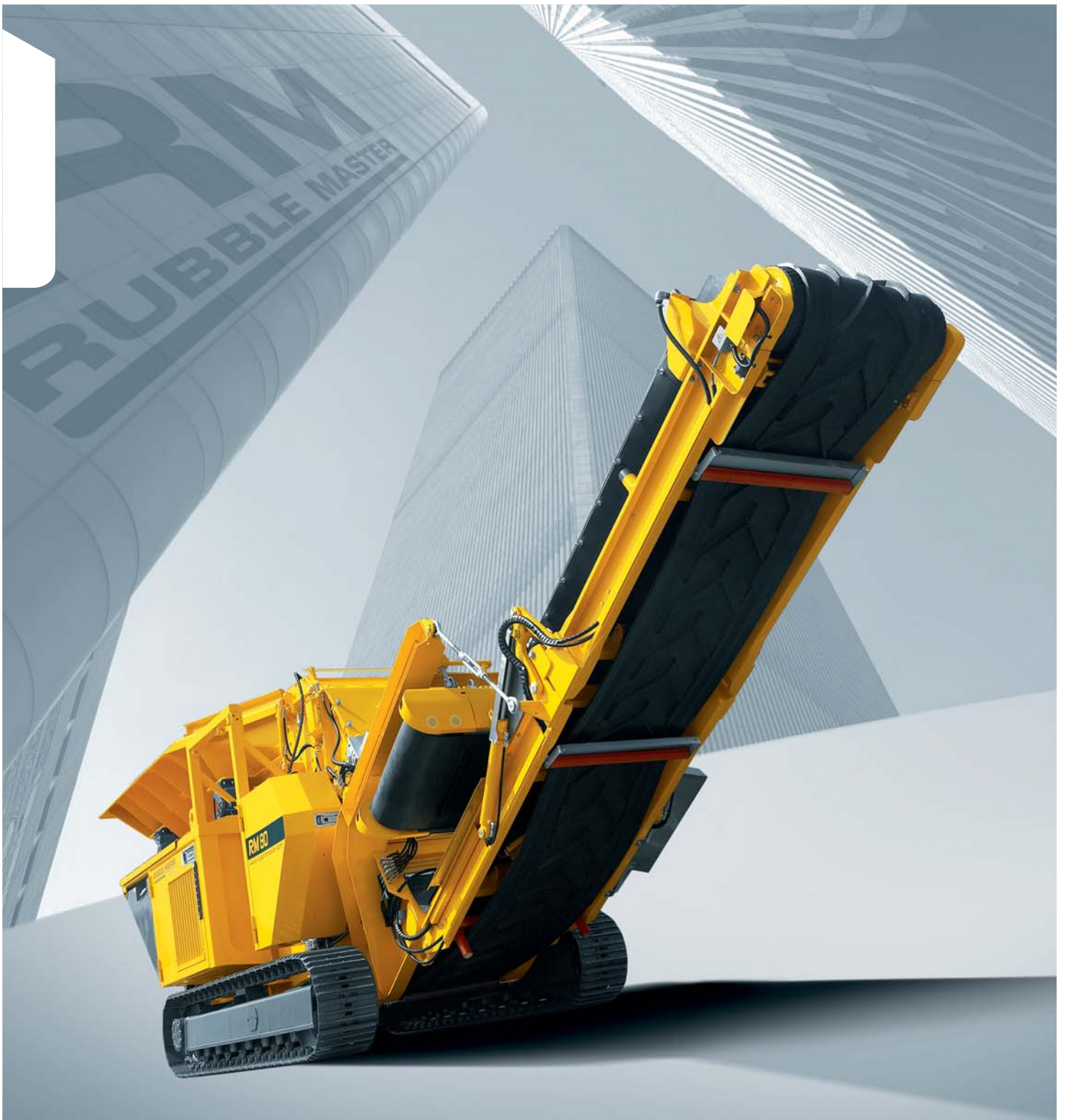




RM80

Instruction Manual

COMPACT RECYCLING FOR WINNERS

RUBBLE MASTER®
COMPACT RECYCLER

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1. PREFACE

1.1. GENERAL POINTS

This manual is intended to help you get to know your crusher, operate it correctly and safely, maintain it and take full advantage of its intended applications. The manual must always be on hand at the equipment location.

Whoever is involved in work at the crusher – e.g.:

- operation,
- maintenance,
- transport, etc.

must have read and understood the user manual before starting work, and must comply with the instructions it contains. It is advisable for the owner to have this confirmed in writing in each individual case.

Should you sell your crusher on, make sure that the new owner receives this manual; from a legal point of view it is part of the equipment.

The equipment supplied is safe to operate only if it is used for the purpose intended. The ceiling values listed in the technical data must not be exceeded in any circumstances; any right to compensation is forfeited if these points are ignored.

If the maintenance schedules laid down are not kept to, and signs of premature wear and tear are detected, no claims for these can be made under the warranty.

1.2. ORIGINAL REPLACEMENT PARTS

Original parts and accessories are designed specifically for this machine. Replacements for these that are not supplied by the crusher manufacturer have not been tested and released by him, either. Fitting and/or using such products may in certain circumstances affect the crusher's design properties and lead to safety hazards.

1.2.1. LIABILITY DISCLAIMER

The manufacturer disclaims any liability whatever for loss resulting from other than original parts and accessories and/or incorrect fitting or replacing of original parts and accessories. Using such parts nullifies any liability for the resulting consequences. We recommend having maintenance and repair work done by an authorized dealer.

We emphasize that improper use of the machine leads to a decrease in performance, more frequent defects and thus increased running costs for you, as well as the risk that the warranty may expire.

1.3. HAMMER AND WEARING PLATE FRACTURE

HMH GmbH accept no liability for loss (including consequential loss) resulting from hammer fracture owing to improper use. the right to claim under warranty obtains only where a material defect in the hammers and wearing plates supplied by HMH GmbH has been identified. so that this can be checked in the case in question, all fragments must be returned to us.

1.4. WARRANTY TERMS

The right to claim under warranty lapses in cases of:

- improper use
- incorrect operation
- incorrect and/or inadequate maintenance
- use of unauthorized consumables
- use of spares, replacement parts and other components not authorized by the manufacturer

We also emphasize that the content of this manual is neither part of a previous or existing agreement, commitment or legal relationship nor intended to modify one. HMM's obligations arise exclusively from the relevant contract of sale, which also contains the entire and exclusively valid terms of warranty. The wording of the manual neither restricts nor extends the terms of the contractual warranty.

2. SAFETY

2.1. WHAT SAFETY INVOLVES

2.1.1. DEFINITIONS

Although the machine's design is state-of-the-art, there are various safety hazards (some of them far from obvious) involved in dealing with it. To reduce the residual hazards, the sections that follow cover the various types of hazard and the appropriate course of action in each case. Depending on the degree of risk involved, a distinction is made between Danger, Warning, Hazard and Caution.

Example:

Danger! Here the type of danger involved is described and assigned to one of the four categories.	WARNING 
Action to be taken: Here the most important steps to avoid the hazard in question are explained.	

2.1.1.1. DANGER

Indicates an **extremely serious current danger** in dealing with the machine. If no warning is given and no precautions are taken, serious injury or even death will definitely result.

2.1.1.2. WARNING

Indicates a **potential danger** from the machine which can result in serious injury or even death if proper precautions are not taken.

2.1.1.3. HAZARD

Indicates a hazardous situation that can result in minor or medium-category injury or in damage to property.

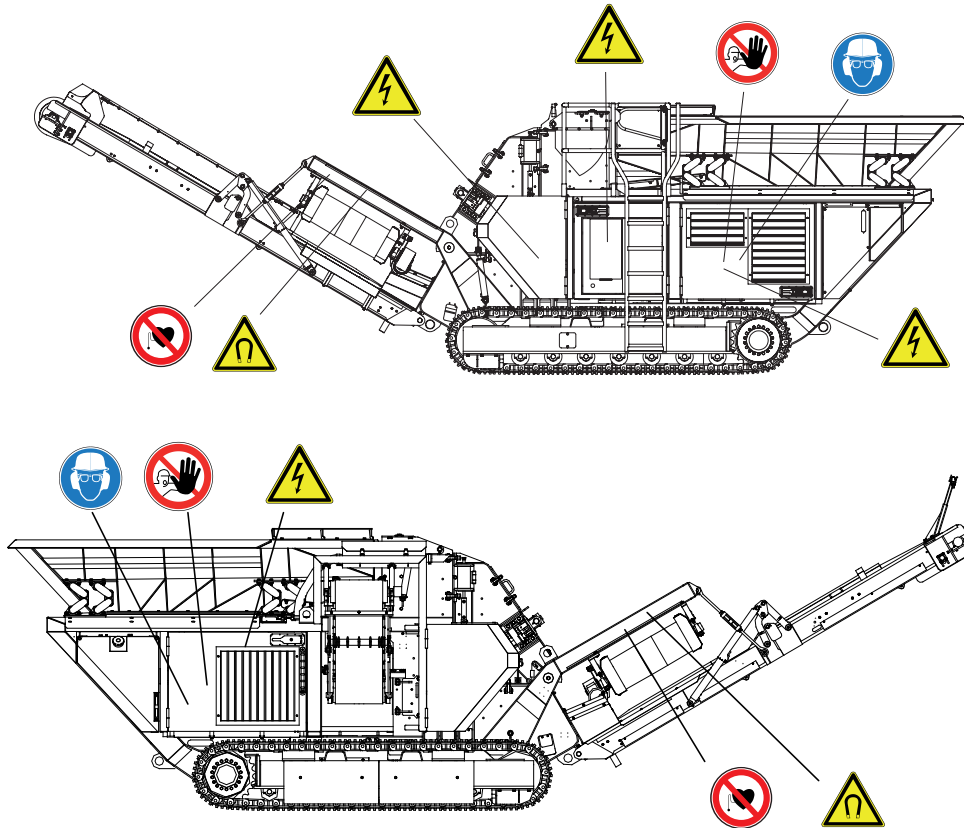
2.1.1.4. CAUTION

Indicates a potentially hazardous situation. If it is not avoided, the machine or something nearby may be damaged.

2.1.2. SIGNS

If signs are illegible or missing, hazards are created: staff make unjustified assumptions, and this leads to mistakes in operating the machine.	WARNING 
Replace a missing or illegible sign immediately!	

Signs are mounted in the following locations:



2.1.3. MANDATORY SIGNS

General-purpose sign giving an order (usually with an additional sign attached)	Wear hard hat	Wear ear protectors	Disconnect from mains before opening

Wear particulate mask (P2 filter)	Wear safety goggles	Wear safety footwear	Wear protective clothing	Wear hard hat, face shield and ear protectors

2.1.4. PROHIBITION SIGNS

Spraying with water prohibited	Fire, naked flame and smoking prohibited	No access for unautho- rized persons	No access for persons with pacemakers

2.1.5. WARNING SIGNS

					
Warning: hazard zone	Warning: risk of electric shock	Warning: inflammable substances	Warning: oxidizing substances	Warning: explosive substances	Warning: hand hazard
					
Warning: intake shaft	Warning: crush zone – keep clear	Warning: falling objects	Warning: falling loads	Warning: hot surface	Warning: magnetic field
					
Warning: machine starts automatically	Warning: corrosive substances	Warning: hazards from battery	Warning: toxins or irritants	Warning: slippery surface	Warning: steep drop

2.2. DEFINITION OF HAZARD ZONE

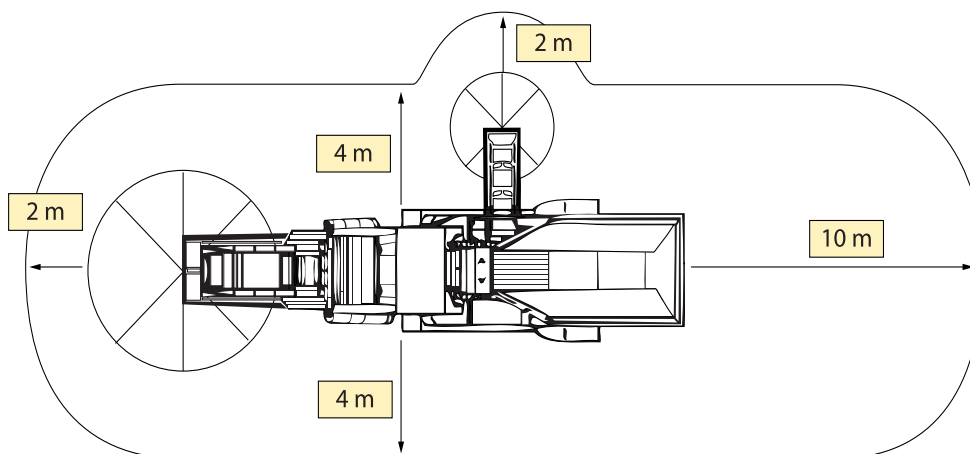
Hazard zone means the area on, beneath and around the machine in which the physical safety or health of persons is at risk.

Danger from disregarding the limits prescribed for working areas! Staying close to the machine outside the limits prescribed for working areas during operation can lead to death or serious injury.	WARNING 
Enter or reach into any hazard zone only after the relevant section of the machine has been disconnected electrically and hydraulically and the switches have been secured against reactivating by means of a padlock and/or prohibition sign. ▪ Take any further steps that may be necessary to ensure that working is safe.	

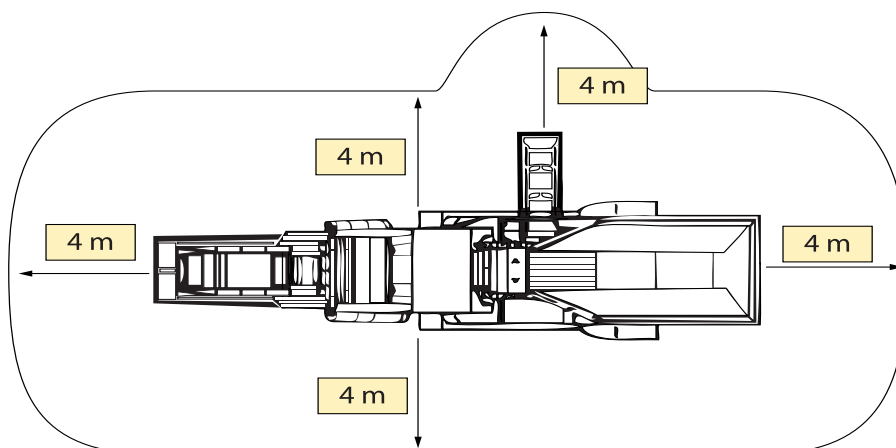
2.2.1. HAZARD ZONES DURING CRUSHER OPERATION



Staying in these danger areas is strictly forbidden!



2.2.2. HAZARD ZONES DURING TRAVEL



2.3. SAFETY IN OPERATION

- The machine must never be operated by untrained or inexperienced personnel.
- Keep operators currently under the influence of alcohol or narcotics well away from the entire machine.
- Unauthorized modifications to the machine by the user or operator are not allowed; the manufacturer is in no way liable for any material damage or personal injury resulting from such modifications.
- The accident prevention rules applying, and all other generally accepted regulations in the fields of health and safety at work and of road traffic, must be kept to.
- The accident prevention and safety regulations applying to operation, transport, installation, maintenance and repair, and the manufacturer's operating and maintenance instructions, must be complied with.
- The user is also required to comply with local safety regulations.

2.3.1. USE FOR THE PURPOSE INTENDED

2.3.1.1. MATERIAL TO BE PROCESSED

- The **RM 80** Compact Recycler may be used only for the purpose intended, i.e. only to crush **rubble, asphalt, brickwork, and standard and recycled concrete**.
- Stone can be crushed without difficulty up to a **maximum compression strength of 25 000 N/cm²**, allowing for the size of charge.
- In the case of compression strengths beyond 25 000 N/cm² the manufacturer should be consulted. Only after this should a test with modest amounts of material and grain sizes be performed to determine the crushing behaviour of materials with higher compression strengths.
- **Rebars** are permissible up to a **diameter of 12 mm**, provided that they do not project out of the charge, and that **martensitic ceramic hammers** are used.

2.3.1.2 SIZE OF MATERIAL

- The permissible size of material depends on charge quality and on the material of the hammers.
- In the most favourable circumstances feed size can be up to 700 mm edge length; "edge length" is the term for the greatest spatial extension of the material.
- The general rule is: the greater the compression strength, the less the size of the feed must be.
- Any attempt to use the machine for material beyond this limit counts as no longer for the purpose intended. The manufacturer is in no way liable for whatever damage results; the user bears the risk involved, and the warranty on the machine expires automatically.
- Use for the purpose intended involves complying with the manufacturer's instructions as regards operation, maintenance and repair work.

In section 4.3.1 you will find tables that specify feed size and hammer material exactly on the basis of the type of material to be processed.

2.4. SAFETY RULES AND HAZARD WARNINGS

2.4.1. GENERAL POINTS

Before every start on work, and after every interruption to work, the operator must first make sure that there is no one in the hazard zone around the machine.

In addition, all safety rules for the following branches apply:

- Civil engineering
- Earth moving and rock works
- Quarrying and excavation
- Other fields

2.4.1.2. THOUGHTLESS ACTIONS

Hazard arising from thoughtless actions! Thoughtless actions can lead to death, serious injury or material damage to the machine.	WARNING 
▪ Ensure that no one is standing beneath the machine, on it or within the hazard zone around it, when you start a machine function. ▪ Never actuate control levers, keys, contactors, limit switches etc. thoughtlessly or for fun. ▪ Never disable safety devices. ▪ Never change the settings of limit switches, pressure switches or other controls arbitrarily. ▪ Allow only skilled workers (electricians, metalworkers, etc.) to remedy defects.	

2.4.1.3. PROTECTIVE CLOTHING

In some circumstances the crusher may eject material into the hazard zone. For this reason there is a rule that no one may enter the hazard zone unless they are wearing a hard hat, gauntlets, protective clothing, safety footwear, a face shield and ear protectors; they may also need a particulate mask.	WARNING 
--	---

2.4.1.4. SUBSOIL

Hazard if subsoil load capacity is inadequate! If subsoil load capacity is inadequate, the machine may bog down and/or overturn. This can result in the death of or severe injury to persons, or cause damage to the machine.	WARNING 
- Make sure that the subsoil can support the loads involved. - Keep a safe distance from pits and steep slopes, to avoid the machine slipping down-hill or overturning.	

2.4.1.5. SAFETY EQUIPMENT

Safety equipment is installed for the safety of persons and material assets, and must not in any circumstances be altered, removed or in any way bypassed!	WARNING 
--	---

2.4.1.6. LED'S (LIGHT-EMITTING DIODES)

During operation, keep a constant eye on the LED's on the control unit (motor supervision / LED chain), so as to detect any sign of trouble and take corrective action without delay	CAUTION 
--	---

2.4.1.7. UNTRAINED PERSONS

Hazard from mistakes by untrained persons! If anyone with inadequate knowledge of how the machine works actuates controls or otherwise tampers with the machine, this can lead to death, serious injury or material damage to the machine.	WARNING 
- Inform personnel at regular intervals about the machine's functions and residual hazards. - Keep unauthorized / untrained non-employees well away from the machine. - Always lock all doors. - Place the prohibition sign "No admittance for unauthorized persons" at the site entrance. - Before work starts, the user must familiarize himself with all controls and machine functions – during operation it is too late for this.	 

2.4.1.8. WELDING

Before doing welding work on the machine, you must take the following steps: ▪ Turn main battery switch to OFF ▪ Unplug the cables connecting the following devices, to prevent possible damage to them: • EMR controller (at the back of the engine compartment on the left) • Frequency converter (in the control box at the back of the engine compartment on the right) • Hydraulic regulator (inside at the right-hand-side control box casing) • Remote-control receiver (behind control box, next to bypass chute) ▪ Connect the welder earthing cable as close as possible to the welding zone. For welding work on the vibrating chute you must earth the welder to the vibrating chute, to avoid a current overload in the cables to the vibrator motors.	HAZARD 
Before welding/burning/grinding anything on or close to the machine, remove all dust and flammable substances from the surrounding area, and ensure adequate ventilation (explosion and fire hazard!).	

2.4.1.9. CLEANING

Covers

Cleaning with water could conceivably damage the electrics. Avoid aiming a jet of water directly at electrical components. Avoid aiming a jet of water into the exhaust – this could damage the engine and exhaust system.	CAUTION 
▪ Before cleaning the machine with water or a steam jet (high-pressure cleaning), cover all components that water/steam/cleaning agents must not penetrate into (because safety and/or correct functioning might be impaired).	

Lines

There is a risk of consumables escaping and polluting the environment, or oil escaping at high pressure and injuring people. Lubrication points must not be cleaned with a pressure washer.	HAZARD 
▪ After cleaning, you must check all fuel, lubricant and hydraulic fluid lines for leaks, loosened connections, chafing and damage! -> Remedy any defects found immediately! ▪ After cleaning lubrication points, lubricate them as per lubrication schedule.	

2.4.1.10. WORKING ON THE BATTERY

Battery acid

There is a risk of acid leaking out. Serious injury will result from skin contact with acid. There is also a risk of pollution, and the machine base frame could be damaged. When working on the battery, you must not smoke in any circumstances – smoking would involve a risk of explosion.	WARNING 
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Battery short-circuit or cable fire

Avoid metal parts touching the battery poles. If they do, there is a risk of a short-circuit or cable fire, which could cause a fire or an explosion!	CAUTION 
--	---

Charging the battery

To charge the battery, the pole caps must be removed; there is then a risk of explosion. If enclosed spaces are not properly ventilated, there is a risk of asphyxiation; so make sure that ventilation is adequate during charging. Disposal: as and when a battery stops working, dispose of it in an environmentally acceptable way.	WARNING 
--	---

Starting with an external battery

If you connect the machine to an external battery to get it started, make sure that the battery cables are connected in parallel: positive (+) to positive (+) und negative (-) to negative (-). Otherwise the battery might be damaged.	CAUTION 
---	---

2.4.1.11. FUELLING

Correct procedure

When fuelling the machine, draining diesel fuel, or working on the engine or the fuel tank, comply with the rules for dealing with flammable liquids. There is an increased risk of the engine or tank catching fire if the correct procedure is not followed.	WARNING 
▪ The engine must be switched off during fuelling, otherwise a spark might ignite diesel fumes. ▪ Fire, naked lights and smoking are strictly forbidden during fuelling, draining diesel fuel, working on the engine or the fuel tank and handling flammable liquids.	

Diesel fumes

The filling hose nozzle must always be in contact with the filling port leading to the fuel tank, as otherwise static electricity could conceivably ignite diesel fumes, causing a fire or a fuel tank explosion.	WARNING  
--	---

Fuelling in the open

If you fuel the machine in the open, you must place a drip pan under the fuel tank, as diesel fuel leaking out would pollute the surrounding area.	CAUTION 
---	---

2.4.1.12. EFFECTS ON HEALTH

Dust

Inhaling the dry dust that forms when the vibrating chute is charged, material is crushed, material is shifted out of the crusher or dropped off the conveyor belts onto the tip, or the machine is cleaned can impair health.	WARNING 
As and when dust is formed, or you are working near the machine or cleaning it, wear a particulate mask (P2 filter) .	

Gases

The diesel engine emits poisonous gases. So ensure adequate ventilation when working in enclosed spaces. Inhaling diesel fumes is bad for your health; avoid doing so as far as possible.	WARNING 
---	---

Noise

It is essential to wear effective ear protectors, otherwise you risk going deaf.	WARNING 
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Tripping or falling

Working on the machine can involve removing covers. Some components (such as the drums driving the conveyor belts) can be reached only via ladders etc. Climbing unsecured ladders or scaffolding involves a risk of falling. Tripping or falling can result in death or serious injury. - When climbing on the machine, keep your eyes open for obstacles. For maintenance and repair work: - Use stable ladders or scaffolding for work involving climbing up to the higher parts of the machine. - When climbing up or down, guard against falling by securing yourself with a suitable device After maintenance and repair work: - After finishing the job, replace/close all covers. - Remove any climbing aids, or secure them against unauthorized use (cordon them off). Owner to check: - that safety regulations are complied with whenever maintenance/repair work is done.	WARNING  
--	--

2.4.1.13. WHAT TO DO IN AN EMERGENCY

In an emergency, immediately press the blue shock switch (S0) on the radio-control unit or one of the EMERGENCY OFF shock switches on the machine. An emergency applies if continuing operation would lead to severe material damage or injury.	HAZARD 
THEN ACT AS APPROPRIATE IN THE CIRCUMSTANCES.	

2.4.2. LOADING THE MACHINE

2.4.2.1. REMOTE CONTROL

General points

Mistakes in operation, or misuse, may well cause danger to: - the operator's (or other persons') life and limb - the machine and other material assets	HAZARD 
--	--

Sources of danger

Remote control functions outside the field of vision, and through/around obstacles. - Switch the transmitter off and remove key (possible only in position 0 = off) whenever you put the transmitter down. - Before installation, maintenance and repair work switch the power supply to the machine off! - Never remove or alter safety devices! - The shock switch on the radio control unit will switch the machine off only if the transmitter is switched on AND within range of the receiver.	HAZARD 
---	--

2.4.2.2. TRAVELLING WITH TRACK MECHANISM

Staying in hazard zone

Staying in the hazard zone is strictly prohibited. If persons stay in the hazard zone while crushing is going on or the crusher is travelling, there is a danger that they will be hit by material dropping out or ejected, or be run over by the machine if they are not paying attention. In the case of travel (see section 2.2.2) the hazard zone comprises: - the space on and under the machine - the area within 4 m of the machine, particularly around the track mechanism.	WARNING 
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Runaway machine

As soon as the engine starts, the hydraulic pump is also running; so – given a most unlikely chain of events – the machine could conceivably start travelling of its own accord, in which case there would be a risk of being run over or crashed into. That is why caution is required in this area.	WARNING  
---	---

Travelling on gradients and ramps

The machine can cope with gradients up to 50% (22.5°). With gradients steeper than this, parts of the machine could ground at the start of the gradient and be damaged. Here the crawler track drive must be at the rear. Great care must be taken with negotiating ramps in either direction. Particularly on slippery surfaces, the machine can easily slew – in which case people might be injured or the machine might be seriously damaged. Take care with changes in gradient -> have the machine tilt over its centre of gravity as slowly and cautiously as possible!	CAUTION 
---	---

Crawler tracks

When the machine is travelling, no one must touch the crawler track. There is a risk of getting caught! At low temperatures you must check whether the tracks have frozen to the ground; in this case the hydraulic fluid could overheat, or the hydraulics could be damaged.	WARNING  
--	---

Moving the machine

Whenever you move the machine, the discharge belts must be retracted and bolted in place!	CAUTION 
--	---

2.4.2.3. LOADS DROPPING

If loads are lifted with unsuitable or damaged devices and/or ropes, chains etc., they may drop; this could lead to death or serious injury. The hazards involved: falling and being crushed.	WARNING    
- Take the weight of the machine into account (see data plate, dimensioned drawings or section 7. Technical data). - Use suitable devices and accessories in good condition for lifting. - Do not pass under a load in midair. - Always wear a hard hat. - Always wear safety footwear. - No one must be on the machine when it is being loaded onto a vehicle or unloaded, or when it is being lifted by crane. - The lugs for lifting the machine by crane have a design load of 7 000 kg each (28 t in all). - Make sure that all warning, mandatory and prohibition signs are in place and legible. - Comply with rules about protective devices for persons.	

2.4.2.4. MAIN AND SIDE DISCHARGE BELTS

Retracting/swinging out discharge belts

- No one must be in the hazard zone when the belts are being swung out/retracted, otherwise they could get caught! - Before you swing the side discharge belt out, you must remove the bypass chute, otherwise it will be damaged.	WARNING 
---	---

2.4.3. DURING OPERATION

Operators

- Only reliable personnel may carry out work on / with the machine. Bear the minimum legal age in mind. - Use only trained or instructed personnel. - Ensure that only personnel authorized to do so are in action on the machine. - Define the operator's sphere of responsibility (with regard to traffic law, too), and allow him to refuse to carry out orders by third parties where such orders involve safety hazards.	WARNING 
--	---

▪ Allow personnel undergoing training / instruction / an apprenticeship to work on / with the machine only under continuous supervision by an experienced person. ▪ The staff must always wear protective clothing: • hard hat with face mask and ear protectors • safety footwear • gauntlets ▪ The operator must operate the machine so as to avoid danger to himself and others. ▪ Only the operator may actuate the crusher controls. ▪ If persons fail to leave the hazard zone in spite of being warned, the operator must stop work. ▪ The operator must check every day before starting work that the controls and safety devices (e.g. EMERGENCY OFF function) are fully operational; in the case of machines that are not often used, he must do this whenever he switches the machine on. ▪ Operators must keep a watchful eye on the state of the machine. Any defects detected must be reported to the relevant supervisor and (in the case of shift working) to the operator on the following shift. In the case of defects that interfere with safe operation, work must stop at once.	 
--	---

2.4.3.1. POWER TRAIN

Danger of being caught and injured

Do not open the engine space during operation!	WARNING
Belt drives involve a risk of people getting caught between: ▪ clutch unit and hydraulic pump ▪ clutch unit and generator ▪ clutch unit and rotor V-belt pulley Reaching or moving into these areas can result in serious injury.	 
▪ You must wait for the machine to come to a complete standstill (about 2 minutes after switching off) before opening guards (these are bolted in place). ▪ The rule is that guards are not to be opened except for maintenance.	

2.4.3.2. TRACK MECHANISM

see section 2.4.2.2. TRAVELLING WITH TRACK MECHANISM

Moving the machine

▪ Whenever you move the machine, the discharge belts must be retracted and the side belt bolted in place! The only exceptions are slewing movements and short realigning movements; these can be performed during crushing (when idling). ▪ If the machine is exposed to high humidity without operating for some considerable time, actuate the crawler tracks at intervals, to prevent the track links rusting and seizing up.	CAUTION 
---	--

Danger from obstacles obstructing other vehicles

Around the machine obstacles may extend into the path of other site vehicles such as wheeled loaders and trucks etc. Carelessness can lead to a collision with the machine, and thus to personal injury or to the machine being damaged.	WARNING 
When driving into the hazard zones, pay close attention to the yellow/black paint markings on the obstacles.	
Do not drive into any zones closed to traffic with paint markings.	

2.4.3.3. VIBRATING CHUTE

Persons around the chute

Bending over close to the vibrating chute and the crusher intake, and staying in the vibrating chute during operation, are strictly prohibited, as parts of one's body could get caught or chopped off – danger to life and limb is acute! Staying in the vibrating chute is permissible only if the engine is switched off. In this case take the following steps:	DANGER 
- Remove the ignition key from the machine and keep it in a safe place - Turn battery main switch to OFF - Disconnect batteries - Place "Overhauling in progress" sign next to ignition lock	

Contact

No one must touch the vibrating chute when it is switched on. There is a risk of getting caught or being struck by debris.	HAZARD 
---	--

2.4.3.4. SERVICE PLATFORM

Persons on the platform

Access to the service platform is strictly prohibited during operation, except for maintenance and inspection activities as per section 2.4.4.3. Service platform. Parts of one's body could get caught or chopped off. There is also a risk of being struck by ejected material and badly hurt or even killed.	DANGER 
--	--

2.4.3.5. IMPACT CRUSHER

Chip guard

- The intake box, which acts as a chip guard, must be closed during operation. If something goes wrong, switch the machine off immediately and put things to rights! -> Material ejected from the intake can cause serious injury. - The chains and rubber curtains at the crusher intake must be in good condition and closed, to prevent crushed material from escaping. - Before every crushing phase you must check all the eye bolts that keep the crusher closed, and tighten them up if necessary. -> Otherwise the crusher housing can be damaged.	WARNING  
--	--

Adjustment

Adjust the kinematics of the impact arm only with the rotor disengaged and locked. There should be a gap of at least 3 cm between hammer and impact arm; you can check this through two service flaps. Open either flap only with rotor stationary! If the crushing gap is set too narrow, this can cause damage to the hammers and greatly increase wear and tear.	WARNING  
--	---

2.4.3.6. MAGNETIC SEPARATOR

Purpose

The magnetic separator may be used only to remove reinforcing bars and metal elements that are listed as permissible in the RM 80 user manual. Misuse can cause damage to the magnetic separator .	CAUTION 
--	---

Injury

Danger of crushing, striking, catching and winding up! Conveyor belts involve a risk of crushing between: the guide and drive drums where the belt passes onto the drums the moving belt and the covers over the guide and drive drums There is a danger of being caught by the rotating guide and drive drums and wound up. There is a danger of being struck: banging one's head against the separator being struck by the bars on the belt Reaching or moving into these areas will result in serious injury.	WARNING   
▪ Do not reach or move into the hazard zones while the conveyor belt is running. ▪ Pay attention to the alarm horn that indicates the machine is starting operation, and leave the hazard areas immediately. ▪ If danger threatens, actuate the EMERGENCY OFF shock switch closest to you.	 

Magnetic field

The magnetic separator is equipped with a very powerful permanent magnet. Objects that could be damaged by magnetic fields (such as watches, credit cards, pacemakers etc.) must be kept at least 800 mm away from the magnet (minimum safe distance). ▪ Avoid handling largish objects that can be magnetized close to the magnet; keep at least 800 mm away. ▪ Caution is also necessary with tools that can be magnetized; they can influence/ damage other objects.	DANGER  
--	--

2.4.3.7. MAIN AND SIDE DISCHARGE BELTS

See section 2.4.3.6. Magnetic separator, subheading “Injury”.

Retracting belts /swinging out

Before retracting the main or side discharge belt or swinging it out, the operator must make sure that no one is in the hazard zone. Before swinging the side discharge belt out, remove the bypass chute, otherwise it will be damaged.	WARNING 
--	---

2.4.3.8. GUARDS

Opening covers

Guards and covers may be opened only when the machine is at a complete standstill – allow for the extra time the rotor takes to stop. Otherwise there is a risk of injury.	WARNING 
--	---

2.4.3.9. HYDRAULICS

Specialized staff

Only trained personnel with special expertise and experience may work on hydraulic equipment. Non-specialists' tampering with hydraulic components can result in serious injury.	WARNING 
--	---

2.4.3.10. ELECTRICS

Tampering by non-specialists

Tampering with the settings and controls without proper knowledge of the machine's functions and improper handling of the machine can result in death, injury or damage to the machine.	WARNING 
Only a trained electrician, or trained persons supervised by a trained electrician, may perform work on the electrical equipment in the machine – in line with electrical engineering regulations.	

Danger from touching live components directly

Danger from high voltage! Touching live components can result in death!	DANGER 
- Inform staff about the machine's functions and about residual hazards at regular intervals. - Keep outsiders, unauthorized persons and untrained persons away from the machine and out of the hazard zone. - Always lock all doors and covers. - Place the prohibition sign "No admittance for unauthorized persons" at the site entrance.	

EMERGENCY OFF switches

The individual EMERGENCY OFF shock switches on the control console, on the service platform, on the optional cable remote-control unit (which functions only if the unit is connected up) and on the right-hand magnet support pillar opposite the control panel make it possible to shut the entire machine down fast by simply pressing a switch if danger threatens. In this case the engine brakes the crusher rotor (you must allow for coastdown time).	WARNING 
---	---

▪ There is an additional shutdown switch with the same function on the radio control unit (transmitter); however, this works only in radio mode and within the transmitter's range. ▪ If an EMERGENCY OFF switch is pressed during operation: • all 230V / 400V 50 Hz drives and consumers are deenergized • the engine is switched off. ▪ IMPORTANT! • The EMERGENCY OFF shock switch invariably shuts the machine down. • The shutdown switch on the radio control unit shuts the machine down only if the transmitter is switched on and within range of the receiver. ▪ Routine checks by service staff: • Function of EMERGENCY OFF shock switches -> every day • Function of EMERGENCY OFF shock switches on equipment not often used -> every time it is switched on. The procedure for checking the EMERGENCY OFF shock switches is as follows: ▪ Switch ignition on, turn selector switch on control console to "Radio" and switch radio control unit on. Now the LED "EMERGENCY OFF OK/hydraulic fluid level OK" on the control panel must shine green. ▪ Check each EMERGENCY OFF switch separately. When you press an EMERGENCY OFF switch or the shutdown switch, the LED "EMERGENCY OFF OK/hydraulic fluid level OK" must go out; when you release the switch, this LED must shine green again. N.B. The EMERGENCY OFF chain is also interrupted if: ▪ the hydraulic fluid level is low ▪ the left-hand crusher door is open with the crusher engaged ▪ the dummy connector for the cable remote-control unit is not plugged in.	
--	--

Hazard from lightning

Do not operate the machine during a thunderstorm – there would be a risk of being killed by lightning.	WARNING 
--	---

Acoustic alarms

At regular intervals, check that the acoustic alarms are working properly. (The alarm horn is working if a short beep is heard whenever the machine is started up.) If the horn fails to sound, the defect must be dealt with as soon as possible, since the safety of people working in the area is jeopardized as long as the horn does not signal malfunctions.	HAZARD 
--	--

2.4.4. DURING MAINTENANCE AND REPAIR WORK

Service personnel

▪ Only reliable personnel may carry out work on / with the machine. Bear the minimum legal age in mind. ▪ Use only trained or instructed personnel. ▪ Ensure that only personnel authorized to do so are in action on the machine. ▪ Define the operator's sphere of responsibility (with regard to traffic law, too), and allow him to refuse to carry out orders by third parties where such orders involve safety hazards.	WARNING  
--	--

▪ Allow personnel undergoing training / instruction / an apprenticeship to work on / with the machine only under continuous supervision by an experienced person. ▪ Service personnel must always wear protective equipment: • hard hat with face mask and ear protectors • safety footwear • gauntlets • protective clothing	
--	---

2.4.4.1. POWER TRAIN

General points

For work to be done on the electrics and the power train, the engine must be switched off and (depending on the circumstances) the battery disconnected or the power supply interrupted with the battery disconnecter. Failure to comply with this rule during work on the electrics can result in leakage currents – which may lead to the engine starting -> consequent risk of injury.	WARNING 
---	---

Consumables

When dealing with oils, greases and other chemical substances, comply with the safety regulations applying to the product in question!	HAZARD 
--	---

Cooling system

Inspect the cooling system only after switching the engine off and allowing it to cool down. Undo the radiator cap slowly, so that the pressure can be relieved gradually. Steam escaping under pressure can cause injury. Inspect only after the coolant has cooled down.	HAZARD 
--	--

Topping up consumables

▪ Never top coolant up while the engine is still hot – let the engine cool down first. ▪ When topping oil up, avoid oil dripping onto hot surfaces – fire hazard. ▪ When checking the engine oil level, switch the engine off and wait until the oil has collected in the sump(s); then check the oil level, and top up if necessary. ▪ Hot oil can cause skin burns.	HAZARD 
--	--

2.4.4.2. VIBRATING CHUTE

Persons at the chute

Staying at the vibrating chute is permissible only if the engine is switched off. In this case take the following steps:	DANGER 
▪ Remove the ignition key from the machine and keep it in a safe place ▪ Turn battery main switch to OFF ▪ Place “Overhauling in progress” sign next to ignition lock	

2.4.4.3. SERVICE PLATFORM

Climbing onto the machine

Before anyone climbs onto the machine, enters the hazard area or opens the guard doors, the operator must be informed and the machine shut down. The owner must provide the accessories needed for climbing onto the machine, which must comply with the relevant safety regulations. Unauthorized persons are prohibited from climbing onto the machine.	WARNING  
- Remove the ignition key from the machine and keep it in a safe place - Turn battery main switch to OFF - Disconnect batteries - Place "Overhauling in progress" sign next to ignition lock Important: always use the service platform ladder to climb onto the machine!	

Dirt

Keep all handles, steps, railings and platforms free from dirt, ice and snow! Hazard from slippery surfaces!	WARNING 
---	---

2.4.4.4. IMPACT CRUSHER

Chip guard

- The chains and rubber curtains at the crusher intake must be in good condition and closed, to prevent crushed material from escaping. - Before every crushing phase you must check all the eye bolts that keep the crusher closed, and tighten them up if necessary. -> Otherwise the crusher housing can be damaged.	WARNING 
---	---

Malfunctions and maintenance work

- In order to do work inside the crusher, you must (after opening the housing) bolt it with the attached securing bolt and secure the rotor against unintentional rotation with the locking rod supplied. The engine must be switched off for this. (Exception: see next section.) - If only electricity is needed, it is permissible to start the engine after disengaging the crusher drive by hand in the engine space. The guard doors to the engine space must then be closed and bolted. If you start the engine with the crusher housing open, make sure that the housing is bolted correctly, that the rotor is secured and cannot rotate, and that no one is in the hazard area around the crusher during starting. The guard door on the drive side is monitored by a limit switch which prevents the engine from starting if this door is open and the clutch is engaged. - When adjusting the height of the impact arm, make sure that the nuts on the spindle are tightened up correctly, otherwise there would be a risk of crushing. - If the crusher jams because debris has got wedged in place the rotor must come to a full stop before the jam can be tackled (allow for coastdown time!).	WARNING  
---	---

To convey debris out of the crusher after loosening, the discharge belt can be operated even with the crusher open, provided that the clutch is disengaged. In this case take care that there is no one inside the crusher while the discharge belt is running, as the bars on the conveyor belt could easily injure someone severely. While the belt is moving, no one must stay in the crusher/discharge belt V hazard zone.	
--	--

Adjustment

Adjust the impact arm only with everything at a standstill. There should be a gap of at least 3 cm between hammer and impact arm; you can check this through two service flaps. After adjusting the kinematics, you must check this gap and adjust it if necessary. Open either flap only with rotor stationary! If the crushing gap is set too narrow, this can cause damage to the hammers and greatly increase wear and tear.	HAZARD 
--	--

Replacement parts

It is essential to replace the hammers in pairs. The maximum permissible discrepancy in weight between two opposed hammers is 0.4 kg. If this limit is ignored, serious imbalance will result – which may cause damage to the machine. After replacing hammers, you must secure them against axial displacement by means of locking washers -> risk of damage! Disclaimer of liability: HMM GmbH accept no liability for loss, including consequential loss, due to bars breaking that had not been installed correctly. Claims under our warranty can arise only from a material defect in hammers supplied by HMM GmbH. For this to be checked in a given case, all fragments of hammers must be returned to HMM GmbH. Inspection: Check the condition of the hammers and replacement plates at regular intervals.	HAZARD 
---	---

2.4.4.5. MAGNETIC SEPARATOR

See section 2.4.3.6. Magnetic separator, subheading “Injury” and section 2.4.1.3 Protective clothing.

Before maintenance and repair work: - Set the main switch on the control console to OFF and secure it against being switched on again with a padlock and an “Overhauling in progress” sign next to the ignition lock. - Always wear a hard hat and protective clothing. After maintenance and repair work: - Replace all covers and lock devices	CAUTION 
---	---

Magnetic field

The magnetic grain screen is equipped with a very powerful permanent magnet. Objects that could be damaged by magnetic fields (such as watches, credit cards, pacemakers etc.) must be kept at least 800 mm away from the magnet (minimum safe distance).	DANGER 
---	--

▪ Avoid handling largish objects that can be magnetized close to the magnet; keep at least 800 mm away. ▪ Caution is also necessary with tools that can be magnetized; they can influence/ damage other objects.	
---	---

2.4.4.6. MAIN AND SIDE DISCHARGE BELTS

See section 2.4.3.7. MAIN AND SIDE DISCHARGE BELTS

Maintenance by service staff

Routine checks by service staff: ▪ Function of EMERGENCY OFF shock switches -> every day ▪ Function of EMERGENCY OFF shock switches on equipment not often used -> every time it is switched on	CAUTION 
---	---

Retracting the belts / swinging out

▪ When the belts are swung out or retracted there must be no one in the hazard zone – risk of getting caught! ▪ Before swinging the side discharge belt out, remove the bypass chute, otherwise it will be damaged.	WARNING 
--	---

Risk of collision with underside of conveyor belts

The clearance beneath the conveyor belts is limited to some extent. If you are careless, you can easily bang your head here, possibly injuring your head or spine. ▪ Pay special attention to the black and yellow paint marking in this area, and walk slowly. ▪ Always wear a hard hat.	WARNING 
---	---

2.4.4.7. COVERS AND GUARDS

Opening covers

Open guards and covers only when the machine has come to a complete standstill (allow for rotor coastdown time). Otherwise there is a risk of injury.	WARNING 
---	---

Signs

If signs are illegible or missing, hazards are created: staff make unjustified assumptions, and this leads to mistakes in operating the machine. ▪ Replace a missing or illegible sign immediately!	HAZARD 
--	--

2.4.4.8. HYDRAULICS

Service staff

Only trained personnel with special expertise and experience may work on hydraulic equipment. Tampering with hydraulic components can result in serious injury to staff.	WARNING 
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2.4.4.9. ELECTRICS

Service staff

Tampering by non-specialists is dangerous! Tampering with the settings and controls without proper knowledge of the machine's functions and improper handling of the machine can result in death, injury or damage to the machine.	WARNING 
- Only a trained electrician, or trained persons supervised by a trained electrician, may perform work on the electrical equipment in the machine – in line with electrical engineering regulations. - Inform staff about the machine's functions and about residual hazards at regular intervals. - Keep outsiders, unauthorized persons and untrained persons away from the machine and out of the hazard zone. - Always lock all doors. - Place the prohibition sign "No admittance for unauthorized persons" at the site entrance.	

Service work

- For work to be done on the electrics, the engine must be switched off and (depending on the circumstances) the battery disconnected or the power supply interrupted with the battery disconnecter. Failure to comply with this rule during work on the electrics can result in leakage currents – which may lead to the engine starting -> consequent risk of injury. - Use only original fuses with the current rating specified! Never use fuses with a current rating higher than that specified in the circuit diagrams, otherwise the electrical equipment could be damaged. - If the power supply malfunctions, switch the machine off immediately! Otherwise the machine could suffer serious damage.	WARNING 
---	---

Danger from touching live components directly

Danger from high voltage! Touching live components can result in death!	DANGER 
Before doing maintenance and repair work: - Deenergize the relevant part of the machine, and secure the switches concerned against switching back on by means of a padlock and "Overhauling in progress" sign. - Before starting work, check that the part concerned really is deenergized, using a voltage tester. - Never touch exposed leads or live components. - Comply with national regulations for working with machines using electricity (EN, ÖVE, VDE, etc.). - After work on electrical components, do not fail to re-earth them, and check that they are connected correctly. Before switching the power supply back on, close the enclosures, control consoles and terminal box lids, and keep them closed. In the case of electrical maintenance or adjustments by service staff, a exceptionally hazardous situation arises if work has to be done in an energized enclosure, control console, terminal box or local control station.	

In this case: ▪ Remove the ignition key from the machine and keep it in a safe place ▪ Turn battery main switch to OFF ▪ Disconnect batteries ▪ Actuate all EMERGENCY OFF switches, to secure machine against switching back on ▪ Place “Overhauling in progress” sign next to ignition lock If these steps are taken, the machine is protected against unauthorized startup, and persons working on it will not be injured.	
--	--

External consumers

A power rating of at most 6 kW is available for external consumers. If more power is required, the manufacturer should be consulted.	CAUTION 
--	---

EMERGENCY-OFF shock switches

See section 2.4.3.10. Electrics, subheading “EMERGENCY OFF shock switches”.

Acoustic alarms

At regular intervals, check that the acoustic alarms are working properly. (The alarm horn is working if a short beep is heard whenever the machine is started up.) If the horn fails to sound, the defect must be dealt with as soon as possible, since the safety of people working in the area is jeopardized as long as the horn does not signal malfunctions.	HAZARD 
---	--

Important!

▪ Protect the machine against theft, as no compensation is paid in the case of theft. ▪ When work is finished, return the equipment to a hazard-free state.	HAZARD 
--	--



Of course hazards can never be eliminated completely, but compliance with safety regulations reduces them significantly.



2.5 SAFETY DATA SHEETS

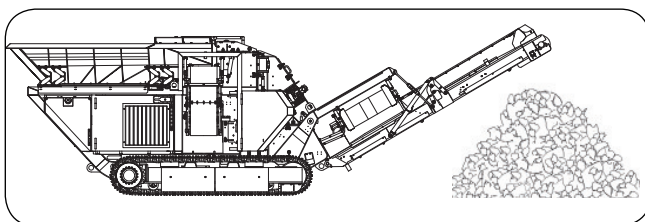
Safety data sheets and certificates are on hand at the manufacturer's offices,
and can be inspected on request at any time.

3. OPERATING AND MAINTENANCE INSTRUCTIONS

3.1 SETTING-UP THE RM80

The RM 80 must be placed on firm and plane ground which is at least 15 000 kg/m² firm and suitable to bear the weight of the machine (approx. 23 000 kg). The site must be of a size big enough to provide sufficient space for the manipulation of the material to be crushed and of the crushed material.

The site must be at a safe distance from pits and slopes so as to ensure that the crushing plant does not slip down the slope or tilt over. Appropriate setting-up and locating of the stockpiles can contribute to significantly lower emissions of dust and noise. In addition a dust suppression system (optional) and an ENVIRO package for minimizing the noise of crushing (optional) are available.



3.1.1. SERVICE PLATFORM

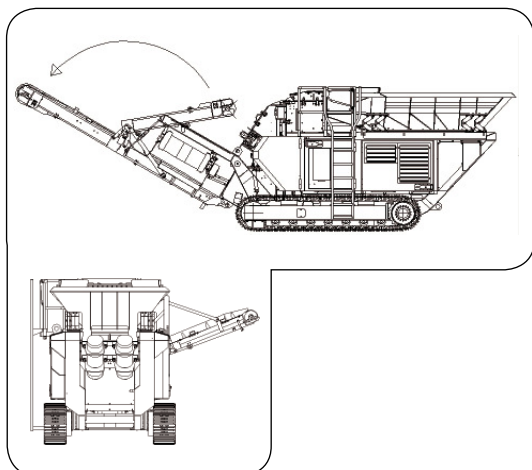


Fit ladder, detachable handrails and safety door on machine.

3.1.2. BYPASS CHUTE

The material prescreened in the vibrating chute can be discharged either together with the crushed material on the main discharge belt (through the bypass chute) or alternatively on the side discharge belt (option). Depending on the choice, fit the bypass chute or remove it. **Before swinging the side discharge belt (option) out, remove the bypass chute.**

3.1.3. SWINGING DISCHARGE BELTS OUT



Swing main and side discharge belt (option) out hydraulically. Remove any metal objects sticking to the magnetic separator. (You will find instructions on working with the magnetic separator in **section 2. Safety.**)

Before swinging the side discharge belt (option) out, remove the bypass chute.

3.2. TRANSPORT

3.2.1. GETTING MACHINE READY FOR TRANSPORT

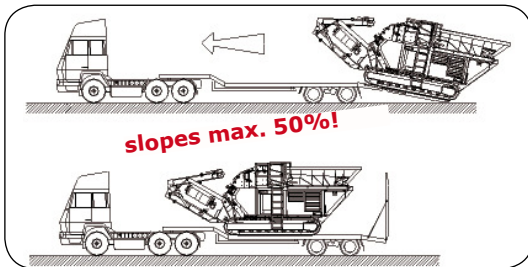
- Before the machine is transported, dismantle OS80 oversize grain screen (option) if fitted.



- Check that
 - conveyor belts are swung in and
 - side discharge belt is locked in place.
- Shut machine down (see section “3.6. Stopping the RM80”).
- Clean entire machine.
- Close and lock guard doors.

Due to its relatively low weight of abt. 23 000 kg, the RM 80 can be transported on any transport vehicle. The plant can be transported with any suitable low-loader or by articulated lorry (loading with crane).

Transport height: max. 2 960 mm



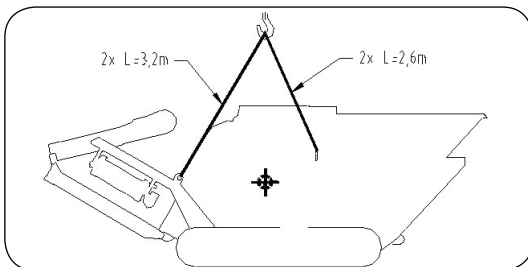
Slopes: The machine can negotiate slopes up to 50 % (22,5°). Take special care when negotiating ramps, there is a risk of the machine grounding and damaging protruding parts. The machine may easily swing round on slippery ground.

Securing with chains: before the machine is transported on a low loader or in a container, it must be secured with chains against shifting position. The chains must be attached to the

lugs provided at the front and back of the base frame, not to anything else.

3.2.2. LIFTING THE MACHINE BY CRANE

Use the lugs provided for this (2 at the front, 2 at the back) to lift the machine. The maximum permissible load per lug is 7 000 kg. Using 4 chains or steel wire ropes with hooks is recommended.



The machine will stay horizontal when lifted if the chains or wire ropes at the back are about 60 cm shorter than those at the front.

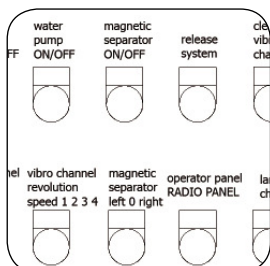
3.3. TRAVELLING WITH TRACK MECHANISM

- Check track tension (approx. 15 to 25 mm slack between track edge and first idler).
- Check that no oil is escaping from travel gearbox and motor.
- Check caterpillar tracks: remove any rough material if necessary.
- When travelling up a gradient, the tracks should be driven forward – i.e. idlers first.
- Ensure the tracks are not frozen to the ground before moving the machine.

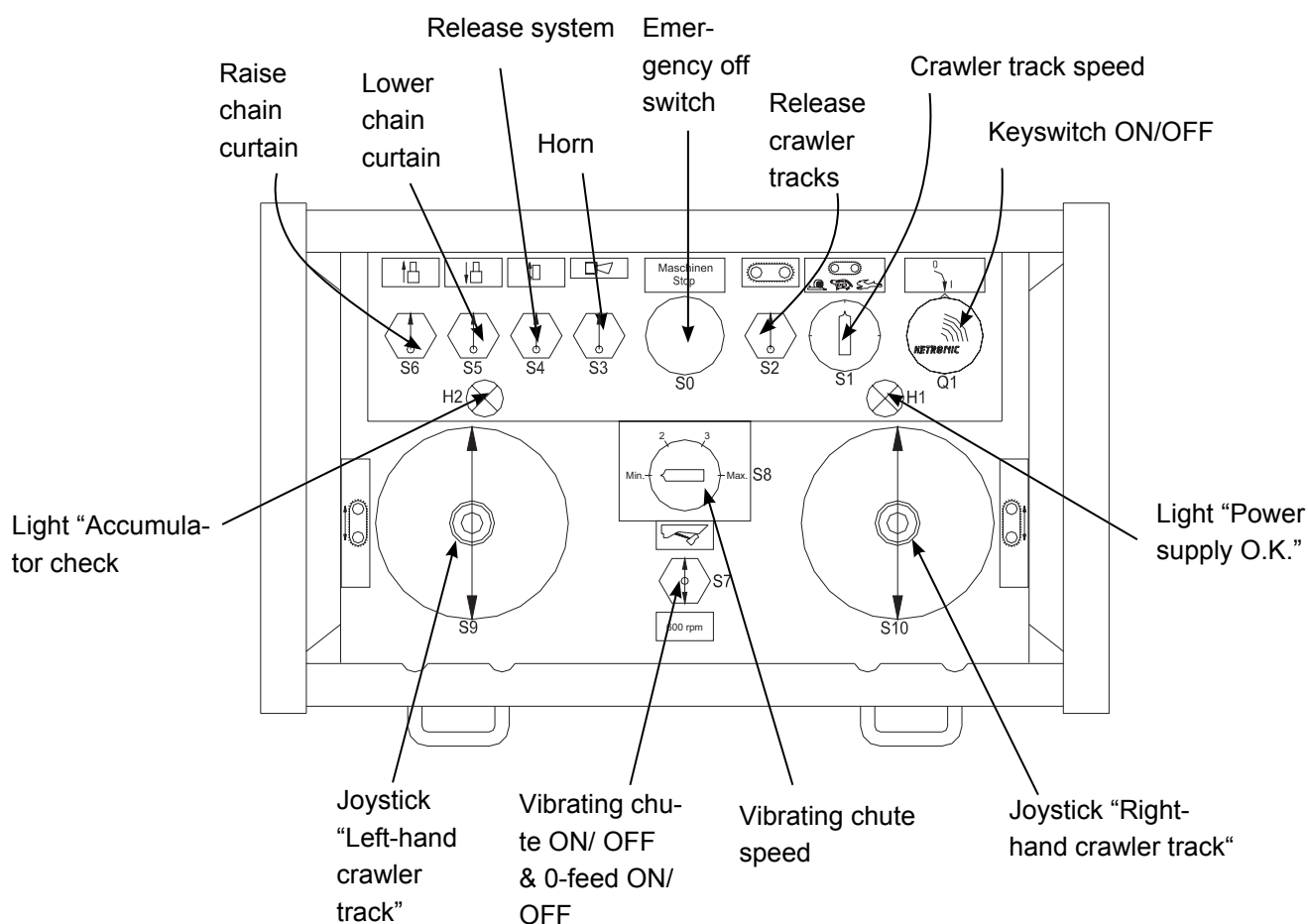
If the RM80 is parked in a wet and rainy area and not used for a longer period, move the tracks from time to time to avoid the track links get stiff with rust.

3.3.1. DRIVING WITH RADIO REMOTE CONTROL

- Turn the selector switch on the control panel to “radio” (if not already on).
 - Disengage crusher and start diesel engine.
 - Fold conveyor belts into transport position and lock in place. Close and lock all doors.
 - Before starting the machine: switch on radio control and activate clearance switch on radio control unit. Caterpillar drive remains activated for 10 seconds without activating the joystick – drive signal sounds.
 - Carefully use both joysticks to pivot into the desired direction of transport, make sure both tracks are running at the same speed.
- Note:** Maximum range of radio signal is approx. 150 m with loaded accu and no handicaps between transmitter and receiver.
- The best way to steer is to adjust one track at a time.
 - Onn changes in gradient gradually let the centre of gravity of the machine tip into the new position.
 - When the caterpillar tracks stop the transmission disengages after about 10 seconds and has to be reset before being started up again.



RADIO REMOTE CONTROL



3.4. STARTING UP

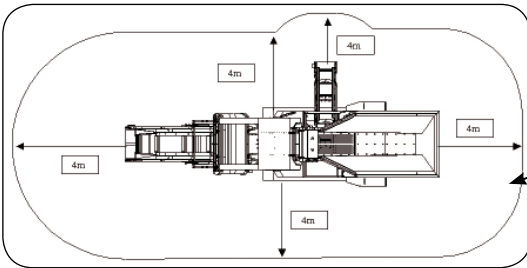
1. Check that all points in section 3.1. “Setting-up the RM80” have been complied with.
2. Carry out all actions listed in section 5.4. “Each day before starting up”.



3. Check that both fuel shut-off valves (in the supply and return lines) are open.
 - Open: the lever is parallel to the line.
 - Closed: the lever is at right angles to the line.
 Close these valves only if the machine is shut down for some considerable time.
IMPORTANT: the machine is shipped with all lines open and the levers in the toolbox.

4. Switch on battery isolator switch.

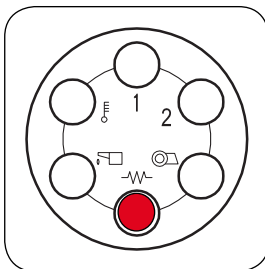
5. Engage crusher. (**ATTENTION:** engage clutch at standstill only!)
6. Driving and tail pulleys of conveyor belts must be free of dirt. Check carrier rollers, lateral guiding rollers, sliding plates and seals. (see chapter „5.3. belt alignment and tension“).
7. If necessary, fill the intake line leading to the water pump.
8. Close and lock all booth doors.



9. Check all Emergency Stop buttons (siehe Kapitel „5.1. Checking EMERGENCY OFF chain“).

10. **Hazard zone:** Apart from the operator, there must be no one else on the machine or in the hazard zone.

11. Turn selector switch on control panel to “Radio” and switch radio control unit on.
12. **Warm start:** Switch on main switch at control panel. Turn ignition key to position 1, wait till preheating LED is off. Then start diesel engine. The engine first starts running at an idling speed of > 2 000 rpm.



Cold start: Switch off main switch at control panel. Turn ignition key to position 1, preheat and then start diesel engine. The engine starts running at approx. 1 000 rpm. After approx. 30 seconds, switch the main switch to position 1 so that the diesel engine switches over to the idling speed of > 2 000 rpm.

13. Start up the main discharge belt, the side discharge belt (option), the magnetic separator and if required, the water pump (option) from the control panel. Check belt operation of conveyor belts.

14. When operating the machine from the control panel, the vibro-channel can be started up from there as well. The vibro-channel first starts running at zero-feed speed (600 rpm in order to synchronize the vibrator motors) and then increases automatically in line with the delivery speed selected at the 4-speed selector switch. Pressing the button 0-feed trims the speed back to around 600 rpm, there is no feed to the machine any more. Pressing the button again returns the vibro-channel to the preselected feed speed.
15. Start feeding in the material.

3.5. OPERATING THE RM80

- Feed the plant only with equipment with a capacity of max. 2 m³ and a shovel width of max. 2.6 m.

- If the material has a high proportion of fine material it would be worth reducing the feed rate in order to improve the effectiveness of the prescreening system. The screened material can either be fed into the crushed material (using the bypass-chute) or discharged by conveyor belt (option).
- Do not keep switching the vibro-channel on and off. This may cause the vibrator motors to overheat. Use the 0-feed function to respond to any feed problems: this function does not cause the motors to overheat and can be used as often as you like.
- Reduce quantity and size of feed material and feed speed in the case of bigger and/or harder feed.



- Feed bigger or bulky material in single units by using the hand control (use radio control unit for controlling the vibro-channel). If material becomes jammed at the crusher intake, open crusher intake top cover by pressing the „open chain curtain“ button. This increases the size of the opening to reduce the build-up of material.
- Only use appropriate hammers as in chapter „4.3. hammers“.

- Check crushing gap regularly. Recommended: min. 30 mm to max. 80 mm. The hammers are subject to wear and tear, so it may be necessary to reset the crushing gap at intervals.

3.5.1. SETTING THE CRUSHING GAP

Before adjusting the crushing gap, make sure that the impact arm can move freely, by actuating the release system with the engine running (see section 3.5.3. “RELEASE SYSTEM”).

Spindles for adjusting crushing gap: undo locknuts on both sides, open inspection window and set impact arm to the crushing gap desired with the corresponding hydraulic lever. Then close window and tighten locknuts. Recommended gap between hammer and impact plate: 30 to 80 mm.

3.5.2. ADJUSTING UPPER IMPACT ARM



Open both doors (see illustration) remove fillers and adjust top fulcrum hydraulically. Range of adjustment: 90 mm

- “Up”: standard setting
- “Down”: mainly for secondary crushing

After adjustment, put all fillers and both rubber elements back in place and close doors.

3.5.3. RELEASE SYSTEM



If the need arises, actuate the release system. Should feed material get jammed above the rotor, it is possible to pivot the impact arm back hydraulically, as long as the corresponding rocker switch is pressed.

This widens the crushing gap between impact arm and rotor temporarily, and the jam can resolve itself.

Once the switch is released, the two pairs of springs force the

impact arm back into its original position. In “radio” mode the release system can be actuated only from the radio control unit.

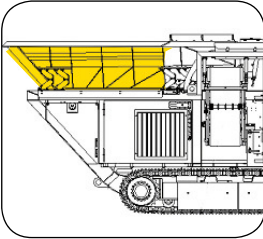
Recommendation: actuate release system from time to time during idling, to prevent feed material accumulating behind the impact arm.

3.5.4. AUTOMATION

3.5.4.1. ELECTRONIC MOTOR REGULATOR (EMR)

In certain cases the EMR immediately stops the diesel engine or switches the vibrofeeder to 0-feed and if the error remains, stops after a short while. For details see chapter “**6.2. LED’S on diesel control unit**”.

3.5.4.2. OVERLOAD PROTECTION FOR VIBRATING CHUTE



The vibrofeeder automatically switches to 0-feed if the machine is overloaded (speed drops by more than 5-10%). The vibrofeeder does not return to the preselected speed until the diesel engine has reached operational speed again. The sensitivity of this system can be adjusted at a special control relay to the grade of material being processed on each job. As a rule though, if the machine keeps overloading, reducing the rate of feed one step should be sufficient.

3.6. STOPPING THE RM80

- Operate vibrofeeder, crusher and discharging belts until they are empty.
- If the vibrofeeder is dirty run the “Clean vibro-channel” program
- Stop vibrofeeder, discharging belts, magnetic separator and water pump (option).
- Let diesel engine run a further 2 minutes to cool down.
- Turn ignition key to position 0, take it out and keep it in a safe place.
- Switch off the battery main switch.

4. USE FOR THE PURPOSE INTENDED

4.1. MATERIAL TO BE PROCESSED

The RUBBLE MASTER 80 Compact Recycler may be used only for the purpose intended, i.e. only to crush rubble, asphalt, bricks, and standard and recycled concrete. Stone can be crushed up to a maximum compression strength of 25 000 N/cm², allowing for the size of charge.

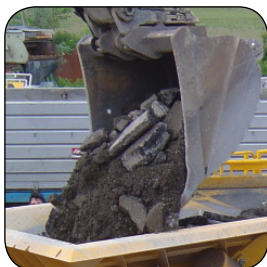
In the case of compression strengths beyond 25 000 N/cm² the manufacturer should be consulted. In addition, a test with modest amounts of material should be performed to determine the crushing behaviour of materials with higher compression strengths.

Rebars are permissible up to a diameter of 12 mm, provided that they do not project out of the charge, and that martensitic ceramic hammers are used.

Guy wires, massive metal and timber objects must not get into the crusher.

If the circumstances warrant it, the material should be inspected and sorted before charging.

4.2. FEED SIZE



The feed size depends on the feed material's resistance to breaking and on the material of the hammers. The edge length of the feed material can be up to 700 mm in the best case. Edge length means the maximum three-dimensional corner-to-corner length of the feed material.

Important: the higher the resistance to breaking - the smaller the size of the material to be fed in.

For more information on how to calculate the maximum feed size please see the tables in chapter “4.3.1. Hammer types and application”.

4.3. HAMMERS



It is recommended that the rotor is operated with 2 used and 2 new hammers. This improves both the throughput and the crushing characteristics and prevents fine material from being produced. Using 4 new hammers is recommended for small material (up to 250 mm) if a high degree of crushing is required, especially for second stage processing.

Remark: Max. weight difference of two opposite hammers must not exceed 0.4 kg!

4.3.1. HAMMER TYPES AND APPLICATION

A) CERAMICS HAMMERS (MARTENSITIC STEEL WITH CERAMICS REINFORCEMENT)

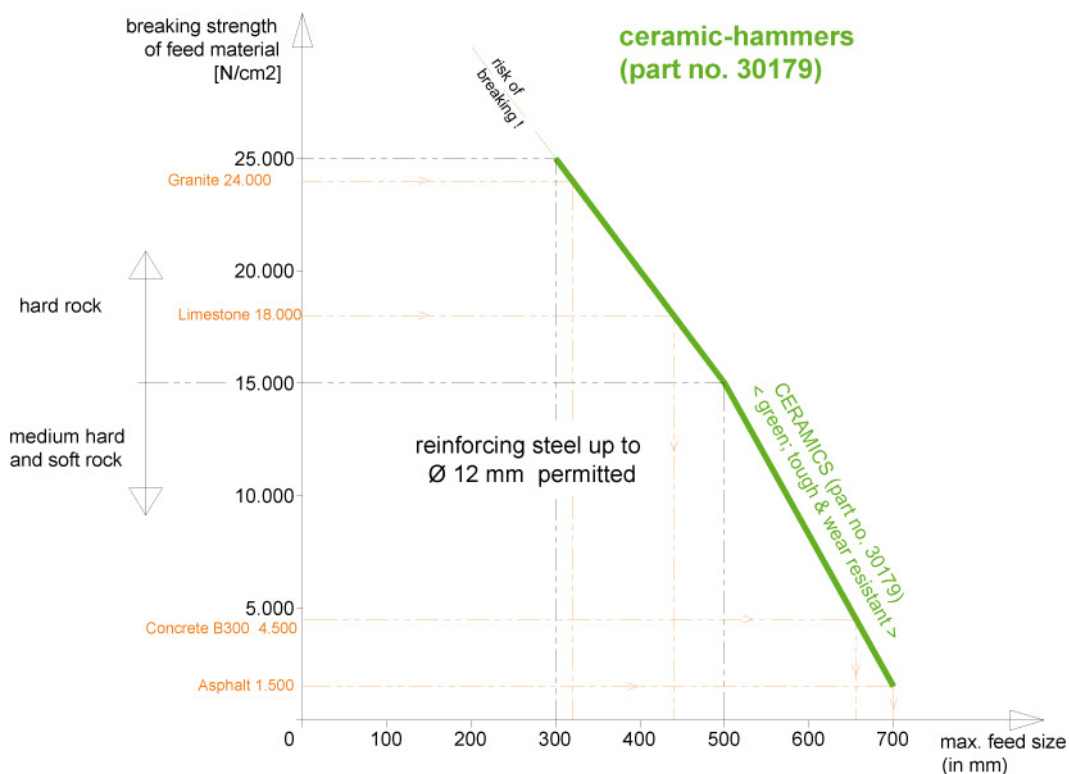
These hammers are all-purpose hammers made of tough base material with wear resistant ceramics reinforcement.

Although there is no advantage compared with “Hard hammers” for asphalt or in secondary stage crushing of abrasive materials (e.g. quartz) because of higher wear.

When using ceramics hammers it is permissible to process reinforcing steel up to a diameter of 12 mm providing it is embedded in concrete.

type	part	color	reinforcing steel permitted?	characteristic	application range	standard time ratio
ceramics	30179	green	up to a diameter of 12 mm (providing it is embedded in concrete)	tough base material with wear resistant ceramics reinforcement	all purpose hammer, advantages not for all cases	approx. 2

evaluation of feed size in dependence on hardness of rock



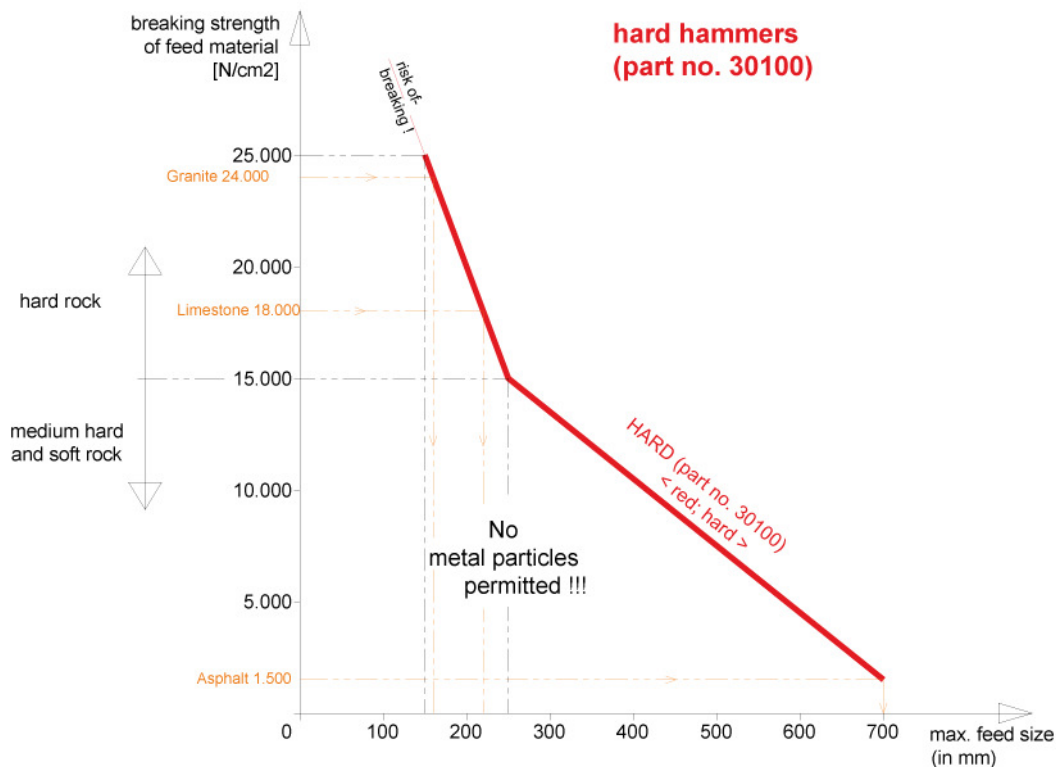
B) HARD HAMMERS (MADE OF CAST CHROMIUM STEEL)

Hammers made of cast chromium steel are considerably harder than hammers made of martensitic steel, and that is why they are more brittle and sensitive to impact. These hammers are more likely to fracture when subjected to excessive strain and may only be used for specific purposes (e.g. asphalt or controlled secondary crushing).

If these hammers are used, make sure that NO metal particles can get into the crusher. When using them at secondary crushing make sure the feed size of harder rock does not exceed 150-250 mm.

type	part	color	reinforcing steel permitted?	characteristic	application range	standard time ratio
hard (Cast chromium steel)	30100	red	NO	very hard but brittle	especially approved for asphalt and secondary crushing	approx. 1.5-2.5

evaluation of feed size in dependence on hardness of rock



C) HARD CERAMICS HAMERS (MADE OF CAST CHROMIUM STEEL WITH CERAMICS REINFORCEMENT)

Hammers made of cast chromium base material with wear resistant ceramics reinforcement are considerably harder than hammers made of martensitic steel, and that is why they are more brittle and sensitive to impact.

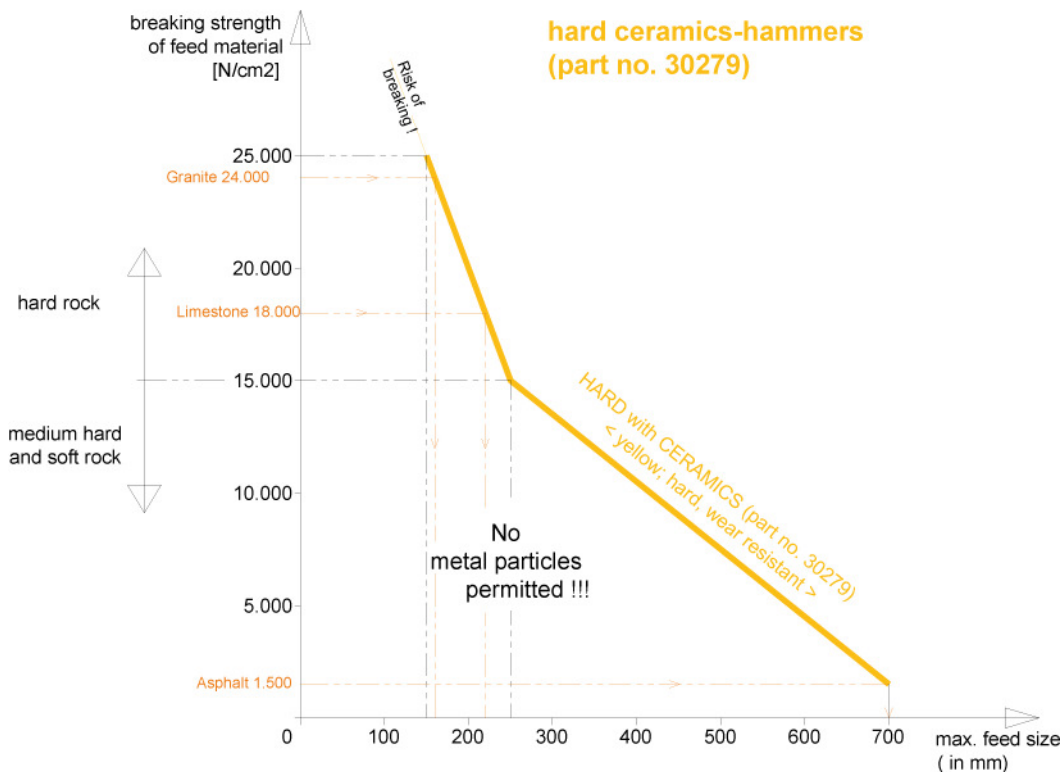
These hammers are more likely to fracture when subjected to excessive strain and may only be used for specific purposes, e.g. asphalt or controlled secondary crushing (= feed size of harder rock does not exceed 150-250 mm).

If these hammers are used, make sure that NO metal particles can get into the crusher.

Hard ceramics hammers have a 20–30% higher time ratio than “Hard hammers”.

type	part	color	reinforcing steel permitted?	characteristic	application range	standard time ratio
hard (Cast chromium steel)	30279	yellow	NO	very hard but brittle; very wear resistant	especially approved for asphalt and secondary crushing	approx. 2-3

evaluation of feed size in dependence on hardness of rock



The maximum feed size depends on the feed material's resistance to breaking. It can be determined using the diagrams and the tables.

4.3.2. APPLICATION AREA OF THE MACHINE AND CHOICE OF HAMMERS

recommended application area of the machine				
type of rock	breaking strength [N/cm²]	breaking characteristics	wear	hammers
asphalt	1 000 - 1 500	good - moderate	high	red / yellow

concrete

concrete B 35/25 (ordinary concrete)	3 500 - 4 000	good	moderate	green
concrete B 300 (recycling concrete)	4 500	good	moderate	green

ordinary rubble

brick	1 200 - 2 600	good	low	red / yellow
-------	---------------	------	-----	--------------

stone

basalt	25 000 - 44 000	moderate - bad	high	green
pumice stone	600 - 3 000	good	moderate	red / yellow
diabase (greenstone)	18 000 - 25 000	moderate	high	green
diorite	17 000 - 30 000	moderate	high	green
dolomite rocks	8 000 - 18 000	good	low	green
boulders	8 000 - 25 000	moderate - bad	low - high	all
gneiss	16 000 - 28 000	moderate	high	green
granite	16 000 - 24 000	moderate	high	green
gray wacke	15 000 - 30 000	good - moderate	moderate	green
limestone	8 000 - 18 000	good	low	green
conglomerate	3 500 - 3 800	good	moderate - high	red / yellow
marble	8 000 - 18 000	good	low	all
porphyry	15 000 - 24 000	good - moderate	moderate - high	green
quartz-mica schist	25 200	good	high	green
quartzite	15 000 - 30 000	moderate - bad	high	green
sandstone	3 000 - 18 000	good	moderate	all
tuffstein	2 000 - 3 000	good	low	red / yellow

The size of feed per hammer can be determined from the hammer diagram.

In the case of stone in monitored secondary crushing, hard chromium alloy cast hammers and hard ceramic hammers can be used with small-size feed material.

4.4. MAGNETIC SEPARATOR

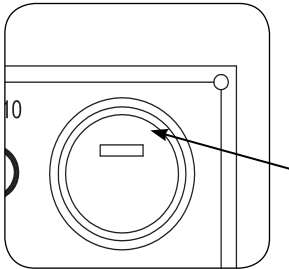


The magnetic separator belt is only to be used for removing from the crushed material reinforcements and other ferrous material as specified in the user manual.

You can select the direction of rotation of the magnetic belt by selector switch on the control panel. Please activate the selector switch only when the magnetic separator is switched off.

After changing the direction of rotation you must check the belt run and adjust if necessary! For details see chapter „5.3. belt alignment and tension“.

5. SERVICE AND INSPECTION ACTIONS



Fill in the service reports for 500 and 1 000 hours' operation and send them to HMM GmbH within 14 days. In the case of an extended warranty, fill in the service reports for 1 500 and 2 000 hours' operation once these durations have been achieved and send them to HMM GmbH (failure to do so nullifies warranty rights).

5.1. CHECKING EMERGENCY OFF CHAIN

- Switch radio control unit on.
- At control console select "Radio" as mode.
- Check whether all EMERGENCY OFF shock switches are released:
 - EMERGENCY OFF shock switch on control console
 - EMERGENCY OFF shock switch on service platform
 - EMERGENCY OFF shock switch on right-hand magnet support pillar
 - shutdown shock switch on radio control unit
- Check whether the dummy connector for the cable remote-control unit is plugged in. If the machine is operated by means of the cable remote-control unit, check whether the EMERGENCY OFF shock switch on this unit is released.

- Check the level of hydraulic fluid.
- Switch the radio control unit on.
- Turn ignition switch to position "1". On the control console the LED "EMERGENCY OFF OK/hydraulic fluid level" should shine **green**. If it shines **red**, you must check the EMERGENCY OFF chain again – the machine cannot be started without clearance for the EMERGENCY OFF chain..

20H0	☐	temperature of generator too high
20H1	☐	hydraulic oil
20H2/3	☐	vibro channel
20H4/5	☐	side discharge belt
20H6/7	☐	main discharge belt
21H1/2	☐	waterpump
21H3/4	☐	magnetic separator
21H5/6	☐	hydraulic radiator
21H7	☐	clean diesel pre-filter
21H8	☐	clean hydraulic oil filter
21H9	☒	EMERGENCY-OFF OK hydraulik oil level OK

Function test:

- When you press an EMERGENCY OFF switch or the shutdown shock switch, the LED "EMERGENCY OFF OK/hydraulic fluid level" must go out; when you release the switch, this LED must shine green again. Check each EMERGENCY OFF switch and the shutdown shock switch separately.
- At the end of the function tests the LED "EMERGENCY OFF OK / hydraulic fluid level" must shine green again.

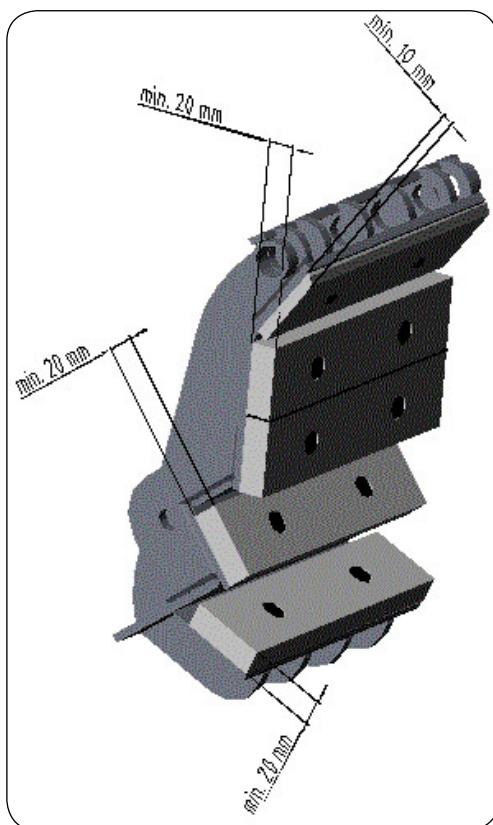
- Then switch the ignition off again..

5.2. REPLACING THE WEAR PARTS AND WEAR IN GENERAL

The interior of the impact crusher is lined with several wear parts. These wear parts must be replaced as soon as the minimum thickness of the material is at any point less than prescribed below.

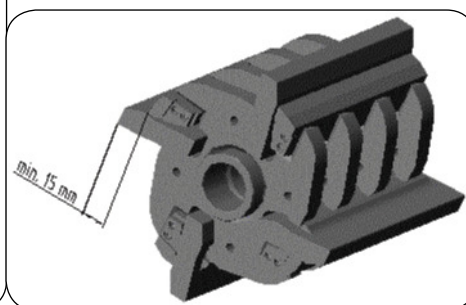
Minimum thickness of material:

- Impact plate, rotor and wearing edges (see graphic chart).
- The wearing plates on the side must be of a minimum thickness of 10 mm.



Hammers and other wearing plates do normally not wear down evenly. Basically, a wear part must be replaced as soon as the thickness is at any point less than the minimum thickness prescribed.

- In order to save costs, it is recommended to interchange wearing plates subjected to heavy wear with wearing plates subjected to less wear in good time, provided the wearing plates are alike.
- Whenever wearing plates are replaced or interchanged, the fastening screws must be replaced as well, because they are also subjected to wear.



- Hammers may only be replaced in pairs or as a whole set. A maximum weight difference of two opposite hammers must not exceed 0.4 kg. Otherwise there is the risk of heavy unbalance which may cause mechanical damage to the plant.

- After replacement, the hammers must be secured against axial displacement by means of safety plates on both sides.
- Tightening moment for screws of the wearing plates see table in chapter “5.7. Tightening torques for bolts”.

Wear of hammers and wear parts is influenced by various reasons as:

- Type of hammers and material of wear parts
- Setting of crushing gap and upper pivot of impact arm
- Type, composition and breaking strength of feeding material
- Size of feeding material
- Percentage of fines and moisture of feeding material
- Amount of reinforcing steel
- Throughput of material

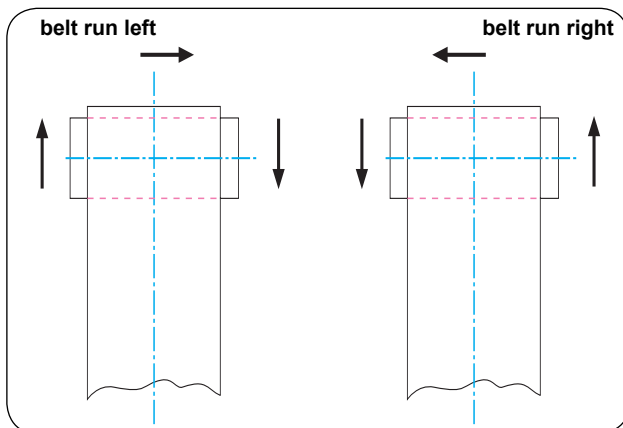
The crusher can be equipped with high wear resistant cladding for crushing very abrasive material (e.g. material with high content of silicate (option)).

5.3. BELT ALIGNMENT AND TENSION

5.3.1. ALIGNMENT OF CONVEYOR BELT

If the belt runs askew, it will wear out quickly, even though it is a high-grade product. For correct alignment all support rolls must be horizontal and aligned at right angles to the belt axis. None the less, various factors (such as moisture, material clumping etc.) can lead to the belt's skewing. To remedy this, realign the drums and/or support rolls.

5.3.2. ALIGNMENT OF DRIVE DRUM



If the belt runs askew, it will wear out quickly, even though it is a high-grade product. For correct alignment all support rolls must be horizontal and aligned at right angles to the belt axis. None the less, various factors (such as moisture, material clumping etc.) can lead to the belt's skewing. To remedy this, realign the drums and/or support rolls.

5.3.3. ALIGNING GUIDE ROLLS

The guide rolls can be repositioned with threaded spindles, which shift the clamping bearings (belt movement is influenced as shown in the diagram above).

5.4. EACH DAY BEFORE STARTING UP

component	servicing or inspection
configuration	- Make sure that the RM80 is set up in accordance with specifications (see chapter "3.1. setting-up the RM80"). - Check if the power connectors for the drum motors are plugged in, interlocked and intact.
hydraulic oil tank	Make sure that there is sufficient hydraulic oil in the tanks. N.B. The EMERGENCY OFF chain is interrupted if the hydraulic fluid level drops below 18 l (reservoir capacity approx. 50 l). As and when the hydraulic fluid is topped up, use the grade of fluid specified on the labels on the pump and reservoir.
diesel tank	Read the fuel gauge on the tank and refuel with diesel as the need arises. N.B. The tank holds approx. 200 l; fuel consumption is approx. 15 to 18 l/h.
motor unit	- Check the level of coolant in the engine at the gauge glass on the expansion vessel. As and when necessary, top up with coolant suitable for temperatures down to -35 °C (e.g. FUCHS Fricofin mixed with water, ratio 1:1). - The air intake and exhaust duct for the diesel motor must not be obstructed so that air is allowed to flow freely. - Check all hoses and pipes of engine (cooling system, charging lines, ...) for tightness. - Check the oil level in the engine, and top up with engine oil (e.g. 10W40) as required.
vibro channel	 - Check the screening section (grating, pressure-welded mesh, blanking screen) for accumulations of material or snagged grain, and remove if necessary. - Clean the screen elements. - Check that all the chains on the curtain box are in place.
impact crusher	- Check eye bolts of crusher housing and tighten if required. - Check if rotor runs free (rotate rotor by hand). - Check that the crushing gap at the impact arm is at least 30 mm. - Check the counter nuts for the adjustment spindles of the impact arm for tightness. - Check hammers, wearing plates and chains of chain curtain.

conveyor belts	- Free the driving and tail pulleys on the conveyor belts of dirt. - During operation make regular checks to ensure that the conveyor belts are running smoothly and that the support rollers are functioning. For adjustment of belt operation see chapter “5.3. belt alignment and tension”.
magnetic separator	- Remove all metal clings. - Check smooth running and tension of belt and make sure that the drive and deflector roll are free to rotate.
hydraulic power unit	Make visual check for leaks on hydraulic lines, hydraulic pump and tank.
caterpillar chassis	- Check tension of chains. - Check gearbox and motor of crawler tracks for leaks.

5.5. SERVICING AND CHECKS TO BE CARRIED OUT EVERY WEEK, AND WHEN STARTING UP AFTER A LONGER PERIOD OUT OF OPERATION

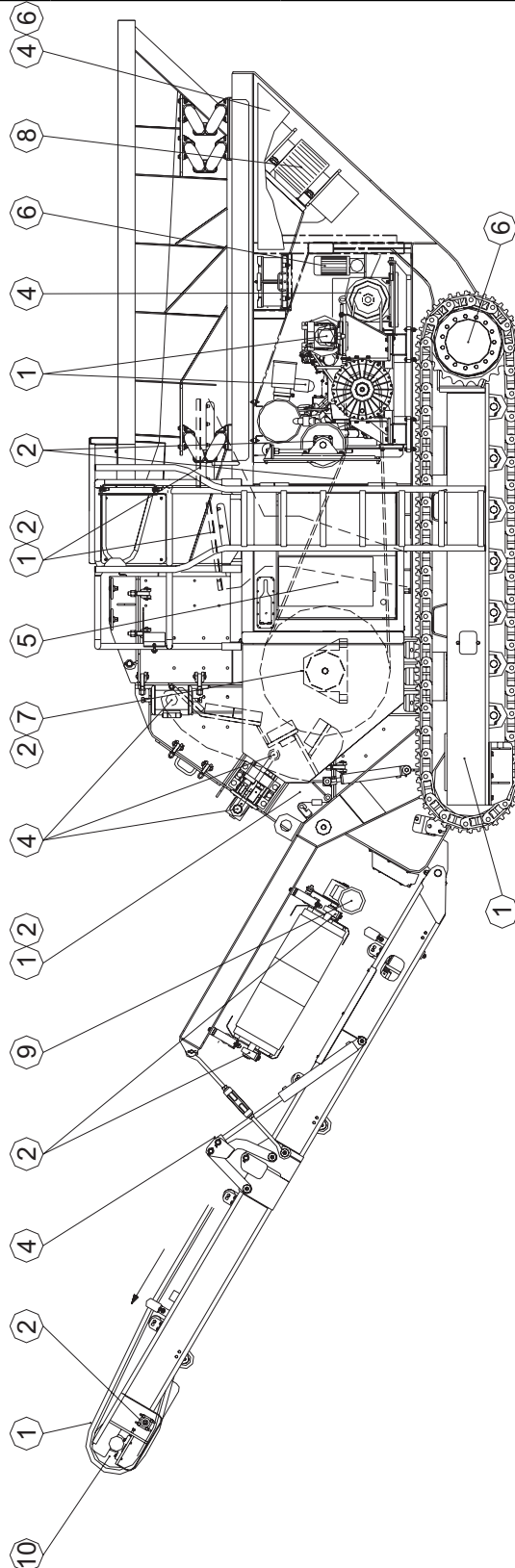
component	servicing or inspection
power unit	- Check tension of drive belts for crusher, hydraulic pumps and generator (see chapter “5.8. v-belts tension”). - Check Diesel, coolant and hydraulic lines for leaks. - Check condition and fit of charge and exhaust pipes. - Check elastomer ring on flexible coupling for damage.
impact crusher	- Check condition and fit of eye bolts on crusher shell, and mounting bolts on wear plates. - Check condition and fit of self-aligning roller bearing; turn the rotor by hand to listen for noise from bearing. - Check rotor shaft for smooth running, check condition of labyrinth rings in bearing housing. - Check mounting bolts of rotor pedestal bearings. - Check hammers for wear; turnover or replace hammers if required. - Check deflector plates for wear; replace if required. - Check condition of armour plating – swap or replace parts as required. - Check condition of side wear plates and those of crusher intake and crusher floor. - Check condition and function of safety limit switch.
vibro channel	- Check condition and fit of mounting bolts and wear of screen elements. - Check fit of mounting bolts on vibrator motors and oscillating elements. - Check condition of vibration absorbers on oscillating parts. - Check condition of rubber seals. - Check condition of steelwork (especially weld seams).
discharge belts	- Check tension of belts, wear to belt and ridges, straight running. - Check free movement of carrier rollers, return rollers and lateral guiding rollers. - Check wear of belt deflector drum on main conveyor at crusher discharge. - Check condition of SANPRO deflector plates on main discharge belt. - Condition of guide roll bearings - Check function and wear of all conveyor belt scrapers. - Check drum motors for leaks.
magnetic separator	- Check oil level of gear motor. - Check bearing seals.

caterpillar chassis	▪ Check bolts, nuts and pins on chassis gearbox, lower rollers, chain wheels and chain links. ▪ Check tension of chains. ▪ Check chassis gearbox, motor, front chain wheels and lower rollers for leaks. ▪ Check oil level on gearbox of crawler tracks.
booth	▪ Check for possible damage, inspect locking mechanisms.
water pump (optional)	▪ Check oil level of gear motor. ▪ Check hoses and manifold block for leaks.

5.6. SERVICE AND LUBRICATION SCHEDULE (DETAILED)

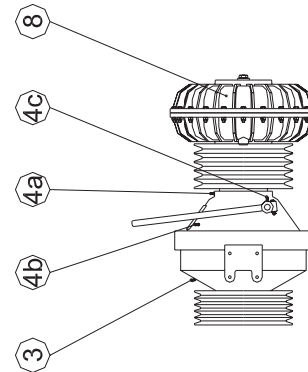
number	component	description
daily		
1	diesel motor	check oil level, coolant level and air filter.
	conveyor belts	check belt operation, belt tension and function of drums and rollers.
	impact crusher	adjust crushing gap for desired size (min. 30 mm); check hammers, impact plates and wearing edges for wear as well as the eye bolts of crusher housing for firm seats.
	vibrating feeder	clean screen decks if necessary.
	hydraulic system	check hydraulic components for leakages.
	track system	check screws, nuts and bolts of flange, rollers, chain wheel and track shoes for firm seats, check chain tension check drive gear, hydraulic motor, rollers and chain wheel for leakages.
weekly		
2	diesel motor	check radiation ribs of water cooler, clean if necessary.
	driving unit	check tension of V-belts used to drive crusher, generator and hydraulic pump.
	impact crusher	check fastening screws of wearing plates for proper condition and firm seat.
	vibrating feeder	check wear of bottom plates and screen decks.
	rotor bearings	grease with 20 g lithium base grease consistency class 2/3.
	labyrinth rings	grease with 40 g lithium base grease consistency class 2/3.
	bearings	grease with 1-2 strokes lithium base grease consistency class 2/3.
every 100 wh		
3	clutch	grease with 20g lithium base grease consistency class 2/3.
	transm.hydr.pump	grease with 1 stroke lithium base grease consistency class 2/3.
every 300 wh		
4	bearings	grease with 1-4 strokes lithium base grease consistency class 2/3.
	hydraulic cylinder	grease with 7g lithium base grease consistency class 2/3.
	clutch	a) 28g lithium base grease consistency class 2/3 b) 7g lithium base grease consistency class 2/3 c) 1 strokes lithium base grease consistency class 2/3
	transm.hydr.pump	d) 2 strokes lithium base grease consistency class 2/3
	generator	remove dust and dirt (also from inside, remove cover).
	hydraulic system	check radiation ribs of oil cooler, clean if necessary.

5	every 500 wh (see service form 500 wh)
6	every 1 000 wh (see service form 1 000 wh)
7	every 1 500 wh (see service form 1 500 wh)
8	every 2 000 wh (see service form 2 000 wh)



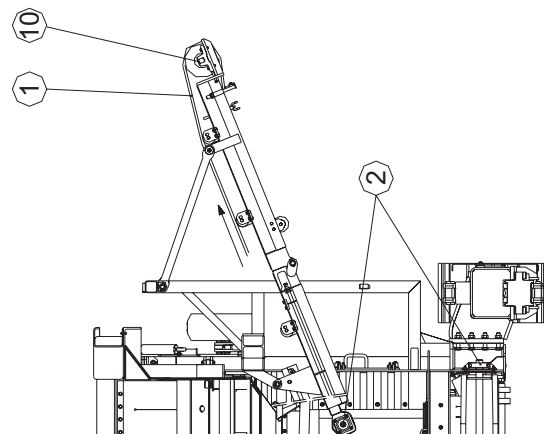
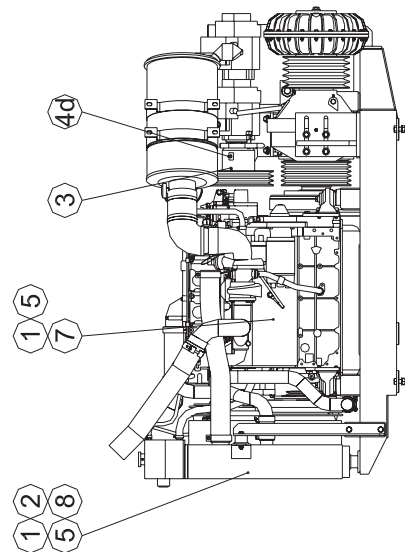
Kupplungseinheit:

Clutch unit:



Dieselaggregat:

Diesel aggregate:



5.7. TIGHTENING TORQUES FOR BOLTS

Designation of bolted connection	Bolt dimension	Property class	Tightening torque [Nm]	Comment
Wearing plates - impact arm	M 24	10.9	750	additional bonding with Loctite 243
Wearing plates - impact arm	M 36	10.9	1500	
Wearing plates - housing of impact crusher	M 24	10.9	750	
Wearing plates - housing of impact crusher sidelinings	M 16	10.9	300	
Rotor pedestal bearings	M 36	10.9	1500	
Rotor - rotor shaft (Ring clamping element, series 1800 Ø 165/Ø120)	M 12	12.9	145	
V-belt pulley rotor - rotor axle clamping element (Taper-Lock 5050)	7/8"	10.9	270	
V-belt pulley generator - generator axle clamping element (Taper-Lock 2517)	1/2"	10.9	50	
Aluminium ring rubber disc clutch - flywheel diesel engine	M 10	8.8	48	
Ring rubber disc clutch - V-belt pulley (in case the rubber disc must be replaced)	M 12	8.8	86	
Crawler track system - flange mounting	M 24	10.9	750	
Crawler track system – toothed wheel rim Turas gearbox	M 16	10.9	300	
Crawler track system – hydraulic motor	M 20	10.9	550	
Transmission hydraulic pump - bracket	M 16	8.8	200	
Release system + impact arm adjustment unit	M 20	10.9	550	
Vibration feeder - oscillating element (Rosta element)	M 16	8.8	200	
Vibration feeder - unbalanced motors	M 30	10.9	1500	

5.8. V-BELTS TENSION

driven unit	type of v-belt	quantity	tension [N] new v-belt	min. tension [N] used v-belt
crusher	Red Power SPC x 6000 LD	5	1 300	1 000
generator	Red Power SPB x 2000 LD	2	650	500
hydraulic pump	Red Power SPB x 1800 LD	3	750	600
diesel engine	Deutz V-rib belt	1	see Deutz manual	Check wear limit - see Deutz manual

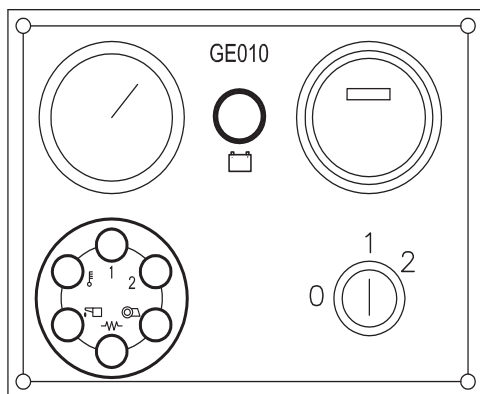
5.9. PUTTING THE MACHINE AWAY FOR THE WINTER

When the machine is put away for the winter, take care that it is standing on firm ground. If the ground it stands on is soft/muddy, the crawler tracks can freeze to it. Ensure that the water in the pipes is drained off. The proportion of anti-freeze in the engine cooling system must be high enough to cope with winter temperatures. It is advisable to disconnect the battery terminals.

In the case of an extended shutdown, the machine should be started up at regular intervals (every 3 to 4 months) and all drive mechanisms switched on once.

6. FAULT DETECTION AND REMEDY

6.1 OVERVIEW



- 20H0 ○ temperature of generator too high
- 20H1 ○ hydraulic oil
- 20H2/3 ○ vibro channel
- 20H4/5 ○ side discharge belt
- 20H6/7 ○ main discharge belt
- 21H1/2 ○ water pump
- 21H3/4 ○ magnetic separator
- 21H5/6 ○ hydraulic radiator
- 21H7 ○ clean diesel pre-filter
- 21H8 ○ clean hydraulic oil filter
- 21H9 ○ EMERGENCY-OFF OK
hydraulic oil level OK

6.2 LED'S ON DIESEL CONTROL UNIT

	oil pressure	RED & horn sounds continuously	Oil pressure of diesel engine too low -> Diesel engine keeps running (warning limit) or engine stops (shut off limit) <i>Possible causes / Remedy:</i> - Oil level of diesel engine too low -> check oil level and fill up if necessary. - Oil pump is defective -> contact RUBBLE MASTER or DEUTZ After-Sales-Service.
	coolant temperature	RED & horn sounds continuously	Coolant temperature too high -> Diesel engine keeps running (warning limit), Vibro-feeder switches to 0-feed. <i>Possible causes / Remedy:</i> - Coolant temperature too high (>112 °C) -> check coolant level, clean radiator, wait until temperature of coolant drops below 112°C and LED's extinguishes after restarting the machine. - Fan-V-belts are loose or defective -> tighten or replace V-belts (tension min. 300 N). Coolant temperature too high -> Diesel engine stops (shut off limit) <i>Possible causes / Remedy:</i> - Coolant temperature too high (>120 °C) -> check coolant level, clean radiator, wait until temperature of coolant drops below 112°C and LED's extinguishes after restarting the machine. - Fan-V-belts are loose or defective -> tighten or replace V-belts (tension min. 300 N).

1	speed control	Red & horn sounds continuously	Speed of diesel engine too low -> Diesel engine stops <i>Possible causes / Remedy:</i> - Speed of diesel engine too low (engine stops if speed remains below 1 750 rpm for more than 30 seconds while starting or speed drops below 1,750 rpm for more than 10 seconds during operation) -> check if rotor runs free, check idle running speed (> 2 000 rpm). - Alternator-V-belts are loose or defective -> tighten respectively replace V-belts (tension min. 300 N).
2	EMR	Red & horn sounds continuously	Fault signal from EMR (Electronic Motor Regulator) -> Diesel engine keeps running or stops (depends on status of failure) <i>Possible causes / Remedy:</i> Diesel engine fault: e.g. quantity of diesel injection, charge intake, charge pressure, broken sensor cable etc. -> use serial PC interface to analyse further information from EMR, contact RUBBLE MASTER or DEUTZ After-Sales-Service.
	air filter	Red & horn sounds continuously	Air filter clogged -> Diesel engine keeps running <i>Possible causes / Remedy:</i> - Primary and/or secondary filter is clogged -> clean or replace filters. - Check air intake pipes, cyclone prefilter and ejector.
	load control	Red & horn sounds continuously	No charging of battery when diesel engine is running -> Diesel engine keeps running <i>Possible causes / Remedy:</i> - Alternator-V-belts loose or defective, V-belt-pulley defective -> tighten or replace V-belts (tension min. 300 N), check V-belt-pulley of alternator for wear indications. - Cable connection or alternator is defective -> check cable connection and alternator, replace if necessary.
	load control	Red	No loading of battery -> Diesel engine not started <i>Possible causes / Remedy:</i> Ignition switched on but diesel engine not started -> start diesel engine.
	preheating control	Red	Preheating control light ist on Function: Control light is on during preheating of the diesel engine.

6.3 LED'S IN GENERAL

	overtem- perature generator	Red & inter- mediate sound	<i>Overtemperature of generator -> Vibrating feeder stops</i> <i>Possible causes / Remedy:</i> - Red LED „generator“ is on -> wait 15 to 30 minutes to enable PTC-resistor to cool down, locate malfunction - Generator full of dust -> Remove cover at back side of generator and carefully dust off generator with compressed air. - Too much auxiliary power taken from the power outlets. Up to 6 KW is available using auxiliary power outlets. Please contact the manufacturer if you intend to use more than 6 kW auxiliary power.
	oil tem- perature hydraulic oil	Red	<i>Fault indication - hydraulics -> Tracks cannot be activated.</i> <i>Possible causes / Remedy:</i> - Hydraulic oil temperature too low (< 0°C) -> If diesel engine is running hydraulic oil warms up and LED extinguishes. - Hydraulic oil temperature too high (> 75°C), hydraulic radiator clogged or fan motor defective -> Wait until oil temperature drops below 75°C and red LED extinguishes, clean hydraulic radiator or replace fan motor.
	vibrating feeder ON/ MALFUN- TION	GREEN	<i>Vibro feeder is switched on.</i>
		ORANGE	<i>Vibro feeder switched on zero-feed speed (600 rpm).</i>
		Red & inter- mediate sound	<i>Fault indication - Vibrating feeder -> Vibrating feeder stops</i> <i>Possible causes / Remedy:</i> - Generator-V-belts are loose or defective -> tighten or replace V-belts (tension min. 500 N). - Fault indication (flashing red LED) on frequency converter -> restart machine after min. 2 minutes to quit fault indication, contact RUBBLE MASTER After-Sales-Service.
	side discharge belt ON/ MALFUN- TION	GREEN	<i>Side discharge belt is switched on.</i>
		Red & intermedi- ate sound	<i>Fault indication - side conveyor -> Side conveyor & vibrating feeder stop</i> <i>Possible causes / Remedy:</i> - Motor protective switch dropped -> After waiting for two minutes switch motor protective switch on again – reset protective switch first (switch to “0”). - Cable or cable connection from conveyor belt defective -> Check cable connection. - Water or dirt in cable connector -> Check cable connector for defects or moisture permeability. - Conveyor is blocked -> Remove obstruction. - Red LED on PTC resistor relay – „Main conveyor“ -> Wait 15 to 30 minutes to enable PTC-resistor to cool down, locate malfunction.

	main discharge belt ON/ MALFUNCTION	GREEN	Main discharge belt is switched on.
		Red & intermediate sound	Fault indication - main discharge conveyor -> Main discharge conveyor & vibrating feeder stop <i>Possible causes / Remedy:</i> ▪ Motor protective switch dropped -> After waiting for two minutes switch motor protective switch on again – reset protective switch first (switch to “0”). ▪ Cable or cable connection from conveyor belt defective -> Check cable connection. ▪ Water or dirt in cable connector -> Check cable connector for defects or moisture permeability. ▪ Conveyor is blocked -> Remedy obstruction. ▪ Red LED on PTC resistor relay – „Main discharge conveyor“ -> Wait 15 to 30 minutes to enable PTC-resistor to cool down, locate malfunction.
	water pump ON/ MALFUNCTION	GREEN	Water pump (from dust suppression system) switched on.
		Red & intermediate sound	Fault indication - water pump -> Water pump stops <i>Possible causes / Remedy:</i> ▪ Motor protective switch dropped -> After waiting for two minutes switch motor protective switch on again – reset protective switch first (switch to “0”)
	magnetic separator ON/MALFUNCTION	GREEN	Magnetic separator switched on
		Red & intermediate sound	Fault indication - magnetic separator -> Magnetic separator stops <i>Possible causes / Remedy:</i> ▪ Motor protective switch “10Q2” dropped -> After waiting for two minutes switch motor protective switch on again – reset protective switch first (switch to “0”). ▪ Conveyor is blocked -> Remedy obstruction. ▪ Cable or cable connection from conveyor belt defective -> Check cable connection.
	hydraulic radiator ON/MALFUNCTION	GREEN	Hydraulic oil reached operating temperature.
		Red & intermediate sound	Fault indication - hydraulic radiator -> Hydraulic radiator fan stops <i>Possible causes / Remedy:</i> ▪ Motor protective switch dropped -> After waiting for two minutes switch motor protective switch on again – reset protective switch first (switch to “0”). ▪ Fan motor defective -> Check fan motor and replace if necessary.

	clean diesel pre-filter	Red	Water in separator of fuel prefilter -> Diesel engine keeps running <i>Possible causes / Remedy:</i> Water in separator of preliminary diesel filter (Separfilter) -> Open drain plug of separator and drain off water.
	hydraulic oil filter contamination	Red & intermediate sound (only 10 minutes after starting the machine)	Hydraulic oil filter clogged -> Diesel engine keeps running - crawler tracks possible to move <i>Possible causes / Remedy:</i> - Hydraulic oil filter clogged (filter console behind hydraulic cover) -> Check hydraulic oil filters and replace if necessary. - Hydraulic oil temperature is too low -> If diesel engine is running hydraulic oil warms up and red LED extinguishes.
	EMERGENCY-OFF OK hydraulic oil level OK	GREEN	Emergency stop circuit is OK, Hydraulic oil level OK
			Emergency stop circuit interrupted or hydraulic oil level too low -> Diesel engine stops <i>Possible causes / Remedy:</i> - One or several emergency stop buttons pressed -> Unlock emergency stop buttons; Position on machine: control panel, base frame (right side), service platform, remote control. - Crusher door opened -> Close crusher door. - Dummy plug for cable remote control unplugged (right side of vibrating motors) -> insert dummy plug. - Safety switch of crusher door defective -> Check safety switch, adjust 5-7 mm distance between safety switch and counterpart. - Hydraulic oil level in hydraulic oil tank too low -> Check oil level and refill if necessary.

6.4 Frequency converter malfunction codes

YASKAWA

Malfunction indicated	Interpretation	Corrective action
UU (FLASHING) VOLTAGE IN INTER-MEDIATE CIRCUIT LOW	The DC voltage in the intermediate circuit has dropped below the low voltage trigger level while no operating signal was actuated. 200 V class: 195 VDC (155 VDC single-phase) 400 V class: 390 VDC	- Check mains voltage - Check that mains power supply is connected - Check that all terminals are in satisfactory condition

OU (FLASHING) VOLTAGE IN INTER- MEDIATE CIRCUIT HIGH	The DC voltage in the intermediate circuit has risen above the high voltage trigger level with the converter output switched off. 200 V class: 425 VDC 400 V class: 810 VDC	Check mains voltage
UU1 VOLTAGE IN INTER- MEDIATE CIRCUIT LOW	The DC voltage in the intermediate circuit has dropped below the low voltage trigger level during operation. 200 V class: 195 VDC (155 VDC single-phase) 400 V class: 390 VDC	- Mains voltage low - One phase of mains power supply interrupted - Mains power supply temporarily down - Check mains voltage - Check that power terminals are connected - Check that terminals are connected
UU2 CONTROL CARD VOLTAGE LOW	The supply voltage to the control card has dropped.	Switch power supply off and then back on. If this does not help, you must replace the frequency converter.
F00 CONTROL UNIT: COMMUNICATION MALFUNCTION 1	Communications between the frequency converter and the control unit were interrupted for more than 5 seconds.	- Check that control panel is installed correctly - Switch power supply off and then back on - Replace control panel or frequency converter
F01 CONTROL UNIT: COMMUNICATION MALFUNCTION 2	Communications between the frequency converter and the control unit were impaired for more than 5 seconds.	- Check that control panel is installed correctly - Switch power supply off and then back on - Replace control panel or frequency converter
F05 ANALOG-TO-DIGI- TAL CONVERTER MALFUNCTION	Analog-to-digital converter malfunction	- Switch power supply off and then back on - Replace control panel or frequency converter
F07 CONTROL UNIT MALFUNCTION	Control unit malfunction (EEPROM or analog-to-digital converter malfunction)	- Check that control panel is installed correctly - Switch power supply off and then back on - Replace control panel or frequency converter
OPR CONTROL UNIT NOT CONNECTED	The connection to the digital control unit was interrupted just as a command was input from the unit.	Check communications facilities and transmission signals
CE MEMOBUS COMMU- NICATION MAL- FUNCTION	After data had been received once, normal reception was not possible for at least 2 seconds.	Check communications facilities and transmission signals

SAWI

Status display

H3 Green LED	H2 Orange LED	H1 Red LED	Description
OFF	OFF	OFF	No power, or malfunction
	X	OFF	InCircuit programming active
ON	OFF	OFF	Not operational
		ON	Malfunction (see malfunction table)
	flashing	OFF	Motor running
		flashing	Motor running, warning, (see warning display)
		ON	Motor running, malfunction (see malfunction table)
	ON	OFF	Operational
		flashing	Operational, warning, (see warning display)
		ON	Operational, malfunction (see malfunction table)

Malfunction table

H4	Malfunction	Description
E1	No setpoints on hand	Set new setpoints
E2	Circuitry temperature high	Let frequency converter cool down
E3	Motor temperature high	Let frequency converter cool down
E4	Brake resistance overload	Too many braking cycles, let frequency converter cool down
E5	I ² t overload	Motor overload
E6	Excess current	Motor current excessive
E7	Intermediate circuit malfunction	Intermediate circuit voltage out of range
E8	Phase malfunction	One phase of mains power supply not connected
E9	Generator running	Energetic recovery from generator
E10	Input voltage too low	Input voltage too low during start
E11	Earth fault	Short-circuit in PE phase
E12	W phase excess current	Short-circuit in W phase
E13	V phase excess current	Short-circuit in V phase
E14	U phase excess current	Short-circuit in U phase

Warnings

H4	Warning	Description
A1	Output current high	Motor current above motor rating
A2	Circuitry temperature rising	Warning about high circuitry temperature
A3	Motor temperature rising	Warning about high motor temperature
A4	Varistors are no longer contacted	Manufacturer to replace varistors
A5	Input current low	Input current is too low

6.5 TROUBLESHOOTING DIAGRAMS

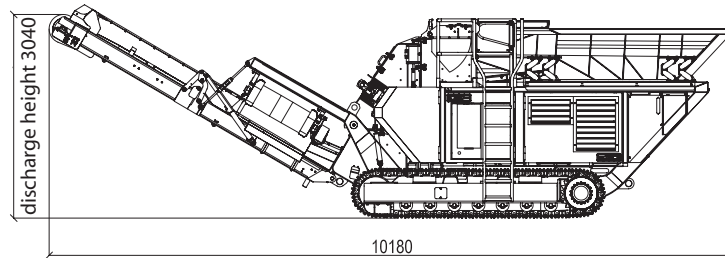
Troubleshooting diagrams for the RM80 are attached to the user manual.

7. TECHNICAL DATA

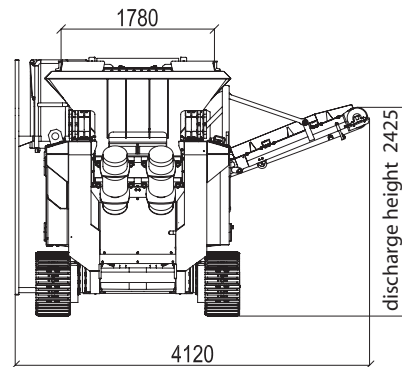
7.1. MAIN MACHINE DIMENSIONS (TRANSPORT AND OPERATION)

Operation:

Maximum length: 10 180 mm
Maximum width: 4 120 mm

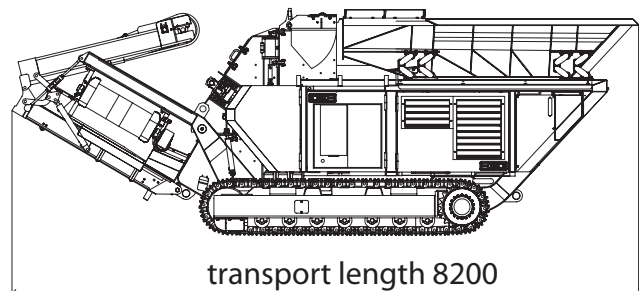


Discharge height:
main discharge belt 3 040 mm
side discharge belt 2 425 mm
vibrating chute width 1 780 mm

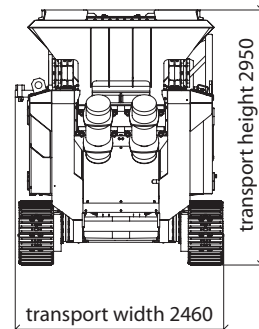


Transport:

Maximum transport length 8 200 mm
Maximum transport width 2 460 mm
Transport height 2 950 mm
(without handrail and ladder)

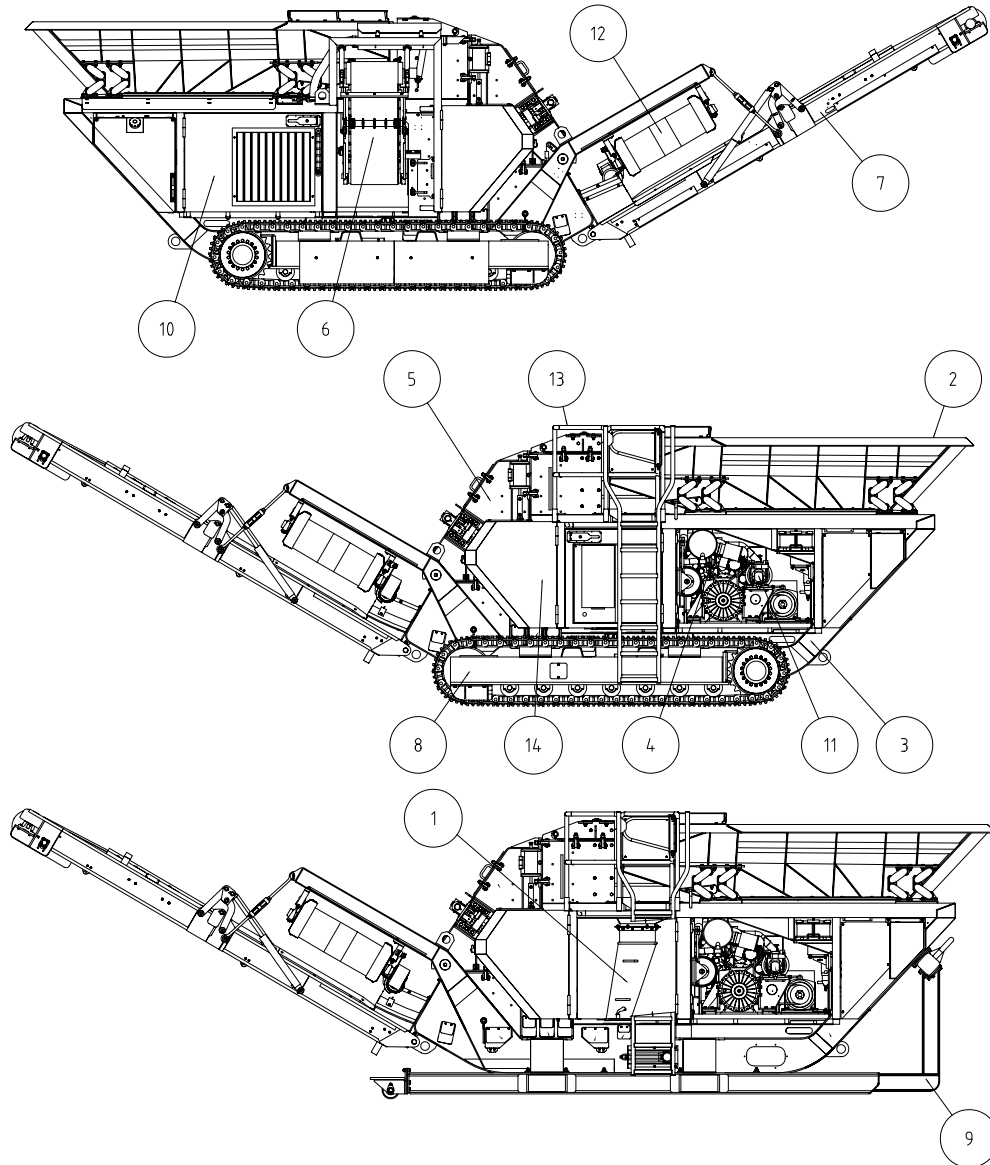


Transport weight 23 000 kg



7.2. OVERVIEW - MAIN PARTS

1 Bypass chute	2 Vibrating chute	3 Base frame	4 Power unit	5 Crusher
6 Side discharge belt	7 Main discharge belt	8 Crawler tracks	9 Hook lift	10 Lining
11 Hydraulics	12 Magnetic separator	13 Service platform	14 Power supply	



7.3. RAL COLOURS OF PAINTWORK

Colour	RAL code
yellow	1003 - glossy
grey	7015 - glossy

7.4. BASE FRAME

The base frame is of modern monochassis design, with integrated crusher housing, power train, vibrating chute support and partially integrated main discharge belt. Side connection flanges for the crawler tracks, hydraulic supports and skids, and hook lift and skids are provided.

7.5. VIBRATING CHUTE

The vibrating chute is a massive steel structure with high resistance to deformation.

The built-in prescreening system offers a choice: the prescreened material is discharged either together with the crushed product via the main discharge belt or via an optional side discharge belt onto a separate tip.

capacity	approx. 2.5 m ³
mass	3 300 kg
replaceable cladding in floor	Hardox 400

pre-screening system	Grating with conical openings Gap size: 30/50 (standard) or 50/70 (optional)
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Options:

- blanking screen – can be bolted onto existing grating / pressure-welded mesh.

drive	vibrating motor	JV 246-1161
	manufacturer	Jöst
	rating	3 kW/ 400V/ 50Hz
	speed	600 to 1 000 rpm
	maximum torque	max. 1 160 kgcm
	bearing grease	Esso Unirex 60g
	greasing schedule	20 g every 2 000 h
mounting	4 pivot components	from 50-2 on
	4 pivot components	from 50 on

Cleaning the vibrating chute

If you press the key “Clean vibrating chute” when the chute is switched on and **empty**, this initiates a program in which the chute is accelerated from idling to maximum speed several times within 40 seconds, before returning to the speed previously set. Idling can also be initiated by hand at the radio control unit or control console.

7.6. POWER UNIT

7.6.1. DIESEL MOTOR

manufacturer	Deutz
model	TCD 2013 L04 2V
speed	2 040 min ⁻¹
rating	122 kW
capacity	4 761 cm ³
no. of cylinders	4

The Deutz Common Rail diesel engine complies with Tier 3 emission standards.

7.6.2. 3-PHASE SYNCHRONOUS GENERATOR

type	EC28LD2
speed	3 000 min ⁻¹
voltage	400 V
rating	31.5 kVA

The generator is equipped with a temperature monitor. If the temperature in the generator rises too far, the LED “Temperature in generator high” on the control console goes on, and the vibrating chute is switched off or set to idle.

A power rating of at most 6 kW is available for external consumers. If more power is required, the manufacturer should be consulted.

7.6.3. CLUTCH UNIT

- Engine side: ultra-elastic dry plate clutch bolted to flywheel, with V-belt pulley to drive generator and hydraulic pumps.
- Manual coupling to connect/disconnect crusher mechanism when idling.
- Take-off side: hydraulic coupling and V-belt pulley for crusher mechanism.

7.6.4. OIL QUANTITIES REQUIRED

The engine requires approx. 17 l of engine oil (see oil specification label on left-hand bulkhead).

The hydraulic coupling requires approx. 7.5 l of hydraulic fluid (VG 22HLP).

7.6.5. COOLANT

The engine requires approx. 25 l coolant. The machine is supplied with Fuchs Fricofin long-term coolant based on monoethylene glycol, which is effective down to -38°C.

7.6.6. MEAN CONSUMPTION

The machine consumes approx. 17 l diesel fuel per hour. The fuel tank has a capacity of 200 l.

7.7. CRUSHER

model	LPB 800
manufacturer	HMH
intake dimensions	860 x 600 mm
impact arc	ø 850 mm
no. of hammers	4 (2+2)
rating	up to 150 t/h
max. feed size	700 mm
final size	cubic up to 70 mm
impact arm adjustment (height of pivot point adjustable by hand with hydraulic valve; fix with fillers)	pivot point above 90 mm
crushing gap (adjustable by hand with hydraulic valve)	30 to 80 mm

- Parts of crusher housing structurally integrated into frame geometry
- Compact hydraulic adjustment of crushing gap
- Height of impact arm pivot point hydraulically adjustable
- Crusher space geometry can be modified with new impact arm kinematics
- Hydraulic mechanism to open crusher housing
- New geometry greatly simplifies replacing hammers by hand
- Integrated release system

7.8. MAIN DISCHARGE BELT

belt width	800 mm
length	15 000 mm
discharge height	3 000 mm

7.8.1. MOTOR DRIVE

drum motor	TM321
belt speed	1.6 m/s
rating	7.5 kW/ 400 V

The **crusher outlet** to the discharge belt is integrated in the structural frame as a load-bearing element.

For transport purposes the main discharge belt can be retracted hydraulically.

At the crusher outlet the belt is guided by SANPRO wearing plates, elsewhere by support rolls and sliding plates. Close to the motor drive a rotating arm dusts the belt off.

The direction reverse switch for the main discharge belt is on the right-hand magnet support pillar next to the EMERGENCY OFF shock switch. If the main discharge belt is blocked because material at the crusher outlet cannot be discharged, the belt can be run in reverse for as long as the switch is held in position 2.

7.9. CRAWLER TRACKS

axle-to-axle distance	3 100 mm
track	1 950 mm
width of individual track	400 mm
travel speed	max. 2.4 km/h
maximum tractive power	175 kN
hydraulic motor	A2FE45
mass	approx. 4 000 kg

7.10. COVERS AND GUARDS

The doors serve as permanent guards, and must always be closed and locked during operation.

Exception: during service and inspection activities – here special care must be taken.

7.11. HYDRAULICS

7.11.1. TRACK MECHANISM HYDRAULICS

model	Double axial piston pump with electrical adjustment and power ceiling
rating	max. 2 x 30 kW 100l/min, 385 bar
tank capacity	50 l
hydraulic oil	Fuchs Renolin B32 HVI

Drive via V-belt and speed reducer.

As standard the hydraulic system is filled with the multi-range hydraulic fluid Renolin B32 HVI, made by Fuchs. For delivery to warm climates, where the machine is also operated at high outdoor temperatures, the hydraulic system is filled with Renolin B15 VG46 hydraulic fluid, also made by Fuchs. Take note of the labels on the fluid reservoir and the hydraulic pump.

7.11.2. ANCILLARY HYDRAULICS

model	Gear-type pump (flanged onto hydraulic pump for track mechanism)
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7.12. POWER SUPPLY

The engine drives a three-phase synchronous generator directly via a V-belt; this has a rating of 31.5 kVA and provides power at 400 V and 230 V.

For external consumers the following power points are provided on the machine:

1 x 32A 400V	Power point at rear, close to vibrating chute
2x 16A 400V	Power point at rear, close to vibrating chute
	Power point on base frame, at front on left, to supply OS80 over-size grain screen (option)
1x 16A 230V	Power point at rear, close to vibrating chute

A power rating of at most 6 kW is available for external consumers. If more power is required, the manufacturer should be consulted.

7.13. MAGNETIC SEPARATOR

magnet dimension	1 200 x 925 x 300 mm
belt width	900 mm
belt length	4 240 mm
belt speed	1.6 m/s
drive motor	2.2 kW/ 400V
mass	approx. 1 500kg

- The separator, which is fitted at right angles to the direction of discharge, removes pieces of iron/steel from the crushed material.
- The direction in which the magnetic belt rotates can be selected with a switch on the control console; the metal separated out can thus be ejected to the left or right of the machine.

7.14. SERVICE PLATFORM

This is intended exclusively for service work.

Bolted plate structure with detachable handrail, non-slip ladder and safety door at point of entry.

7.15. BYPASS CHUTE

This serves to transfer the pre-screened material straight to the main discharge belt without using the side belt (option).

To simplify fitting the chute, it is made of plastic reinforced with glass fibre, and has a bayonet coupling.

IMPORTANT: before swinging the side discharge belt out, remove the bypass chute!

8. OPTIONS

8.1. SIDE DISCHARGE BELT

belt width	500 mm
length	6 600 mm
discharge height	2 400 mm

8.1.1. DRIVE UNIT

drum motor	TM220
belt speed	1.6 m/s
rating	2.2 kW/ 400 V

The side discharge belt can be folded in or out easily with only one hydraulic cylinder via a special folding mechanism.

8.2. REMOTE CONTROL BY CABLE

If the radio control unit malfunctions, the RM80's crawler tracks can also be operated by cable remote control.

- In this case you must remove the dummy connector (at the back on the right alongside the vibrating motors for the vibrating chute), plug in the connector for the cable remote-control unit and clamp it in place.
- To release the crawler tracks for operation, you must press the two upper buttons on the cable control unit simultaneously (the track mechanism then stays activated for 10 seconds without these buttons being pressed – acoustic travel signal).
- To set the machine in motion, press the appropriate button(s).
- Set travel speed with the rotary switch.
- When you no longer need the cable control unit and disconnect it, plug the dummy connector in again – otherwise the EMERGENCY OFF chain is interrupted.

8.3. REPLACEMENT DEVICE FOR HAMMERS

Any operator can replace the hammers quickly and safely on his/her own with this device as the need arises.

load capacity	250 kg
weight (normal lift)	2.2 kg
chain dimensions d x t	4 x 12 T mm

8.4. DUST SUPPRESSION SYSTEM

Two jets each atomize water in flat or hollow-cone jets, respectively, which bind the dust produced. They are located in the crusher intake, at the rear of the main discharge belt, in the outlet box around this belt, and at the discharge points of the main and side belts.

With its efficient dust control system, the machine is suitable for work in residential districts.

Waterpump (option dust suppression system with pump)

piston diaphragm pump	
model	R406.1-180KM/56
rating	180 l/h at a max. of 10 bar
3-phase motor	0.37 kW/ 400V
gearbox oil	ISO VG150

suction booster

lifting vessel	770/2
manual vacuum	HVP1
suction lance	SL02

The suction booster is designed to:

- fill the intake line quickly
- even out pulsation pressure spikes
- ensure uniform pump operation if air is drawn in briefly.

IMPORTANT!

The pump must not run unless it is filled with water.

Avoid running the pump for lengthy periods without bleeding it.

Use only pure water free of solids at a temperature of at most 30°C.

If there is a risk of frost, the pump, hoses and manifold blocks must be drained completely.

8.5. CENTRALIZED LUBRICATION SYSTEM

A pump takes care of lubricating all necessary points with grease.

Use consistency class NLGI 2 greases. Make sure that the grease used is free from impurities.

8.6. ENVIRO PACKAGE

The RUBBLE MASTER “Enviro” concept:

- Minimizing the noise of crushing
- Exhaust silencer
- Efficient dust control (optional extra)
- Diesel engine with optimal emissions and immissions
- Know-how for efficient site organization

The RUBBLE MASTER “Enviro” package makes the RM 80 the ideal crusher for every inner-city building site and wherever using construction machinery is particularly tricky as regards environmental impact.

The Enviro package features:

- Enclosing the crusher to suppress the noise of crushing.
- Enclosing the engine space doors on the left and right.
- Extremely economical diesel engine.

8.7. HOOK LIFT

The hook lift is available as an alternative to crawler tracks. The hook lift makes it possible to transport the machine with a hook-lift truck, which picks it up and shifts it.

8.8. EXTENSION TOOLKIT 1+2

This toolkit is an extension to the toolbox, and includes an SW55 slugging socket spanner (for replacing wearing plates in the impact arm), a voltage tester, 2 sets of socket wrenches and 2 torque wrenches for tightening bolts with exactly the right amount of torque.

8.9. HARD-WEARING CRUSHER LINING

This upgrade is intended for special applications involving highly abrasive material; it consists of Hardox 500 plates 30 mm thick, which are fitted in sectors of the crusher particularly subject to wear.

8.10. BUILT-IN FUELLING PUMP

This upgrade includes all the necessary components, as in the original version. Power is supplied via the 24V receptacle in the frequency converter enclosure.

8.11. OS80 OVERSIZE SEPARATOR

The OS80 oversize separator ensures a defined final size in a single screening step in which 100 % of the oversize material is removed in 3 cascaded finger sieves. This provides very satisfactory grader material at low cost.

Full information at a glance:

- Reduced share of fines (as crusher is not clogged up)
- Maximum throughput – little wear and tear
- Transport with the crusher – no separate transport required
- Flexible, thanks to adjustable finger cascades
- Power supply via the crusher generator
- Throughput up to 150 t/h
- Screening range 16 to 64 mm => grain size 0/20 to 0/56
- Shorter payback than with stand-alone screens

8.12. OVERSIZE RETURN BELT

With the return belt material from the OS80 oversize separator can be returned to the vibrating chute; this makes it possible to achieve a defined final grade size.

Data on OS80 with return belt:

Throughput	up to 60 t/h
Length	12 220 mm
Width	4 120
Height	3 800 mm
Weight	567 kg

8.13. STEEL BYPASS CHUTE

This is to transfer pre-screened material to the main discharge belt without using the separate side discharge belt.

To simplify fitting the bypass chute it has a bayonet coupling. The chute is made of steel suitable for abrasive charge material.