level	L_{pA}	=	77 dB/A
1 plate for the sound power level	L_{WA}	=	98 dB/A

VIBRATION LEVELS

When the machine is used as intended, the evaluated vibration acceleration "a_{zw}" measured in accordance with ISO 2631, Part 1, is between 0.25 m/s² and 2.50 m/s².



Dimensions

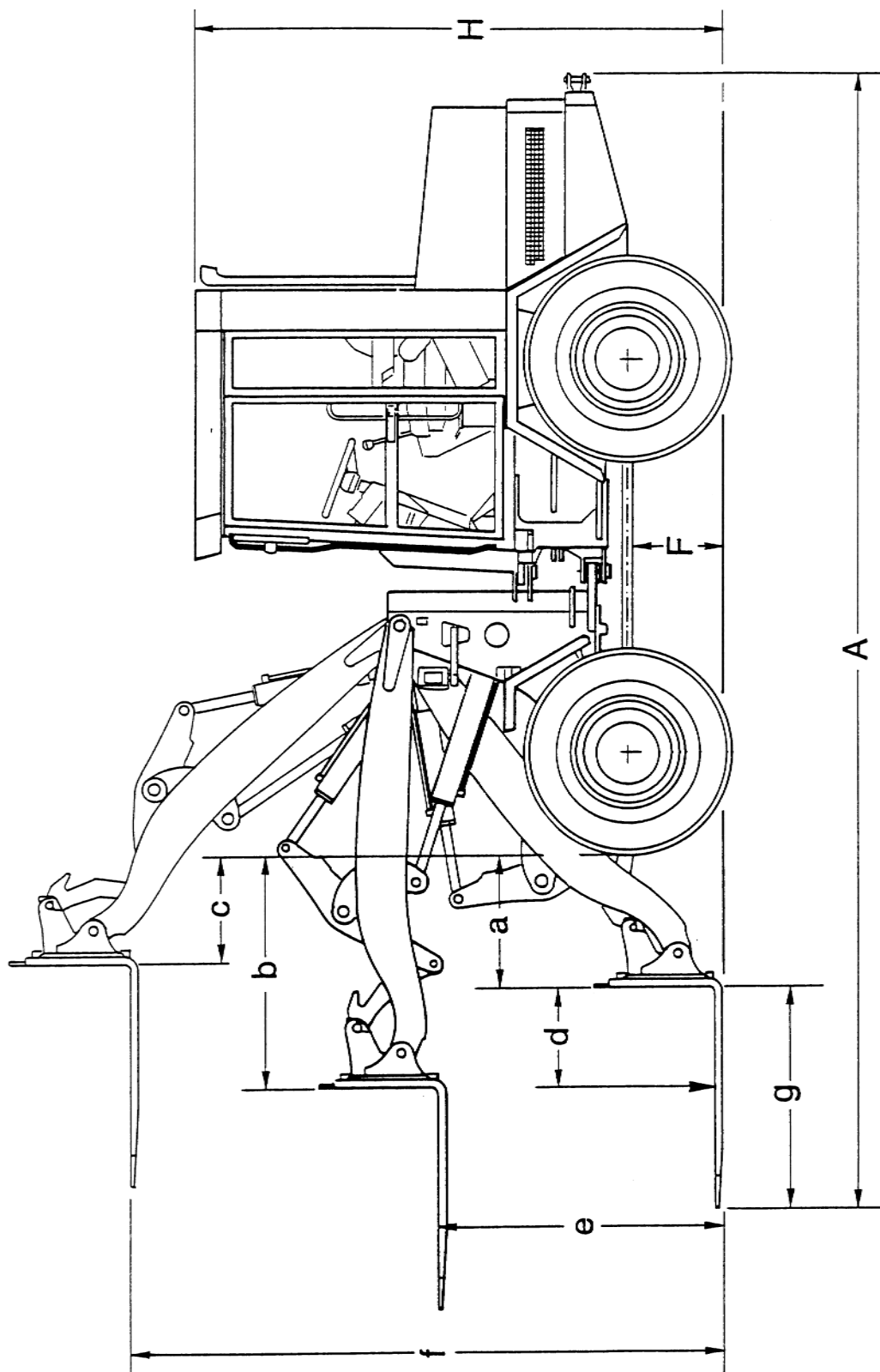
Operating data

Buckets (SAE heaped)		m ³	0.9 (m.p.bkt.)	1.0	1.25	1.50
Material density		t/m ³	1.8	1.8	1.5	1.1
Bucket weight incl. teeth		kg	660	380	470	550
Static tipping load, straight		kg	4540	4600	4460	4380
Static tipping load, 40° articulated		kg	3890	3980	3840	3760
Hydr. breakout force		kN	56.3	70.2	58.3	50.2
Hydr. lifting force		kN	57.4	55.3	55.2	55.0
Operating weight		kg	5960	5680	5770	5850
a Reach at full lift, 45° discharge		mm	919	820	902	997
b Dump height, 45° discharge		mm	2581	2720	2598	2503
c Lift height, hinge pin		mm	3395	3395	3395	3395
d Overall lift height		mm	4375	4410	4455	4530
e Digging depth at 0°		mm	101	72	101	101
f Bucket height, carry position		mm	350	350	350	350
A Overall length		mm	5770	5580	5740	5880
B Wheelbase		mm	2150	2150	2150	2150
C Bucket width		mm	2100	2100	2100	2100
D Width less bucket		mm	2010	2010	2010	2010
E Gauge		mm	1590	1590	1590	1590
F/F ₁ Ground clearance		mm	490/390	490/390	490/390	490/390
H Overall height		mm	2730	2730	2730	2730

All specifications refer to 405/70 R20 SPT 9 tyres.

Please enquire for further bucket sizes.

All details and specifications subject to change without notice.



FORKS

a	=	Reach with forks at ground level	810 mm
b	=	Reach with forks at height "e"	1330 mm
c	=	Reach with forks at maximum height	590 mm
d	=	Load centre distance	500 mm
e	=	Maximum reach at 1460 mm height	
f	=	Maximum height	3155 mm
g	=	Fork tine length	1200 mm

	<u>Straight</u>	<u>Articulated</u>
Static tipping load, DIN 24094 *	3320 kg	2900 kg
Load centre distance	500 mm	500 mm
Payload	2660 kg	2320 kg

* Stability factor: 1.25 (level ground, straight)
2.0 (rough terrain)

LOADING AND BRACING

Fig. R 513

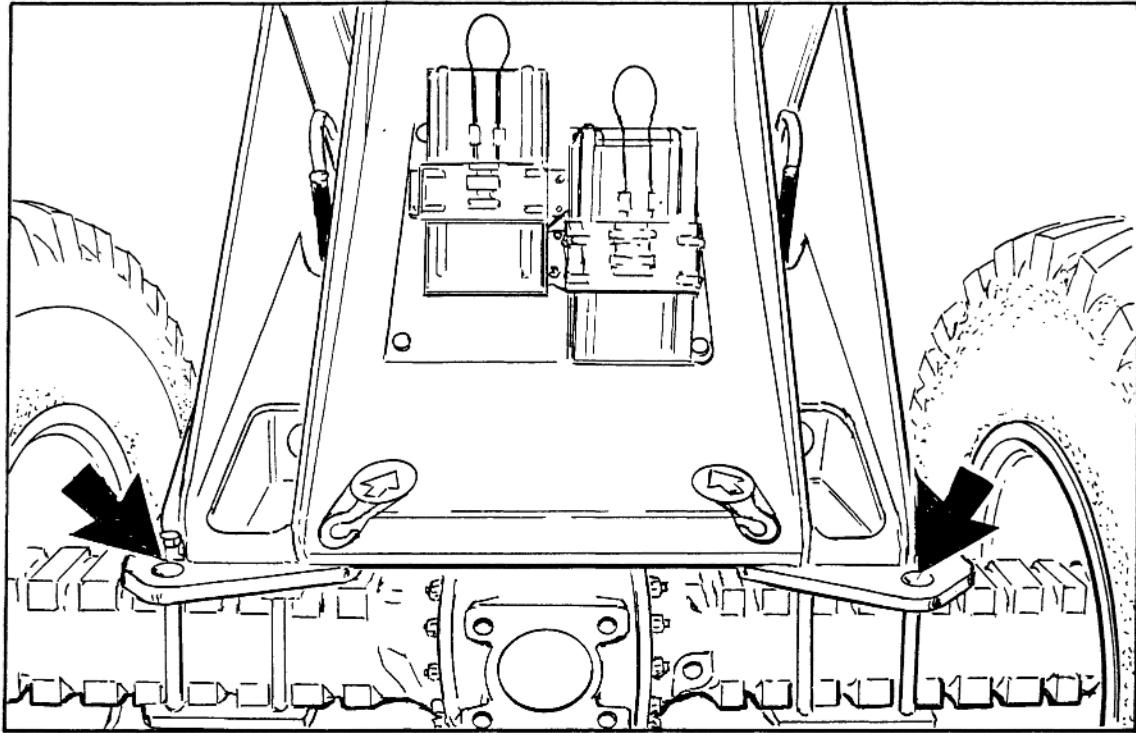
Front attachment points for lifting and bracing.

Fig. R 464

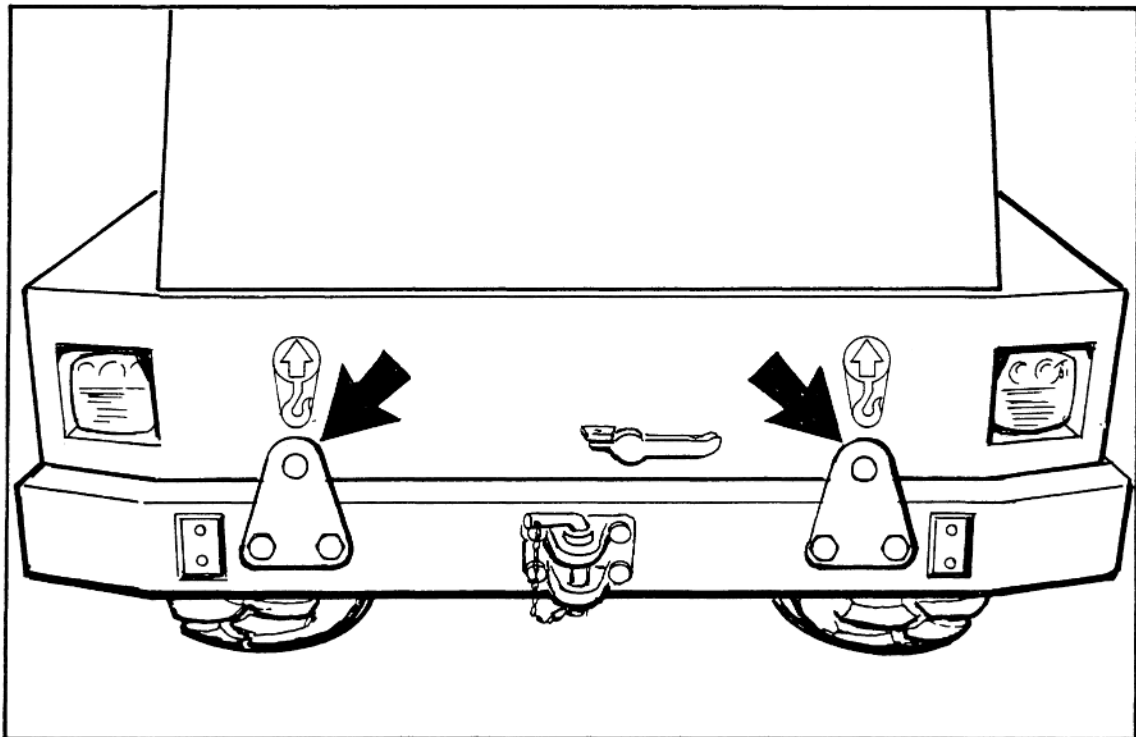
Rear attachment points for lifting and bracing.

Notes:

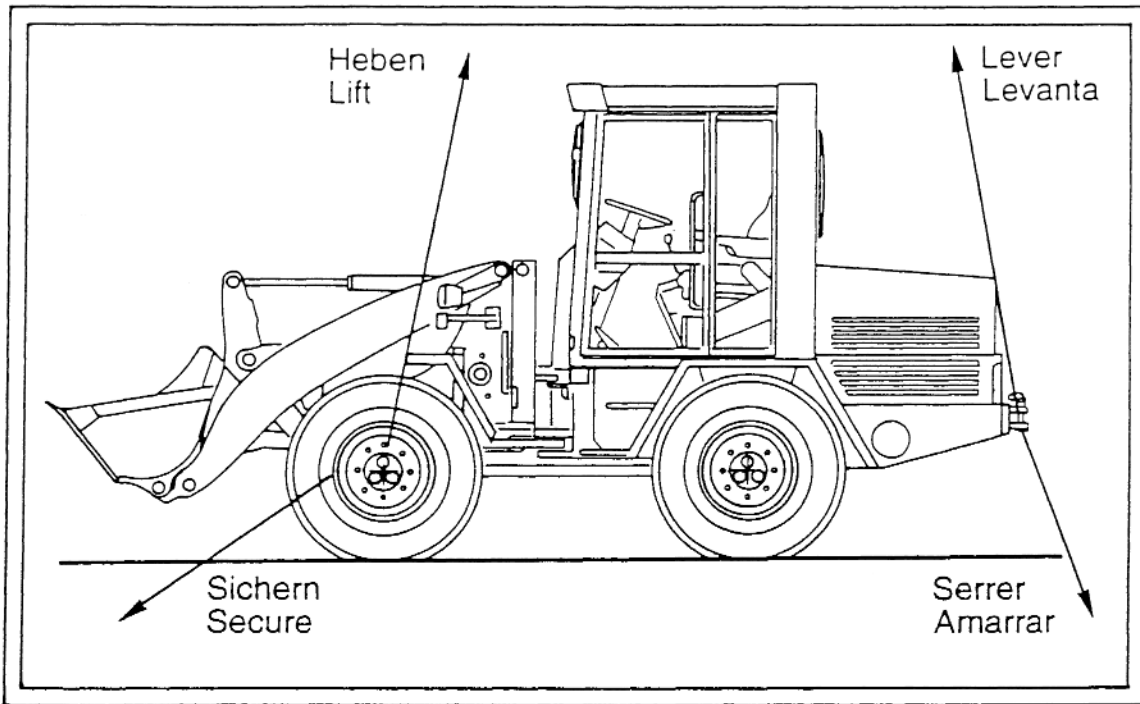
- (a) The lifting brackets are to be found in the stowage compartment of the operator's cab.
- (b) For bracing purposes, use may also be made of the towing hitch.



R 513



R 464



R465

SAFETY PRECAUTIONS

1. Warning information and symbols

- 1.1 In the Operator's Manual, the following terms or signs, respectively, are being used to identify particularly important instructions:

Note: Specific information

Caution! Specific information, or rules and prohibitions, respectively, to prevent damage

Warning! Information, or rules and prohibitions, respectively, to prevent bodily injury or major damage to property

2. Use as intended

- 2.1 The machine has been designed and built according to the state of the art and to the recognized technical safety standards. Still its operation may involve hazards to health and life of the user or other persons. In addition, damage may be caused to the machine and to other property.
- 2.2 Operate the machine as intended and only if it is in proper technical condition. Be safety minded and alert to potential hazards. Follow the Operator's Manual. Have all malfunctions, and especially those which might compromise safety, corrected immediately!
- 2.3 The machine is intended exclusively for breaking up, digging, loading, carrying, dozing, spreading and grading diggable soils and bulk materials. Wheels mounted to landfill compactors serve to further disintegrate and compact the material. Carrying forks attached to the machine are used for picking up, hauling and putting down unit loads and palletized materials. Any other or further application, for example, conveying persons or using the lifting device as a working platform, is considered to be improper. The supplier shall not be liable for any damage resulting therefrom. The risk shall be borne solely by the user. Proper use as intended includes compliance with the Operator's Manual and following of the inspection and maintenance instructions.

3. Organizational measures

- 3.1 Always keep the Operator's Manual handy at the job site (in the tool compartment or in the container provided for the purpose).
- 3.2 In addition to the Operator's Manual, observe, and instruct in, generally applicable legal and other obligatory regulations for prevention of accidents.

Such obligations may also relate, for example, to the handling of hazardous material, to the provision and wearing of personal protective clothing and equipment, or to road traffic regulations.

- 3.3 Supplement the Operator's Manual and any additional instructions considering specific in-plant conditions with regard to work organization, work cycles and personnel employed.

SAFETY PRECAUTIONS

- 3.4 The personnel instructed to perform work on the machine must have read the Operator's Manual before undertaking any work. Particular attention must be paid to the **Safety Precautions** section.
This applies especially to personnel working only occasionally on the machine to perform set-up and maintenance operations.
- 3.5 Check the personnel at least occasionally for being safety-minded and alert to potential hazards in their work, in compliance with the Operator's Manual.
- 3.6 The personnel must not wear long loose hair, loose clothing or jewelry as this involves the risk of injury by getting caught or drawn in.
- 3.7 Use personal protective clothing or equipment as necessary, or as required by rules and regulations!
- 3.8 Heed all safety signs and danger warnings on the machine!
- 3.9 Keep all safety signs and danger warnings on the machine in a legible condition!
- 3.10 In the event of safety related changes in the condition or in the operational performance of the machine, shut down the machine immediately and report the fault!
- 3.11 Do not perform modifications, extensions and conversions of the machine that might compromise safety without obtaining the approval of the supplier! This is equally applicable to the installation and setting of safety equipment and pressure relief valves and also to welding on load bearing structures.
- 3.12 Spare parts must conform to the manufacturer's technical specifications. Conformity is ensured in the case of genuine spare parts as supplied by us.
- 3.13 Replace hydraulic hose lines at the intervals specified, or at reasonable intervals, respectively, even if they fail to show safety related defects!
- 3.14 Adhere to the time limits for periodic tests and inspections as specified, or as indicated in the Operator's Manual!
- 3.15 For the performance of maintenance operations, workshop facilities as appropriate to the work carried out are indispensably necessary.
- 3.16 Inform about location and operation of fire extinguishers!
- 3.17 Know the fire alarm and fire fighting facilities!

4. Personnel selection, qualification and basic duties

- 4.1 Work on and operation of the machine must only be carried out by reliable staff. Observe the minimum age permitted by law!
- 4.2 Employ trained or properly instructed staff only. Clearly define staff competence for operation, set-up, maintenance/service and repair!

SAFETY PRECAUTIONS

- 4.3 Be sure to have only duly charged staff work on or operate the machine!
- 4.4 Define the responsibility of the operator - also in regard to traffic regulations - and allow him to refuse to follow instructions by third parties that would compromise safety!
- 4.5 Have staff to be trained, to be instructed or to be introduced in their work, or staff undergoing general training, work on the machine only under permanent supervision of an experienced person!
- 4.6 Work on the electrical equipment of the machine must only be performed by a skilled electrician or under the direction and supervision of a skilled electrician in accordance with the rules of electrical engineering.
- 4.7 Work on undercarriages, braking and steering systems must only be performed by skilled staff trained to carry out such work!
- 4.8 Work on hydraulic equipment must only be performed by staff having specific knowledge and experience of hydraulics!

5. Notes on safety in particular phases of operation

5.1 Normal service

- 5.1.1 Refrain from any procedure and operating technique that might involve a potential hazard!
- 5.1.2 Before starting a job, familiarize yourself at the job site with the working environment. The working environment includes, for example, any obstructions in the working and traffic areas; soil bearing capacity; and any arrangements required to make the job site safe against the area of public traffic.
- 5.1.3 Take care to ensure that the machine is operated only when in a safe and operative condition!

Operate the machine only with all protective equipment and safety related devices such as removable guards, emergency features, sound insulation and suction devices in place on the machine and operative!
- 5.1.4 Check the machine at least once every shift for visible external damage and defects! Immediately report any changes that have occurred, including those in the operational performance! Where necessary, shut down and safeguard/mark the machine immediately!
- 5.1.5 In case of malfunctions, immediately shut down and safeguard/mark the machine! Have malfunctions corrected immediately!
- 5.1.6 Start and operate machines only from the operator's seat.
- 5.1.7 Observe all starting and stopping procedures, gauges and indicators in accordance with the Operator's Manual!

SAFETY PRECAUTIONS

- 5.1.8 Before preparing to operate the machine, satisfy yourself that no one will be endangered by the machine moving off!
- 5.1.9 Before starting a job and moving off, make sure the braking, steering, signaling and lighting systems are in proper working order!
- 5.1.10 Before operating the machine, always make sure accessories are stowed away so as to preclude accident hazards!
- 5.1.11 When using public highways, roads and places, observe the applicable traffic regulations; where necessary, put the machine in roadworthy condition first!
- 5.1.12 When visibility is poor, and after dark, always turn on the lights!
- 5.1.13 Passengers are allowed to ride on the machine only in proper passenger seats provided for the purpose.
- 5.1.14 When passing subways, bridges, tunnels, overhead lines, etc., adequate clearance must be maintained at all times!
- 5.1.15 Always stay a safe distance from the edge of excavations and from slopes!
- 5.1.16 Refrain from any operating technique that would compromise the stability of the machine!
- 5.1.17 In hillside operation, do not work across the slope. Always keep implements and payload close to the ground, especially when going downhill!
- 5.1.18 When descending a grade, always adapt travel speed to actual operating conditions! Never shift down while going downhill; always select the lower gear range before starting downgrade!
- 5.1.19 When leaving the operator's seat, always protect the machine against accidental movement and against operation by unauthorized persons!
- 5.2 Special operations during machine service life; maintenance procedures; fault clearance in service; disposal
 - 5.2.1 Observe the schedule specified in the Operator's Manual for adjustment, maintenance and inspection procedures, including specifications regarding the replacement of parts or items of equipment. These operations must only be carried out by skilled staff.
 - 5.2.2 Inform the staff concerned before preparing to execute special procedures and maintenance operations! Appoint a person in charge!
 - 5.2.3 Observe all starting and stopping procedures as specified in the Operator's Manual and all instructions regarding maintenance operations! This holds good for all procedures relating to operation, updating, conversion or adjustment of the machine and its safety related equipment as well as to inspection, maintenance and repair.

SAFETY PRECAUTIONS

- 5.2.4 Close off and mark the maintenance area as extensively as necessary!
- 5.2.5 If the machine is disconnected during maintenance and repair operations, it must be protected against unexpected and accidental reclosing:
- Turn off the battery master switch (if fitted).
 - Remove the start switch key.
 - Lock controls, e.g., for the hydraulic system.
 - Attach a warning tag.
- 5.2.6 Do not perform maintenance and repair operations unless the machine has been parked on level and good bearing ground and has been protected against rolling off and jack-knifing!
- 5.2.7 When replacing components and major assemblies, carefully attach them to hoists and secure them so that they do not involve a potential hazard. Use only suitable and technically safe hoists and load take-up devices of adequate lifting capacity! Make sure no one is standing or working in the area beneath suspended loads!
- 5.2.8 Charge only experienced staff with slinging loads and signalling crane operators! The signalman must stay within sight of the operator, or be in speaking contact with him.
- 5.2.9 When performing fitting operations above body height, use the climbing facilities and working platforms provided for the purpose, or any other safety climbing aid or working platform! Do not use machine parts as climbing aids! When performing maintenance operations at any greater height, put on safeguards against falling.
- Keep all grab handles, steps, handrails, walkways, platforms, ladders clean and free from snow and ice!
- 5.2.10 Prior to undertaking any maintenance or repair, clean the machine, and joints and screw fittings in particular, of oil, fuel or service material! Do not use aggressive cleaning agents! Use non-fraying cloth!
- 5.2.11 Prior to cleaning the machine with water, steam, high-pressure cleaning or other cleaning methods, mask or put tape over all openings into which cleaning agent must not enter for safety or functional reasons. Particularly susceptible are items of electrical equipment.
- 5.2.12 When performing cleaning operations in closed buildings, take care to avoid that temperature sensors of the fire alarm and fire extinguishing systems come into contact with hot cleaning agents. Otherwise the fire alarm and fire extinguishing system would respond.
- 5.2.13 On completion of cleaning, uncover all masked and stuck-up openings!
- 5.2.14 On completion of cleaning, check all fuel and oil lines for leaks, loose connections, chafe marks and damage! Immediately correct any defects noted!