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# SERVICE MANUAL

## Wheel Loaders LW80.B



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**NEW HOLLAND**  
**CONSTRUCTION**

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## FOREWORD

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This **Technical Handbook (THB)** has been written with **the servicing mechanic** in mind and contains important information required to carry out repair and servicing procedures.

Read through the **Technical Handbook**, but also the **Operating Instructions** for the **NEW HOLLAND CONSTRUCTION Wheel Loader** before commencing any servicing or repair work. The **Technical Handbook**, as well as the **Operating Instructions** and **Spare Parts List** should be used as a source of reference and assistance - even when the user is well acquainted with the range of NEW HOLLAND CONSTRUCTION Wheel Loaders.

Using the Technical Handbook allows the experienced mechanic to carry out repair work in a correct manner.

### Using the Technical Handbook

The Technical Handbook is divided into main and sub-groups that deal with the machine as actually delivered. Any auxiliary attachments or optional upgrading introduced later are not described.

The main table of contents allows to find the required information quickly.

For the sake of clarity, the illustrations have been simplified and can therefore differ slightly from the actual appearance of the machine.

### Servicing and repair

Servicing and repair work should be carried out as soon as possible. This keeps overall servicing & repair costs to a minimum and increases the availability of the NEW HOLLAND CONSTRUCTION Wheel Loader.

During servicing and repair work, always follow the instructions contained in the Technical Handbook and Operating instructions.

The **NEW HOLLAND CONSTRUCTION After Sales Service** is always available for assistance and advice.

□

# FUNDAMENTAL SAFETY INSTRUCTIONS

## Warnings and symbols

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The following signs are used in the manual to designate instructions of particular importance:

 <b>DANGER</b>
Imminent danger involving the risk of death or of severe injuries.

 <b>WARNING</b>
Precautionary rules and measures designed to protect the machine operator and other persons from life-threatening danger or injuries and to prevent extensive damage.

 <b>CAUTION</b>
Information and precautionary measures designed to prevent damage to the machine or other property.

□

## Danger in the event of non-observance of the safety instructions<sup>96843</sup>

 <b>WARNING</b>
<p>This wheel loader has been built in accordance with state-of-the-art standards and the recognized safety rules.</p> <p>However, operating the machine if a fault is suspected or has occurred, or carrying out repair work inexpertly may</p> <ul style="list-style-type: none"><li>- endanger the lives of persons in contact with it</li><li>- damage the machine and other property.</li></ul> <p>The wheel loader must be stopped immediately on any damage being suspected or occurring to ensure that the safety of the operator, of other persons at the place of use or of other material property is not compromised.</p> <p>All components are carefully co-ordinated. Trouble-free operation and a long service life can only be achieved with original spare parts.</p>

□

## **FUNDAMENTAL SAFETY INSTRUCTIONS**

### **Organizational measures**

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The operating instructions must always be at hand at the place of use of the machine, e.g. by stowing them in the tool compartment or tool-box provided for such purpose.

In addition to the operating instructions, observe and instruct the user in all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection.

These compulsory regulations may also deal with the handling of hazardous substances, issuing and/or wearing of personal protective equipment or traffic regulations.

The operating instructions must be supplemented by instructions covering the duties involved in supervising and notifying special organizational features, such as job organization, working sequences or the personnel entrusted with the work.

Personnel entrusted with work on the machine must have read the operating instructions and in particular the chapter on safety before beginning work. Reading the instructions after work has begun is too late. This applies especially to persons working only occasionally on the machine, e.g. during setting up or maintenance.

Check - at least from time to time - whether the personnel is carrying out the work in compliance with the operating instructions and paying attention to risks and safety factors.

For reasons of security, long hair must be tied back or otherwise secured, garments must be close-fitting and no jewellery, such as rings, may be worn. Injury may result from being caught up in the machinery or from rings catching on moving parts.

Use protective equipment wherever required by the circumstances or by law.

Observe all safety instructions and warnings attached to the machine.

See to it that safety instructions and warnings attached to the machine are always complete and perfectly legible.

In the event of safety-relevant modifications or changes in the behaviour of the machine during operation, stop the machine immediately and report the malfunction to the competent authority/person.

Never make any modifications, additions or conversions which might affect safety without the supplier's approval. This also applies to the installation and adjustment of safety devices and valves as well as to welding work on load-bearing elements.

Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied to do so.

Replace hydraulic hoses within stipulated and appropriate intervals, even if no safety-relevant defects have been detected.

Adhere to prescribed intervals or those specified in the operating instructions for routine checks and inspections.

For the execution of maintenance work, tools and workshop equipment adapted to the task on hand are absolutely indispensable.

The personnel must be familiar with the location and operation of fire extinguishers.

Observe all fire-warning and fire-fighting procedures.

## **⚠ FUNDAMENTAL SAFETY INSTRUCTIONS**

### **Selection and qualification of personnel - basic responsibilities**

Any work on and with the machine must be executed by reliable personnel only. Statutory minimum age limits must be observed.

Employ only trained or instructed staff and set out clearly the individual responsibilities of the personnel for operation, set-up, maintenance and repair.

Make sure that only authorized personnel works on or with the machine.

Define the machine operator's responsibilities - also with regard to observing traffic regulations - giving the operator the authority to refuse instructions by third parties that are contrary to safety.

Do not allow persons to be trained or instructed or persons taking part in a general training course to work on or with the machine without being permanently supervised by an experienced person.

Work on the electrical system and equipment of the machine must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.

Work on chassis, brake and steering systems must be performed by skilled personnel only, which has been specially trained for such work.

Work on the hydraulic system must be carried out only by personnel with special knowledge and experience of hydraulic equipment.

### **Safety instructions governing specific operational phases**

#### **Standard operation**

Avoid any operational mode that might be prejudicial to safety.

Before beginning work, familiarize yourself with the surroundings and circumstances of the site, such as obstacles in the working and travelling area, the soil bearing capacity and any barriers separating the construction site from public roads.

Take the necessary precautions to ensure that the machine is used only when in a safe and reliable state.

Operate the machine only if all protective and safety-oriented devices, such as removable safety devices, emergency shut-off equipment, sound-proofing elements and exhausters, are in place and fully functional.

Check the machine at least once per working shift for obvious damage and defects. Report any changes (incl. changes in the machine's working behaviour) to the competent organization/person immediately. If necessary, stop the machine immediately and lock it.

In the event of malfunctions, stop the machine immediately and lock it. Have any defects rectified immediately.

Start the machine from the driver's seat only.

During start-up and shut-down procedures always watch the indicators in accordance with the operating instructions.

Before setting the machine in motion, make sure that nobody is at risk.

Before starting work or travelling with the machine, check that the braking, steering, signalling and lighting systems are fully functional.

Before setting the machine in motion always check that the accessories have been safely stowed away.

When travelling on public roads, ways and places always observe the valid traffic regulations and, if necessary, make sure beforehand that the machine is in a condition compatible with these regulations.

## **⚠ FUNDAMENTAL SAFETY INSTRUCTIONS**

In conditions of poor visibility and after dark always switch on the lighting system.

Persons accompanying the driver must be seated on the passenger seats provided for this purpose.

When crossing underpasses, bridges and tunnels or when passing under overhead lines always make sure that there is sufficient clearance.

Always keep at a distance from the edges of building pits and slopes.

Avoid any operation that might be a risk to machine stability.

Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.

On sloping terrain always adapt your travelling speed to the prevailing ground conditions. Never change to a lower gear on a slope but always before reaching it.

Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use.

### **Special work in conjunction with utilization of the machine - maintenance and repairs during operation - disposal of parts and consumables**

Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the operating instructions and the information on maintenance work.

Ensure that the maintenance area is adequately secured.

If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:

- removing the ignition key and
- attaching a warning sign.

Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.

To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

## **⚠ FUNDAMENTAL SAFETY INSTRUCTIONS**

For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid.

Wear a safety harness when carrying out maintenance work at greater heights.

Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.

Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance/repair. Never use aggressive detergents. Use lint-free cleaning rags.

Before cleaning the machine with water, steam jet (high-pressure cleaning) or detergents, cover or tape up all openings which - for safety and functional reasons - must be protected against water, steam or detergent penetration. Special care must be taken with electric motors and switchgear cabinets.

Ensure during cleaning of the machine that the temperature sensors of the fire-warning and fire-fighting systems do not come into contact with hot cleaning agents as this might activate the fire-fighting system.

After cleaning, remove all covers and tapes applied for that purpose.

After cleaning, examine all fuel, lubricant, and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found must be rectified without delay.

Always tighten any screwed connections that have been loosened during maintenance and repair.

Any safety devices removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.

Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.

### **Warning of special dangers**

#### **Electric energy**

Use only original fuses with the specified current rating. Switch off the machine immediately if trouble occurs in the electrical system.

When working with the machine, maintain a safe distance from overhead electric lines. If work is to be carried out close to overhead lines, the working equipment must be kept well away from them. Caution, danger! Check out the prescribed safety distances.

If your machine comes into contact with a live wire

- do not leave the machine
- drive the machine out of the hazard zone
- warn others against approaching and touching the machine
- have the live wire de-energized
- do not leave the machine until the damaged line has been safely de-energized.

The electrical equipment of machines is to be inspected and checked at regular intervals. Defects such as loose connections or scorched cables must be rectified immediately.

#### **Gas, dust, steam and smoke**

Operate internal combustion engines and fuel-operated heating systems only on adequately ventilated premises. Before starting the machine on enclosed premises, make sure that there is sufficient ventilation.

Observe the regulations in force at the respective site.

Carry out welding, flame-cutting and grinding work on the machine only if this has been expressly authorized, as there may be a risk of explosion and fire.

Before carrying out welding, flame-cutting and grinding operations, clean the machine and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated (risk of explosion).

## **⚠ FUNDAMENTAL SAFETY INSTRUCTIONS**

### **Hydraulic and pneumatic equipment**

Check all lines, hoses and screwed connections regularly for leaks and obvious damage. Repair damage immediately. Splashed oil may cause injury and fire.

Depressurize all system sections and pressure pipes (hydraulic system, compressed-air system) to be removed in accordance with the specific instructions for the unit concerned before carrying out any repair work.

Hydraulic and compressed-air lines must be laid and fitted properly. Ensure that no connections are interchanged. The fittings, lengths and quality of the hoses must comply with the technical requirements.

### **Noise**

During operation, all sound baffles of the machine must be closed.

Always wear the prescribed ear protectors.

### **Oil, grease and other chemical substances**

When handling oil, grease and other chemical substances, observe the product-related safety regulations.

Be careful when handling hot consumables (risk of burning or scalding).

### **Transporting and towing - recommissioning**

The machine must be towed, loaded and transported only in accordance with the operating instructions.

For towing the machine observe the prescribed transport position, admissible speed and itinerary.

Use only appropriate means of transport and lifting gear of adequate capacity.

The recommissioning procedure must be strictly in accordance with the operating instructions. □

**Repair work - safety instructions**

2801063



**DANGER**

**Operating instructions**

Never carry out repair work without having read and understood the operating instructions.

Pay special attention to:

"Fundamental Safety Instructions",  
"Inspection and servicing - safety instructions" and all warnings and safety instructions attached to the machine.

The descriptions of job sequences provide only experienced personnel with the necessary instructions.

The operating manual must be kept with the machine at all times.

**Repair personnel**

Repair personnel must have know-how and experience relevant to repairing this or comparable machines.

**Working at greater heights**

Always wear safety harnesses when working at greater heights.

Wear an approved safety harness; it must be equipped with stabilizers and safety cables.



**DANGER**

**Pressurized or spring loaded units**

Never open defective pressurized or spring loaded units but replace them as an entirety.

In exceptional cases, open only when the system and the operating sequence are precisely known and any special tools required are available.

The technical handbook contains no information on this point.

**Never remove lead seals**

Never change rated pressure of pressure relief valves without the explicit authorization of NEW HOLLAND CONSTRUCTION.

Never remove lead seals from pressure relief valves and accumulators.

**ACCUMULATORS**  
**Safety instructions**

2800629

**! WARNING**

**Dismantling components**

Never dismantle while the machine is at operating temperature.

Oils, greases, brake fluid or coolants may have a high temperature and result in burning or scalding.

Leave time for the machine to cool down.

Before starting work, depressurize piping and hoses, cylinders, radiator, hydraulic tank, air-brake reservoir and other systems or units.

Replace defective components in good time to prevent major damage.

Clean the defective component carefully before dismantling it.

Mark the dismantled parts in the correct sequence to facilitate assembly.

When dismantling the component, close off exposed hose and piping connections, exposed drill holes and housing carefully to prevent any dust from penetrating.

**After the repair work**

To prevent corrosion, coat all bright metal machine parts with a grease film.

On completing the work, reassemble all protective devices, covers, and sound- and vibration-insulation material.

Never start up the driving motor while work is being done on the machine.

Check the repaired components and all machine functions with a trial run.

Never release the machine for recommissioning until it is fully functioning.

□

**! DANGER**

Accumulators are installed in the hydraulic system. These accumulators contain nitrogen under high initial pressure.

Even when the hydraulic pressure in the system is reduced, the nitrogen remains in the accumulator.

The accumulators are completely safe in operation. If incorrectly handled, however, there is a risk of explosion.

So:

- Never handle accumulator mechanically, never weld or solder it.
- Testing and servicing work must be carried out by experts only.
- Prior to any testing and servicing work, depressurize the hydraulic part of the system.
- To dismantle the accumulator, always wear goggles and working gloves.
- Fill accumulator with nitrogen only, never with compressed air or oxygen.
- Report any defects or damage to the machine owner without delay.
- Prior to recommissioning, an inspection by a specialist or expert is essential if the accumulator was damaged or if the admissible operating temperature or operating pressure was exceeded.

Never remove or paint over warning and information plates, rating plates or type identification markings. Replace illegible or damaged plates immediately.

□

**ENGINE**

2801064

**Engine - repair instructions**



**DANGER**

Read and observe: "Repair, safety instructions" and operating instructions for engine before working on the engine.

Risk of injury from rotating or hot engine parts!

Switch off engine and leave to cool down.

Do repair work only if machine is secured as described in section "Securing the machine" of these operating instructions.

Check and change V-belts only when engine is stationary.

Repair work on the engine demands extensive know-how and special tools.

In cases of doubt, have the repair work carried out by your Dealer.



**Assisted starting (with jumper cables) - safety instructions**

2800620



**WARNING**

Keep any potential ignition sources such as unshielded lights or burning cigarettes away from the batteries. The battery vapours are highly flammable. Explosion hazard.

Never use assisted starting when the batteries are defective or frozen.

Never connect batteries (battery assemblies) unless they have the same voltage.

Use only tested jumper cables with insulated terminal clips and an adequate lead diameter.

Ensure that the bodies of the supplying and receiving machines are not in contact. Otherwise a current flow could result from connecting the positive poles. Risk of short-circuiting.

Never use welding generators or welding transformers as a source of current.

Position the jumper cables in such a way that they cannot be caught by rotating engine components.

Read and observe: "Inspection and servicing, safety instructions", paying particular attention to the section "Handling batteries".



**WELDING OPERATIONS**

**Welding operations - safety instructions**

2801065

**⚠ WARNING**

Never perform welding operations unless you are qualified to do so.

Observe the accident prevention regulations.

Any work on receptacles that contain or have contained substances which are

- combustible or which encourage combustion, which
- are susceptible to explosion, or which
- may develop health-hazardous gases, vapours, mist or dust during welding operations

must be carried out only under expert supervision and only by experienced persons authorized to do such work.

**⚠ WARNING**

Prior to any welding operations on the machine:

- Disconnect the battery, first the negative terminal and then at the positive terminal.
- Disconnect the positive terminal at the alternator.

Protect the disconnected terminals and plugs from short-circuiting and soiling by covering them with foil or adhesive tape.

Apply the welding current terminals very close to the welding point.

The welding current must not flow through gearboxes, bolted or articulated joints or hydraulic cylinders.

On completion of the welding operation, restore all electrical connections.

When connecting the battery, first connect the positive terminal and then the negative terminal.

□

Notes

2800145

A large grid of graph paper for taking notes, consisting of 28 columns and 40 rows of small squares.

**02 Service Data**

**Service Data General**

**Service Data LW 80.B**



# **SERVICE DATEN**

# **SERVICE DATA**

**Allgemein**  
**General**

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VORWORT

2801092

FOREWORD

**⚠️ WARNUNG**

Jede Person, die mit der Inbetriebnahme, Bedienung, Inspektion und Wartung dieser Baumaschine befaßt ist, muß - bevor sie die ersten Handgriffe ausführt - die "BETRIEB-SANLEITUNG" und besonders das Kapitel "GRUNDLEGENDE SICHERHEITSHINWEISE" gelesen und verstanden haben.

**⚠️ WARNING**

Anyone involved with commissioning, operating, inspecting and servicing for this construction machine must read through and acquaint himself with the "OPERATING MANUAL" - and especially the Section "FUNDAMENTAL SAFETY INSTRUCTIONS" - before starting work.

Die "Service Daten" enthalten Angaben, die für Kundendienstmitarbeiter wichtig sind. Maschinendaten, die an anderer Stelle der Dokumentation aufgeführt sind, werden hier nicht wiederholt. Zur Dokumentation dieser Baumaschine gehören:

- Betriebsanleitung
- Ersatzteilliste

Zur Dokumentation im weiteren Sinne gehören auch "Technische Handbücher" (THB) und "Service Informationen" (si).

In dieser Broschüre sind die Daten der Hilfsaggregate zum Betrieb von Zusatz- oder Sonderausrüstungen sowie Daten von Einzelgeräten nicht aufgeführt.

Die aufgeführten Füllmengen der Betriebsmittel sind ca.-Angaben, die Dispositionshilfe sein sollen. Jedes Aggregat besitzt geeignete Kontrolleinrichtungen, z. B. Peilstab oder Kontrollschrauben, mit denen die exakte Befüllung geprüft wird.

The "Service Data" contains details which are important to the service staff. Data included in other parts of the general documentation have been left aside. The set of documents for this construction machine includes:

- Operating manual
- Spare parts list

"Technical Handbooks" (THB) and "Service Information" bulletins (si) are, furthermore, to be considered as supplements to the general documentation.

Data regarding auxiliary units for operating ancillary or special systems, as well as data on machines produced only in small numbers, have not been included.

Filling quantities are only approximate figures intended to help in stockholding the various fluids and agents. Each unit has appropriate checking systems, e.g. dipstick or checking screws, with which the exact filling level can be checked.

**⚠️ VORSICHT**

Die in den Kapiteln aufgeführten Sach-Nrn. nicht zum Bestellen von Ersatzteilen verwenden. Sie sollen nur dokumentieren, auf welches Bauteil sich die nachstehenden Daten beziehen. Zur Ersatzteilbestellung die zur Maschine gehörende Ersatzteilliste verwenden.

**⚠️ CAUTION**

The Part Nos. given in the sections are not to be used when ordering spare parts. They are only intended to identify the component being referred to. When ordering spare parts, use only the Part Nos. given in the spare parts lists.

□



**SI - UND WEITERE GRÖSSEN**  
**SI - AND ADDITIONAL UNITS**

2801093

**Raum - und Massegrößen**  
**Quantities of space and mass**

Größe Quantity	Formel zeichen Symbol	Einheit Unit				Umrechnung Conversion		Erläuterungen und Bemerkungen Explanations and Remarks
		alt	old	neu new		Für genaue Rechnungen for exact calculation	für über- schlägige Rechnungen (2 % Unge- nauigkeit) for rough calculation appr. 2 % inexact	
				SI-Einheit SI-Units	Auswahl weitere Einheiten Selection of additional units			
Länge Length	l	m, mm, cm dm, m, km	m	m, mm, km				
Fläche Area	A	mm <sup>2</sup> , cm <sup>2</sup> , dm <sup>2</sup> , m <sup>2</sup>	m <sup>2</sup>	mm <sup>2</sup> , cm <sup>2</sup>				
Volumen Volume	V, Vn	mm <sup>3</sup> , cm <sup>3</sup> , dm <sup>3</sup> , m <sup>3</sup> , l	m <sup>3</sup>	mm <sup>3</sup> , cm <sup>3</sup> , dm <sup>3</sup> , l				
Masse Mass	m	g, mg, g, kg, Mg=t, (kp s <sup>2</sup> /m)	kg	g, mg, g Mg, t				
Dichte Density	ρ	g/cm <sup>3</sup> , kg/dm <sup>3</sup> , kg/m <sup>3</sup> , (kp s <sup>2</sup> /m <sup>4</sup> )	kg/m <sup>3</sup>	g/cm <sup>3</sup> , kg/dm <sup>3</sup>				
Massenträgheitsmoment Inertia moment	J	kp m <sup>2</sup> , (kp m s <sup>2</sup> )	kg m <sup>2</sup>	Mg m <sup>2</sup>	1 kp m s <sup>2</sup> = 9,81 kg m <sup>2</sup>	1 kp m s <sup>2</sup> = 10 kg m <sup>2</sup>		
Spezifisches Volumen Specific volume	v	m <sup>3</sup> /kg, m <sup>3</sup> /t	m <sup>3</sup> /kg	m <sup>3</sup> /Mg				

**Zeitgrößen**  
**Time-related quantities**

Größe Quantity	Formel zeichen Symbol	Einheit Unit			Umrechnung Conversion		Erläuterungen und Bemerkungen Explanations and Remarks
		alt old	neu new		Für genaue Rechnungen for exact calculation	für über- schlägige Rechnungen (2 % Unge- nauigkeit) for rough calculation appr. 2 % inexact	
			SI-Einheit SI-Units	Auswahl weitere Einheiten Selection of additional units			
Zeitdauer Time	t	s, min, h, d = day	s	ms, min, h, d			
Frequenz Frequency	f	Hz	Hz				1 Hz 1/s
Drehzahl Rate of revolutions	n	U/min	1/s	1/min			s = min/60
Geschwindigkeit Speed	v	m/s, km/h	m/s	km/h			
Beschleunigung Acceleration	a	m/s <sup>2</sup>	m/s <sup>2</sup>				
Volumenstrom Volume flow	V	m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h	m <sup>3</sup> /s	m <sup>3</sup> /min, l/h			
Massenstrom Mass flow	m	kg/s, kg/min, kg/h	kg/s				
Wärmestrom Heat flow	φ	(kcal/h)	W	kW, MW	1 kcal/h = 1,163 W	1 kcal/h = 1,2 W	1 W = 1 J/s = 1 Nm/s
Spez. Kraftstoff- oder spez. Ölver- brauch Specific fuel and oil consumption	b, b <sub>s</sub>	kg/PSh g/PSh	kg/J	g/(kW h)	1 g/(PS h) = 1,359 g/(kW h)	1 g/(PS h) = 1,36 g/(kW h)	

**Kraft-, Energie- und Leistungsgrößen**  
**Quantities of force, energy and power**

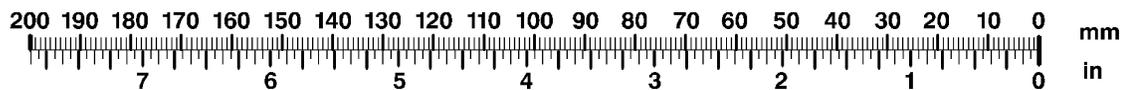
Größe  Quantity	Formel zeichen  Symbol	Einheit Unit		Umrechnung Conversion		Erläuterungen und Bemerkungen  Explanations and Remarks	
		alt old	neu new		Für genaue Rechnungen  for exact calculation		für über- schlägige Rechnungen  (2 % Unge- nauigkeit)  for rough calculation appr. 2 % inexact
			SI-Einheit SI-Units	Auswahl weitere Einheiten Selection of additional units			
Kraft Force	F	(dyn, p)	N (Newton) (njuten)	MN, kN, mN	1 kp = 1 kg x 9,81m/s <sup>2</sup> = 9,81 N	1 kp = 10 N	1 N = 1 kg x 1 m/s <sup>2</sup> = 1 kg m/s <sup>2</sup>
Druck (von Fluiden) Pressure (of fluids)	P, Pi,  P <sub>e</sub> ,  P <sub>ü</sub> , P <sub>u</sub>	(kp/cm <sup>2</sup> ,at,atm,)  (mWS, Torr,)  (mmHg)	N/m <sup>2</sup> ,  Pa (Pascal)	bar, mbar	1 kp/cm <sup>2</sup> = 0,981 bar 1 atm = 1,013 bar 1 mWS = 0,098 bar	1 kp/cm <sup>2</sup> =1 bar  1 mWS = 0,1 bar	1 N/m <sup>2</sup> =1 Pa  1Pa = 10 <sup>-5</sup> bar  1 bar = 10 <sup>5</sup> N/m <sup>2</sup>
Mechanische Spannung Mechanical stress	σ,τ	(kp/cm <sup>2</sup> , kp/mm <sup>2</sup> )	N/m <sup>2</sup> , pa	N/mm <sup>2</sup>	1 kp/mm <sup>2</sup> = 9,81 N/mm <sup>2</sup> 1 kp/cm <sup>2</sup> = 9,81 N/mm <sup>2</sup>	1 kp/mm <sup>2</sup> = 10 N/mm <sup>2</sup> 1 kp/cm <sup>2</sup> = 10 N/cm <sup>2</sup>	1 N/m <sup>2</sup> = 1 Pa
Energie, Arbeit Energy	W	(kpm)	J (Joule) (dschul)	MJ, kJ, kW h	1 kpm = 9,81 J	1 kpm = 10 J	3,6 MJ = 1 kWh 1 J = 1 NM = 1 Ws
Wärmemenge Heat capacity	Q	(cal, erg)	J (Joule) (dschul)	MJ, kJ, kW h	1 kcal = 4,19 kJ		3,6 MJ = 1 kW h 1 J = 1 Nm = 1 Ws
Leistung Power	P	(PS), W	W	kW, MW	1 PS = 0,735499 kW 1 kW = 1,359622 PS	1 PS = 0,74 kW 1 kW = 1,36 PS	1 W =1 J/s = 1 Nm/s
Dreh-Biegemoment Torque, bending moment	M	(kp m)	Nm	N cm	1 kp m = 9,81 N m	1 kp m = 10 N m	

**UMRECHNUNGSTABELLEN  
CONVERSIONS TABLES**

**Umrechnung von Längen-Maßen  
Conversion for units of length**

Länge Length	in	ft	yd	mile	UK n mile	cm	m
1 inch (Zoll)	1	0,0833	0,0278			2,54	0,0254
1 foot (Fuß)	12	1	0,3333	0,00019	0,00016	30,48	0,3048
1 yard	36	3	1	0,00057	0,00049	91,44	0,9144
1 statute mile (Landmeile)	63 360	5 280	1 760	1	0,86842		1609,3
1 UK nautical mile (engl. Seemeile)	72 960	6 080	2 026,7	1,15151	1		1 853,2
1 cm	0,3937	0,0328	0,0109			1	0,01
1 m	39,370	3,2808	1,0936	0,00062	0,00054	100	1

**Länge  
Length**

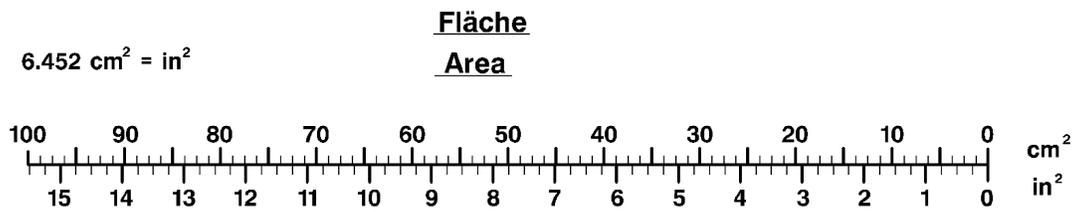


25,4 mm = 1 in

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**Umrechnung von Flächenmaßen**  
**Conversion for units of area**

Fläche Area	in <sup>2</sup>	ft <sup>2</sup>	yd <sup>2</sup>	sqmile	acre	cm <sup>2</sup>	m <sup>2</sup>
1 square inch (Quadratzoll)	1	0,0069				6,4516	
1 square foot (Quadratfuß)	144	1	0,111			929,03	0,0929
1 square yard (Quadratyard)	1 296	9	1		0,00021	8361,3	0,8361
1 square mile (Quadratmeile)				1	640		
1 acre		43 560	4 840	0,00156	1		4 046,9
1 cm <sup>2</sup>	0,1550					1	0,0001
1 m <sup>2</sup>	1 550,0	10,764	1,1960			10 000	1



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