

DIESEL HAMMER MANUAL



PIE

- **TECHNICAL DATA**
- **SAFETY**
- **OPERATION INSTRUCTIONS**
- **TRANSPORT AND STORAGE**
- **TROUBLESHOOTING**
- **MAINTENANCE**



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Thank you for choosing a JW Diesel Hammer.

To ensure safe operation, maximize performance, and achieve a long service life from this equipment, read this manual carefully before operation.

This manual provides important information on the operation, maintenance, and safety of your equipment. Some photographs or illustrations may show details or optional attachments that differ from your unit. Due to continuous product improvement, design changes may have been made that are not included in this manual. If you have any questions regarding your equipment or this manual, please contact PIE or your authorized JW representative for the latest information.

USING THIS MANUAL

- Refer to the Table of Contents for the location of applicable sections.
- All weights and measurements are provided in both English and Metric units.
- Contact the manufacturer or your authorized dealer for information on technical upgrades or modifications.
- The manufacturer retains the rights to this documentation and prohibits its distribution or duplication, even partially, without written consent.



NOTE: Education and training for all workers are required. Read this manual **carefully before starting work on this equipment**. Observe the safety information and instructions contained in this manual. Failure to read the manual could result in serious injury or death.

PIE and JW appreciate your trust and are committed to continued support and exceptional service.



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This manual provides all necessary information for the safe operation, maintenance, and handling of the diesel hammer.

Ensure this manual is kept in a readily accessible location at all times. All operators and maintenance personnel must read and understand this manual thoroughly and know where it is stored. This manual is considered an integral part of the machine.

Therefore:

- Handle the manual with care.
- Ensure the manual remains with the machine if it is sold or transferred.



MANUAL STORAGE AND PRESERVATION

To protect this manual, store it together with the carrier equipment documentation. If the manual is damaged or lost, contact **PIE** or your authorized **JW** representative for a replacement copy.



PERSONNEL QUALIFICATIONS

Compliance with all applicable safety regulations and environmental requirements is mandatory. The diesel hammer must only be operated by:

- Trained personnel
- Personnel currently undergoing supervised training

Operators must be fully familiar with:

- Equipment characteristics
- Operational behavior
- Safety requirements

Maintenance, repair, and service work must be performed only by qualified personnel.

Before starting work, operators must fully understand this manual, with particular attention to all safety instructions.



SAFETY GUIDELINES

Follow all applicable safety requirements at all times:

- ✓ Comply with all relevant construction and site safety regulations.
- ✓ Only trained and authorized personnel may operate the equipment.
- ✓ Always wear appropriate PPE: hard hat, hearing protection during piling operations, gloves and non-slip safety boots as required.
- ✓ When working at height, use fall protection equipment.
- ✓ During offshore operations, life jackets are mandatory.
- ✓ During electrical maintenance, use insulated gloves and boots.
- ✓ Never stand or remain beneath suspended equipment or loads.
- ✓ Ensure all piling operations follow the procedures outlined in this manual.
- ✓ Do not operate the equipment in severe weather conditions (high winds, heavy rain, snow, fog, or lightning).



- Fire extinguishers must be available on-site and meet all applicable fire safety requirements.
- Wire rope is critical for lifting, handling, and transport. Inspect regularly and replace when required.

For questions regarding spare parts replacement or repairs, contact **PIE** or your authorized **JW** service provider.



IMPORTANT NOTICE

Follow all instructions and observe all warnings in this manual. Failure to do so may result in injury, equipment damage, or loss of warranty coverage.



MANUAL OVERVIEW

This manual provides detailed information on the operation, working principles, and maintenance of the diesel hammer.

It is intended as a reference for:

- Operators
- Supervisors
- Maintenance personnel

All relevant personnel must read and understand this manual and any related component documentation before operating the equipment.

Proper training is required to:

- Ensure safe and correct operation
- Reduce operational errors
- Minimize downtime
- Extend equipment service life



USE OF AUTHORIZED PARTS

Only approved wear parts and spare parts may be used.



Use of unauthorized parts may cause equipment damage.



Use of unauthorized parts may reduce performance and reliability.



Use of unauthorized parts may void warranty coverage.

PIE and JW reserve the right to deny warranty claims resulting from the use of non-approved parts.



FUEL AND LUBRICATION REQUIREMENTS

Fuel quality and system cleanliness have a direct impact on performance and service life.

Operators must ensure:

- Clean fuel supply
- Proper lubrication practices
- Regular inspection of fuel and lubrication systems



GENERAL LIMITATIONS AND RESPONSIBILITIES

- Technical data in this manual is for reference only and not for acceptance criteria.
- Specifications may change without notice due to product improvements.
- Do not modify equipment without written authorization.
- The manufacturer is not responsible for damage caused by:
 - Unauthorized modifications
 - Improper operation
 - Failure to follow instructions
- This manual must remain with the machine when sold or transferred.
- Unauthorized reproduction or distribution of this manual is prohibited.



SERIAL NUMBER IDENTIFICATION

- Always provide the machine serial number when:
- Ordering spare parts
 - Requesting service or support

Different serial numbers may correspond to different configurations and components.



This chapter outlines the essential operating procedures for the diesel hammer. Do not operate the machine until you have thoroughly understood these safety guidelines and are aware of the potential hazards in your working environment.

2.1 SAFETY REGULATIONS

The terms “DANGER”, “WARNING” and “CAUTION” have the following meanings in these operating instructions:



DANGER!

Danger indicates an imminently hazardous situation which, if not avoided, **death or serious injury will occur** as a consequence of not following the instruction.



WARNING!

Warning indicates a potentially hazardous situation which, if not avoided, possibility of **death or serious equipment accident** will occur as a consequence of not following the instruction.



CAUTION!

Caution indicates a potentially hazardous situation which, if not avoided, **minor or moderate injury or damage of the spare parts** will occur as a consequence of not following the instruction.



To ensure the safety of operators and prevent accidents, it is imperative to adhere to the following safety regulations and guidelines when using the diesel hammer. Only properly trained and authorized personnel are permitted to operate this equipment.

2.2 GENERAL SAFETY INSTRUCTIONS



Hazard Reduction: Hazards can be minimized by strictly following the instructions provided in this manual.



Trained Personnel Only: Only individuals who have received proper training and authorization should operate the diesel hammer.



Observe Safety Regulations: Always comply with established safety regulations. Be aware of and prepare for unique risks that may arise in specific situations.



PRE-OPERATION CHECKLIST

Prior to operating the diesel hammer, ensure the following steps are completed:

- **Review Technical Documentation:** Thoroughly read and understand all technical documents related to the diesel hammer.
- **Familiarize with Safety Devices:** Know the location and functionality of all safety devices on the diesel hammer.
- **Conduct Expert Inspection:** Verify that the last expert inspection was conducted within the past 12 months. This inspection must be performed by a person who has undergone extensive training. An expert inspection is also required after any structural changes to the equipment. Document the results of this inspection in writing.



SITE AND ENVIRONMENTAL INSPECTION

- **Identify Obstacles:** Be aware of obstacles in the work and transport areas.
- **Assess Soil Load Capacity:** Evaluate the load capacity of the soil to ensure it can support the equipment.
- **Install Safety Barriers:** Implement safety barriers for public traffic areas as needed.
- **Monitor Weather Conditions:** Pay close attention to weather conditions, as they can affect safety. Stop work during critical conditions such as strong winds, heavy rain, snow, fog, or thunderstorms.
- **Ensure Adequate Visibility:** Ensure sufficient visibility for safe operation. Use lighting fixtures providing at least 100 lux for work areas with poor visibility or darkness. For transportation in darkness, equipment must have lights providing at least 10 lux (measured 7 meters ahead in the driving direction).



SAFE DISTANCES

Maintain a safe distance from the following:

- High-voltage overhead lines, phone lines, and other overhead lines.
- Underground utilities such as earth cables, water pipes, and sewage pipes.
- Overhangs, edges, slopes, and unstable areas.



COORDINATION AND COMMUNICATION

- **Consult the Superintendent:** Before starting work, consult the superintendent regarding the location of supply and disposal pipes and the safe distances to maintain.



By following these guidelines and safety regulations, operators can significantly reduce the risk of accidents and ensure the safe and efficient operation of the diesel hammer.



2.2.1 SAFETY MEASURES FOR CUSTOMERS



Operator Selection

The diesel hammer must be operated exclusively by well-trained personnel, as they are solely responsible for its correct usage. Operators must be thoroughly informed of the potential dangers associated with their tasks and the proper operation of emergency devices.

- **Training Requirements:** Operator training should include comprehensive information and practical knowledge contained within this manual.
- **Physical and Psychological Fitness:** Operators must meet physical and psychophysical standards and possess a strong sense of responsibility.
- **Health and Sobriety:** All workers must be healthy and capable of handling the physical demands of the job. Workers under the influence of drugs, alcohol, medication, or similar substances are strictly prohibited from operating the diesel hammer.
- **Compliance with Local Regulations:** Adhere to local safety regulations issued by legislatures, unions, or similar organizations. Address sound and vibration emissions that occur during the diesel hammer's operation.



Maintenance

Maintenance is crucial for maintaining the performance and efficiency of the diesel hammer. It encompasses all activities related to control, regulation, repair, and cleaning to ensure the machine's integrity and the functionality of its safety devices.

- **Consequences of Neglecting Maintenance:**
 - Functional and safety issues.
 - Reduced lifespan of the diesel hammer.
- **Maintenance Protocol:** Maintenance and repair work must only be conducted when the diesel hammer is completely shut off, and all means of operation are securely blocked.

2.2.2 ADDITIONAL INFORMATION



Safety Circuit Integrity: It is forbidden to alter safety circuits and devices. The integrity of protection and safety devices must be prioritized before commencing any work. Do not use the diesel hammer if any issues are present.



Guard and Plate Removal: It is strictly prohibited to remove guards, identification plates, safety devices, etc.



Equipment Modifications: JUWEI does not endorse any modifications to the machine without prior notification and disclaims any responsibility for damages, loss of functionality, or personal injury resulting from unauthorized changes.



Fire Extinguishers: Ensure that suitable fire extinguishers are available at the work site and that personnel are familiar with their locations and proper use.



FIRE EXTINGUISHERS

The diesel hammer must be equipped with at least two fire extinguishers with the following specifications:

- **Capacity:** Minimum of 6 kg.
- **Suitability:** Capable of extinguishing oil and electrical fires.
- **Placement:** Located on the same side as the pile driving equipment, away from high-risk fire areas, and easily accessible to the operator. They should be attached in a way that allows for removal without tools.



SAFE DISTANCES

- Maintain a minimum distance of 4 meters from the units being driven during the diesel hammer's operation.
- Only the crane operator, operator, and foreman should be within an area 1.5 times the height of the lead (or the crane).



HIGH-PRESSURE HAZARDS

- During cleaning, be aware that a mixture of fuel, exhaust gas, soot, and air is expelled from the combustion chamber bolt opening at high pressure.
- Maintain a safe distance and wear safety goggles.



HANDLING FLAMMABLE MATERIALS

- Diesel fuel, ether, and lubricants are highly flammable and can explode under certain conditions.
- Handle these materials carefully to prevent spills, ignition, inhalation, swallowing, or skin/eye contact.
- Ensure proper ventilation in the work area.
- Smoking or open flames are strictly prohibited during fueling or in storage areas for diesel fuel, ether, or lubricants.
- These substances must never be stored in food containers.



WORK PROTOCOLS

- **Turn Off Equipment:** Maintenance, repair, or conversion work must only be performed when the diesel hammer is turned off and resting on the pile, ground, or a lower support device.
- **Avoid Moving Parts:** Avoid touching moving parts at all times.
- **Attention to Loose Components:** Remain vigilant for any components that may come loose and fall from the diesel hammer, lead, impact head, pile guiding system, or the pile itself.
- **Site Tidiness:** Keep the job site organized to prevent injuries.

2.2.3 SAFETY INFORMATION FOR THE OPERATOR



PERSONAL PROTECTIVE EQUIPMENT (PPE)

Operators must wear the following PPE while working with the diesel hammer to minimize the risk of injury and prevent permanent hearing and eye damage:



PERSONAL PROTECTIVE EQUIPMENT (PPE)

Operators must wear the following PPE while working with the diesel hammer to minimize the risk of injury and prevent permanent hearing and eye damage:



Hard hat



Safety boots



Safety gloves



Ear plugs



Safety goggles



Reflective work clothes



FAMILIARIZATION AND OPERATION

- **Operating Instructions:** Familiarize yourself with the operating instructions for the diesel hammer and its accessories before starting operations. Ensure you have a complete set of operating instructions.
- **Equipment Condition:** Operate the diesel hammer only when it is in technically perfect condition. Perform a thorough inspection prior to operation.
- **Warning Signs:** Ensure all warning signs are in place and easily readable.
- **Damage and Issues:** Do not operate the diesel hammer if it is damaged or has operating problems. Report any damage to the foreman in charge of the pile-driving work and resolve all issues before operating the equipment.



SAFETY MEASURES

- **Impact and Vibrations:** Be aware that operating the diesel hammer generates blows, impact forces, and vibrations throughout the pile hammer structure and its immediate vicinity.
- **Working Area:** Never work under the diesel hammer, lead, or material to be driven. Avoid standing in areas where the material to be driven touches the ground.
- **Repairs:** Ensure that repairs are performed only by trained experts.

2.2.4 SAFETY INFORMATION FOR THE FOREMAN IN CHARGE OF PILE-DRIVING WORK



QUALIFICATIONS AND RESPONSIBILITIES

- **Training and Age:** The foreman must be trained in using the diesel hammer and be at least 18 years old.
- **Information Provision:** Provide the operator and crane operator with necessary information to ensure safe execution of the work.
- **Safety Responsibility:** You are responsible for safety and all events within the diesel hammer's work area.



FAMILIARIZATION AND INSPECTIONS

- **Operating Instructions:** Familiarize yourself with the operating instructions for the diesel hammer and all accessories before starting operations.
- **Daily Inspections:** Inspect the equipment and associated attached units daily for any obvious defects prior to operation. Ensure all warning signs are in place and readable.



COMMON DEFECTS



COMMON DEFECTS

Defects are often found in the following components:

- Diesel hammer
- Tripping device
- Guiding components
- Support devices
- Pile helmet and pile guiding system
- Brindle and cables



PRE-OPERATION SAFETY CHECKS

- **Clear the Area:** Ensure no one is on or below the equipment before starting operations.
- **Warning Signal:** Sound the horn to alert persons of the impending operation of the pile hammer.



SAFETY CONSIDERATIONS

- **Impact and Vibrations:** Be mindful that operating the diesel hammer generates blows, impact forces, and vibrations throughout the pile hammer structure and its immediate vicinity.

2.3 PRECAUTIONS BEFORE OPERATION



- ▶ **Secure Installation:** Ensure that the diesel hammer is safely and reliably installed on the guiding rail of the lead. This is crucial to prevent accidents during operation.
- ▶ **Hazard Warning Signs:** Place hazard warning signs in the piling operation area and along the path where the power supply cables are dragged. This will alert personnel to potential dangers and help prevent accidents.



- ▶ **Secure Installation:** The diesel hammer must be safely and reliably installed on the guiding rail of the lead to prevent accidents.
- ▶ **Hazard Warning Signs:** Hazard warning signs must be set up in the piling operation area and where the power supply cables are dragged to alert personnel to potential dangers.
- ▶ **Operator Training:** Operators should receive specialized training before using the diesel hammer to ensure they are knowledgeable about its proper use and safety procedures.



Site Familiarization: It is necessary to be familiar with the surroundings, buildings, and geographical conditions around the working site before beginning piling operations.



Adherence to Technical Data: Work must be performed in accordance with the technical data requirements to ensure the Diesel hammer operates at optimal functionality.



Weather Conditions: Stop working in case of any strong wind, heavy rains, snow, fog, and other inclement weather to ensure safety.



Pre-Operation Check: The Diesel hammer should be thoroughly checked before operation. Any anomalies must be fixed prior to commencing work.



Safety Gear: Anyone entering the construction site must wear a safety helmet and safety shoes. Workers operating at height should wear seatbelts, and noise-proof earflaps are mandatory during piling. Life jackets must be worn during offshore operations.



Restricted Access: Ensure no unauthorized personnel are present in the construction area before beginning operation.



Fire Safety: Fire extinguishers and other fire-fighting apparatus should be readily available and placed strategically in the construction area to address any fire emergencies promptly.



CAUTION!



Operator Instruction: Operators must read the instruction manual carefully and should not use the Diesel hammer until they have fully understood the instructions. Contact the manufacturer if there are any questions or issues.



Parameter and Structural Changes: If the construction company needs to change the parameters or structure of the machine, it is imperative to inform the manufacturer in advance to ensure safety and compliance.



2.4 PRECAUTIONS DURING PILING



- ▶ **Prohibition of Standing Under the Machine:** When the Diesel hammer is in operation, workers must not stand under the machine to avoid potential hazards from falling objects or equipment malfunction.
- ▶ **Proper Positioning for Startup:** The Diesel hammer must only be started when it is resting on a pile or on a specially prepared test stand. This ensures stability and prevents accidents during startup.

2.4 PRECAUTIONS DURING PILING (CONTINUED)



STARTUP RESTRICTIONS

Never start the diesel hammer if:

- It is disconnected from the leads
- It is resting on a skid or unstable surface

Starting under these conditions can cause **instability, unintended movement, and serious accidents.**



DANGER



Do Not Start Off-Leads: The hammer must be properly installed on the leads before startup.



Stable Position Only: Start only when the hammer is resting securely on a pile or approved test stand.



WARNING



Avoid Starting with Impact Block Hanging: Never operate with the impact block hanging free. This can transmit force directly into the cylinder end-ring, causing severe damage.



Proper Alignment: Ensure the hammer and pile centerlines are aligned. Off-center driving can cause uneven loading and equipment failure.



Striking Energy Adjustment:

- Increase energy if penetration is less than **50 mm** per 10 blows.
- Stop operation immediately if penetration is less than:
 - **20 mm** per 10 blows.
 - **30 mm** for D128 and larger hammers.



Slow Penetration Response:

- Check for excessive piston rebound.
- Ensure piston is not contacting the arrester groove.
- Adjust settings or shut down as needed.



Maintain Safe Clearance: Keep personnel clear of the hammer during operation.



Inspection Requirements: Frequently verify that guide clamps and guides are secure.



Replace Worn Components Immediately: Worn guide clamps or gibs can cause the hammer to dislodge.



Batter Limits: Do not exceed allowable batter angles for the hammer.



Equipment Damage Response: Stop operations immediately if damage is observed or suspected. Perform a full inspection before continuing.

2.5 PRECAUTIONS DURING ASSEMBLY AND DISASSEMBLY

WARNING



Follow Manual Requirements

All assembly and disassembly work must strictly follow the procedures defined in this manual.



Inspect Tools and Equipment

Before starting work, ensure all tools, hooks, and wire ropes are:

- In good condition
- Properly rated for the load
- Suitable for the intended use



Controlled Movement During Assembly

When positioning the diesel hammer, maintain controlled movement within **2 meters** of the leads to ensure safe handling.



Bolt Tightening Procedures

Tighten all bolts and fasteners according to specified **torque requirements**.

2.6 PRECAUTIONS DURING TRANSPORT AND HOISTING

WARNING



Designated Signal Person Required

A qualified signal person must be present to direct all lifting and transport operations.



Lifting Equipment Requirements

All ropes, slings, and lifting devices must:

- Be rated for the applied load
- Be free from damage or wear
- Be inspected prior to use



Use of Cross Ties

Secure the diesel hammer with cross ties during transport to prevent movement. Ensure all securing points are **properly fastened and stable**.

CAUTION



Lead Condition Warning

- Do not use leads that are bent, buckled, or excessively worn.
- Damaged leads can result in misalignment and unsafe operation.



Effect of Slow Penetration

Slow penetration increases:

- Component wear
- Internal stress
- Heat buildup



Lubrication Requirements

- Ensure all components are properly lubricated at all times.
- Proper lubrication improves performance, reliability, and equipment lifespan.

2.7 PRECAUTIONS DURING MAINTENANCE



Operational Safety: Do not perform maintenance on the Diesel hammer while it is in operation.



WARNING



Maintenance Location: Perform maintenance operations on the ground or on a designated operating platform.



Maintenance Signage: Display the “equipment maintenance” signboard at the site during maintenance of the Diesel hammer.



Safety at Heights: Wear seatbelts when conducting maintenance at high-altitude locations.



Tool Inspection: Before operation, carefully inspect all maintenance tools and equipment.



Regular Inspections: Conduct monthly and annual self-examinations before operation.



Handling Defects: If any defects are identified during inspection, do not operate the Diesel hammer until the inspection is fully completed.



Use of Spare Parts: Use only components designated by our company for replacing spare parts. Any substitutes used must meet relevant requirements.



Lubricants and Grease: Use only the lubricants and grease of the designated brand as specified in this manual.

! WARNING !

2.8 PRECAUTIONS DURING THE CLOSE-DOWN OF THE DIESEL HAMMER



Proper Placement After Piling: After completing piling operations, place the pile frame on solid ground. Ensure the Diesel hammer is positioned on a crosstie or an underground pile. Proceed by closing the fuel power switch, installing the cover and exhaust cover, tightening the locking screws, and securing with clamps. Set the control lever of the pile frame to the stop position.

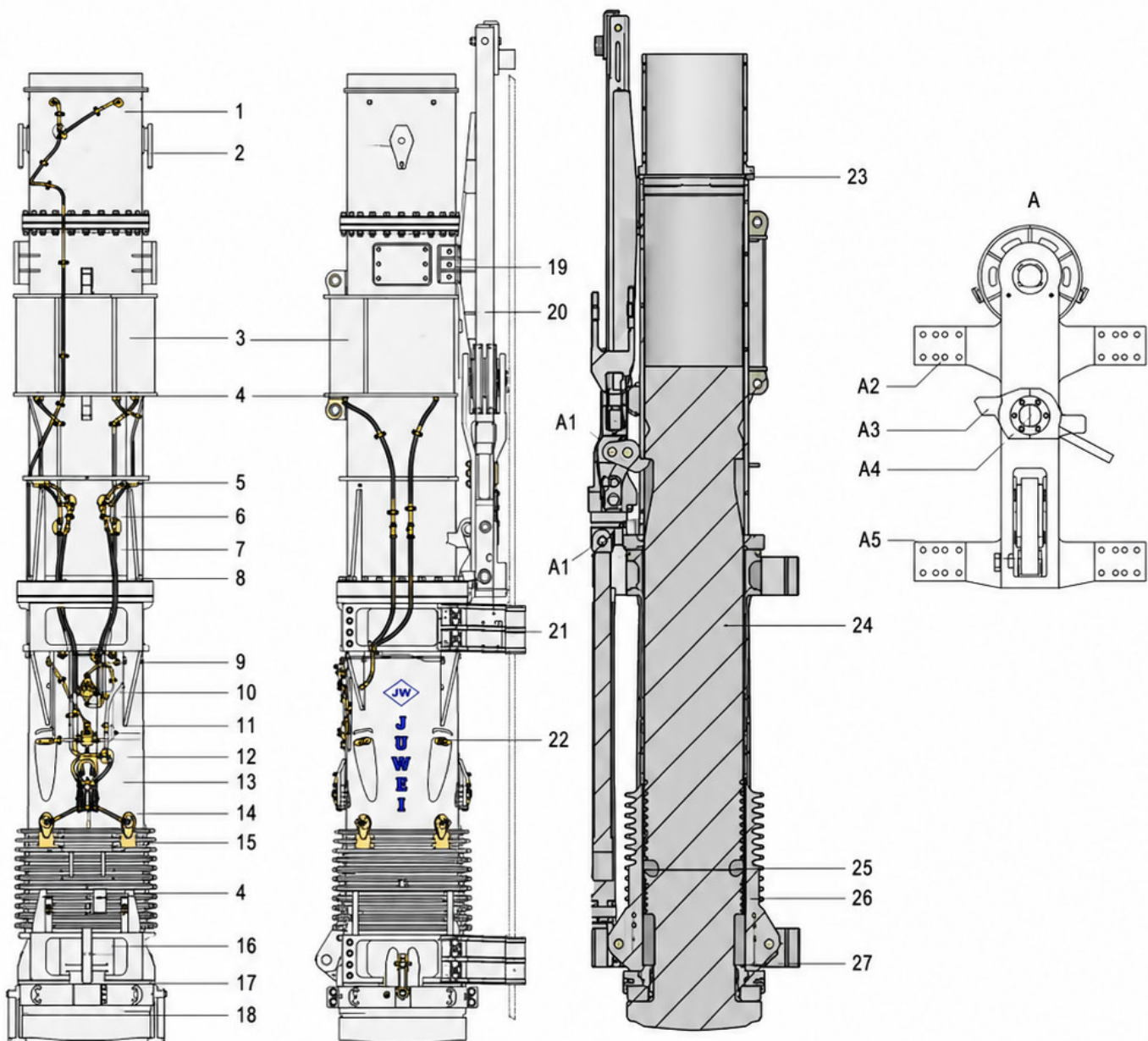


Extended Idle Periods: During prolonged idle periods, remove the Diesel hammer from operation. Secure it using clamps, drain the diesel oil and lubricant, clean the combustion chamber thoroughly, apply rust-preventing oil to the bowl, and implement measures to protect against rain.

3.1 General Description

The Diesel hammer is a machine designed for driving suitable units into a supporting soil layer. These units typically include spun piles, pipes, sheet piles, and similar items that can withstand the impact forces exerted by the Diesel hammer.

It is important to note that any applications beyond driving these specified units, such as material deformation, compaction, or pile removal, are considered improper uses and are strictly prohibited due to safety concerns.





Major components

No.	Description	No.	Description
1	Cylinder upper part	2	Suspension plates
3	Fuel tank	4	Transport eyes
5	Carrier (on both sides)	6	Lube oil lines
7	Connecting screws	8	Catch for pawl lever
9	Lube oil pump 1	10	Lube oil pump 2 (D128 or bigger)
11	Fuel/breather line	12	Variable delivery fuel pump (s)
13	Injection valve (s)	14	Cylinder lower part
15	Locking screw	16	Cylinder end ring (two parts)
17	Rubber ring (two parts)	18	Impact block
19	Plates to fit the guide tubes	20	Stop for pawl lever
21	Guide clamps	22	Exhaust openings
23	Catch groove	24	Striking weight (piston)
25	Catch piston ring	26	Cylinder sleeve (s)
27	Inner damping rings (two parts)		
A	Tripping device (Trip gear)		
A1	Guide gibs	A2	Lever
A3	Driving pin	A4	Pawl
A5	Pawl lever		

3.2 Structure and Functions

The Diesel hammer comprises several essential components: the hammer body, oil supply system, tripping device, and associated accessories.

3.2 STRUCTURE AND FUNCTIONS (CONTINUED)

HAMMER BODY



- **Cylinder Upper Part:** This component guides the piston's movement and includes provisions for lifting the Diesel hammer. It features a suspension plate, stop for pawl lever, and locking screws for securing the piston during non-operation. A rectangular groove facilitates piston starting, covered when not in use. In the event of an explosion, an inclined step ring slot prevents piston displacement. Fuel and lubrication tanks are situated here.



- **Cylinder Lower Part:** The working cylinder houses the fuel and lubrication pumps. External features include a combustion chamber inspection hole and compatibility with the pile frame's guide rail.



- **Piston (Striking Weight):** Essential for impact, the piston's design influences the Diesel hammer's energy output. It includes a bulb for impact and atomization, along with provisions for lifting rings and piston rings. A catch piston ring prevents piston dislodgment during operation.



- **Impact Block:** Positioned at the lower end of the cylinder, the impact block receives piston impacts and transmits force to the pile via the pile helmet. Damping rings mitigate collisions, and a security clamp prevents accidental displacement.

OIL SUPPLY SYSTEM



The oil supply system consists of the fuel pump, lubrication pump, oil pipes, joints, and filters.

- **Fuel Pump:** This radial pump regulates fuel delivery into the cylinder. It includes components like the pump body, plunger, and cam switching device to control oil flow based on operational requirements. Emergency cut-off valves ensure safety during operation.



- **Lubrication Pump:** Also a radial pump, it supplies lubrication to critical components such as the piston, impact block, and cylinders during Diesel hammer operation.

TRIPPING DEVICE



The tripping device serves dual functions: lifting the pile hammer and initiating piston movement. It consists of the guide body, pawl, and driving pin, facilitating controlled lifting and piston activation necessary for starting the Diesel hammer.

3.3 WORKING PRINCIPLE

The working principle of Diesel hammer is as follows:

1



3.3.1 STAGE 1 - FUEL SUPPLY AND COMPRESSION COMMENCEMENT

As the piston descends, it activates the pump lever, injecting a precise amount of diesel oil onto the impact block's surface. Simultaneously, compression of the air trapped in the cylinder initiates as the descending piston passes the exhaust ports. This compression presses the impact block and pile helmet firmly onto the pile head.

2



3.3.2 STAGE 2 - IMPACT AND EXPLOSION

Continuing its descent, the piston overcomes the resistance of the compressed air, colliding with the impact block to generate impact force. Concurrently, diesel oil in the combustion chamber atomizes, driving the pile downwards into the ground. The atomized

3.3 WORKING PRINCIPLE (CONTINUED)

3.3.3 Stage 3 - Exhaust

As the piston is propelled upwards by the expanding gases, the lowermost piston ring disengages from the exhaust openings, releasing high-temperature, high-pressure exhaust gases. This stage facilitates the return of cylinder pressure to normal levels.

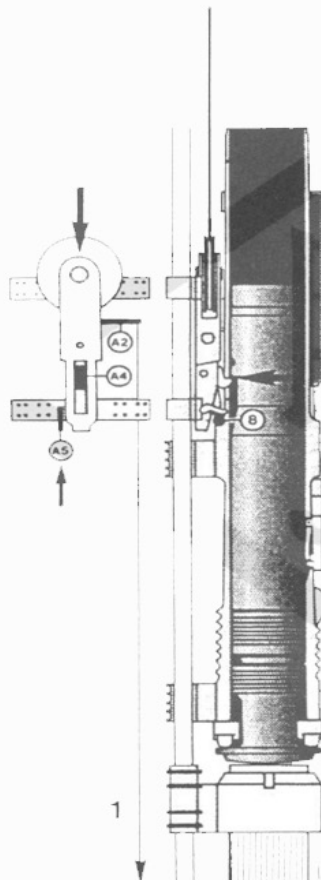
3.3.4 Stage 4 - Scavenging

During the piston's ascent, fresh air is drawn in through the exhaust ports, thoroughly scavenging the cylinder. The pump lever returns to its initial position, ready to draw diesel oil into the fuel pump once again. Once the piston reaches its peak, its descent due to gravitational forces agitates the gas inside the cylinder, completing the scavenging process.

RAISING AND LOWERING OF UPPER PISTON

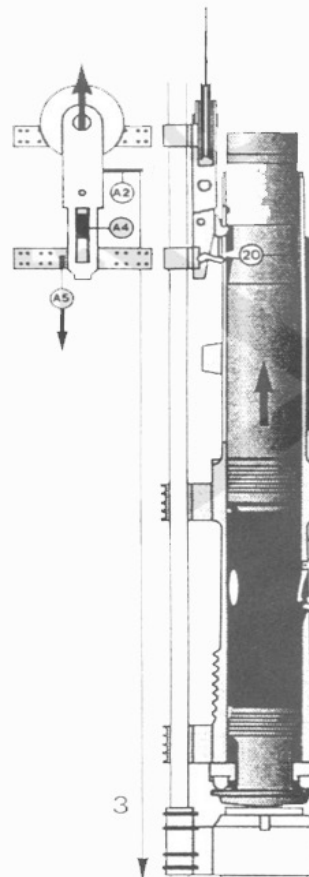
1 Trip Position (Top Dead Center)

The piston is at the top position. The trip lever is engaged, holding the piston before release.



2 Piston Raised (Pre-Drop Position)

The trip lever has lifted the piston. The piston is held near the top, ready to be released for the power stroke.



3.3 WORKING PRINCIPLE (CONTINUED)

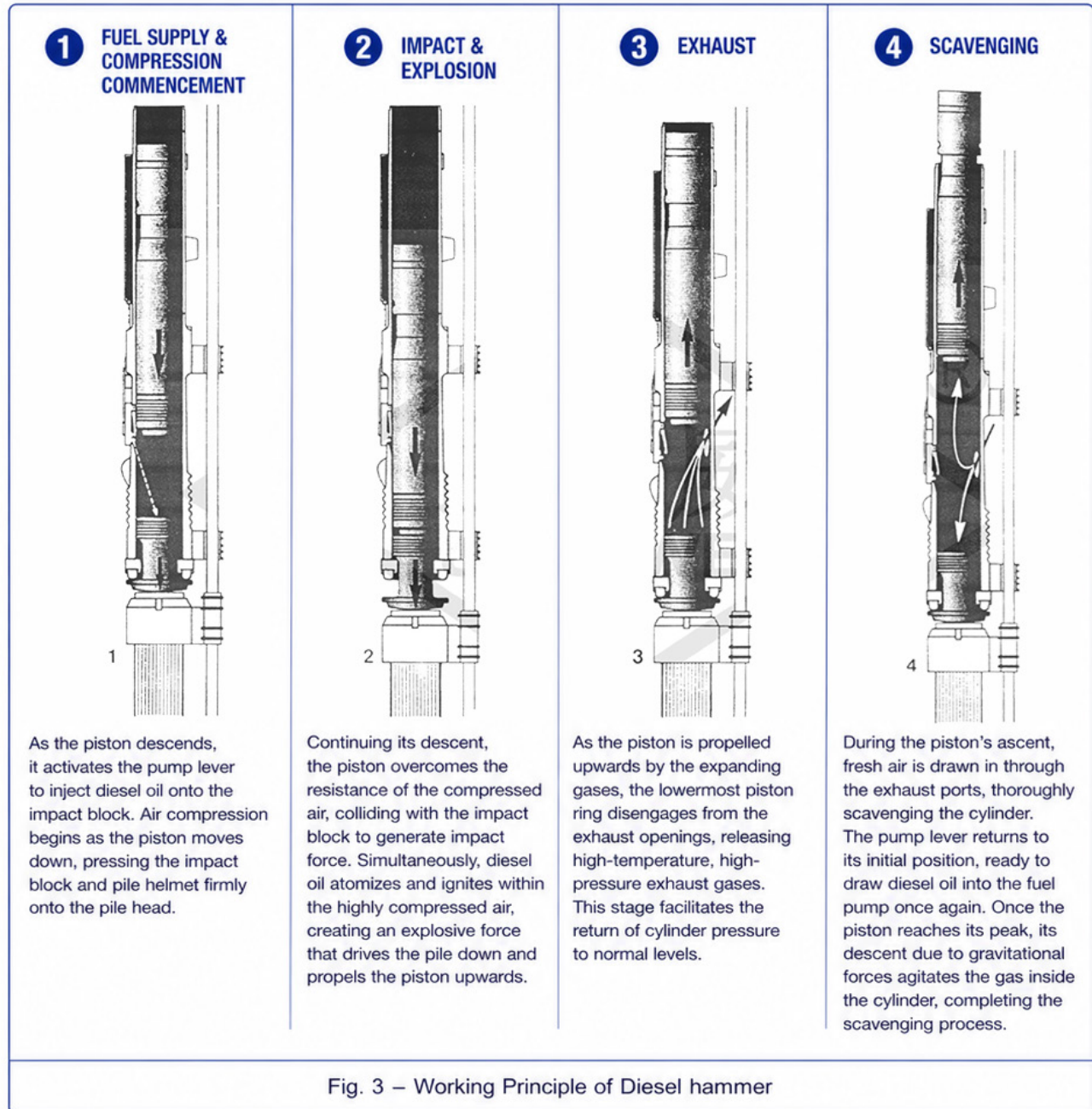


Fig. 3 – Working Principle of Diesel hammer

The initial operation of the Diesel hammer is initiated manually, relying on an external force. Suspension of work is achieved by closing the oil supply valve. During the piling process, the Diesel hammer utilizes both combustion explosive force and impact force in tandem, as depicted in the figure. Initially, the piston impacts the impact block, followed by the combustion of gas which generates explosive force, thereby completing the secondary piling process. While the explosive force is typically less than the impact force, it plays a crucial role in driving the impacted pile deeper into the ground.



3.4 Jumping Height and Striking Energy of the Diesel Hammer

When the piston weight remains constant, increasing the piston's jump height results in greater delivered energy. However, excessive piston stroke can introduce high stresses on both the pile and the piston, potentially leading to damage.

Typical diesel hammer jump height ranges from **2.5 m** to **3.4 m**. During operation, directly measuring piston height is difficult. Instead, the upper piston undergoes free fall, and **blow frequency (per minute)** is used to estimate jump height.

JUMP HEIGHT ESTIMATION

$$H = \frac{4415}{N^2}$$

Where:

H = Jumping height of upper piston (m)

N = Jumping frequency of upper piston (blows per minute)

IMPACT ENERGY CALCULATION

$$E = m \cdot g \cdot H$$

Where:

E = Impact energy (J)

m = Piston mass (kg)

g = Gravitational acceleration (9.81 m/s²)

H = Jump height (m)

The striking energy per blow varies depending on the fuel pump setting.

EFFECT OF BATTER PILING (INCLINED PILES)

When driving batter piles, increased friction between the impact block and guides reduces effective blow energy. This also increases wear on:

- Cylinder surfaces
- Guide components

REMAINING BLOW ENERGY

$$\text{Remaining Energy (\%)} = \frac{\cos \alpha - 0.1 \sin \alpha}{\cos \alpha + 0.1 \sin \alpha} \times 100$$

Where:

α (alpha) = Pile inclination angle (degrees)

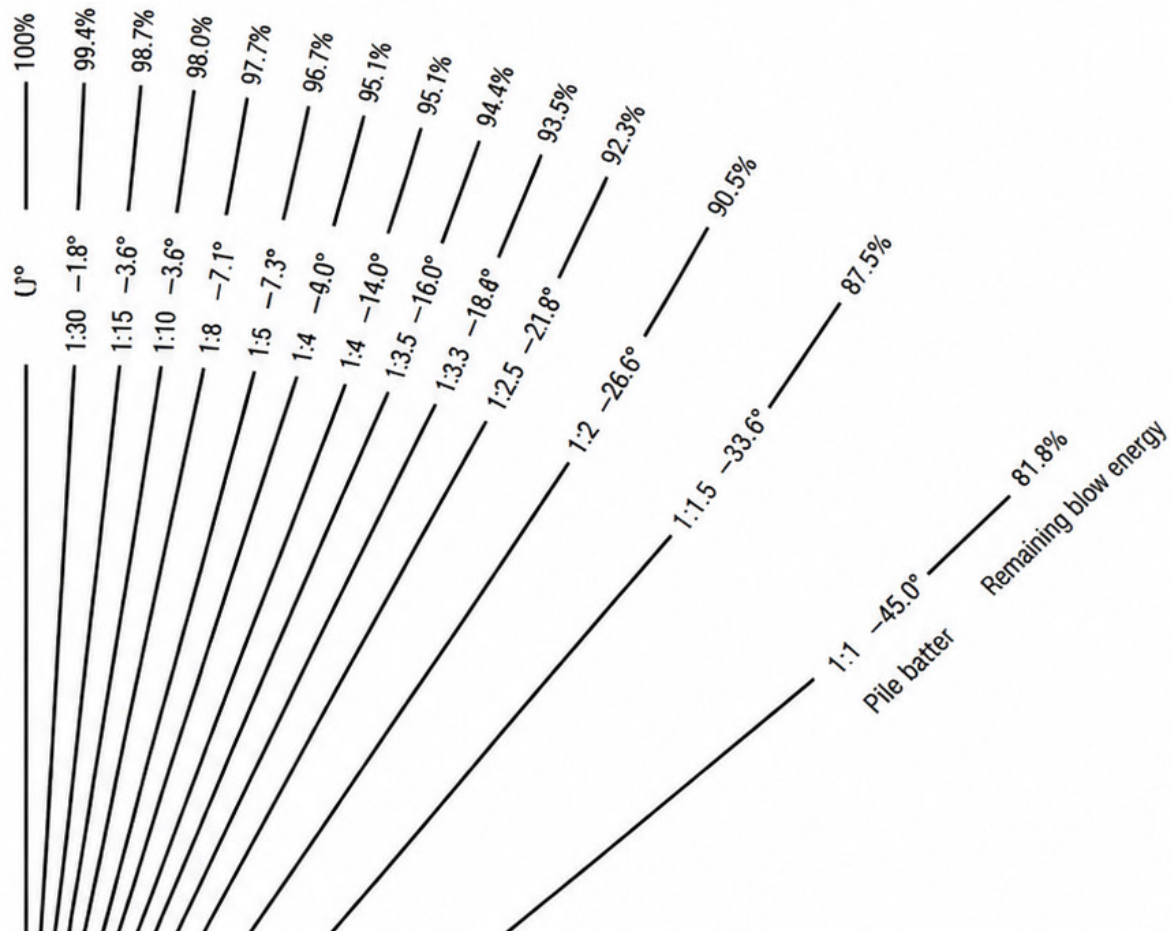


Fig. 4 – Pile Batter and Remaining Blow Energy

3.5 Selection for Diesel hammer

During the Construction of Pile Foundation

- The Diesel hammer is essential for pile foundation construction. Its unique mechanism and operational principles dictate that excessive hammer capacity can lead to rapid initial pile sinking, making continuous ignition impractical and risking pile damage. Conversely, an undersized Diesel hammer not only reduces construction efficiency but also risks long-term damage to both the hammer and the pile head.
- The difficulty of pile sinking isn't solely determined by the ratio of Diesel hammer weight to pile weight but crucially depends on soil conditions.
- Therefore, when selecting a Diesel hammer for pile driving, considerations must include geological conditions, pile structural strength, bearing capacity, and the hammer's performance, supplemented by construction experience or trial piling conditions.



- The impact weight of the pile hammer should match the bearing capacity of the pile. Piles requiring greater bearing force must be driven by a Diesel hammer with sufficient impact energy. Using a small hammer on a large pile is ineffective.

3.6 Hammer-Stopping Standard

- The sinking capacity of the pile is crucial for assessing the Diesel hammer's operational status and capability.
- Effective penetration serves as the standard measurement. If penetration is insufficient, the hammer may jump, risking damage. Typically, a minimum effective penetration value (average sinking per 10 impacts) is specified.
- In hard strata, inadequate penetration per hammer indicates overload, potentially damaging both the Diesel hammer and the pile.
- Powerful Diesel hammers have maximum effective penetration and minimum pile displacement requirements to protect against overload. Elastic pile deformation helps buffer impacts.
- During piling operations, if overload is detected, equipment should be promptly halted or replaced. Insufficient resilience may require additional measures such as adding cushion pads to the pile helmet for safe operation.
- Besides pile penetration, continuous hammering must not exceed standard stop times. Prolonged hammering can overheat the Diesel hammer, causing incomplete combustion of diesel, grease liquefaction, and structural changes in cylinder materials, reducing hardness and abrasion resistance.

3.7 Personal Protection Equipment

- Workers operating the Diesel hammer, carrier, and all personnel in the work area must wear appropriate personal protective equipment (PPE).
- Required PPE includes hard hats, safety gloves, safety boots, and suitable work clothes to ensure safety during operations.



Fig. 5 – Personal Protection Equipment

- **Work clothes:** Operators must wear tight clothes without hanging parts, which can be entrapped in moving part.
- **Safety boots:** To avoid crushing by dropping material.
- **Ear protection devices:** Because of the acoustic pressure is greater than 90 dB(A).
- **Safety gloves:** To avoid cutting, abrasion, burning.
- **Hard hat:** To avoid hazards from dropping materials.

3.8 Sound Emission

Noise Control During Pile Driving Operations

- **General Noise Hazards:** The operation of all types of pile driving equipment generates varying levels of noise, which can pose health risks. EAR PROTECTORS must be worn at all times in the vicinity of any pile driving operation.

Factors Influencing Noise from Diesel Pile Hammers:

- **Explosion and Exhaust Noise:** Contrary to common belief, explosion and exhaust noise are not the primary sources of noise. The installation of noise reduction mantles provides minimal reduction in overall sound levels. However, it also



restricts the escape of exhaust gases, reducing fresh air supply for scavenging and potentially impairing the hammer's function.

- **Noise from Piston Impacting Impact Block:** This noise is contained within the lower cylinder of the hammer and is not a significant source of overall noise.
- **Noise from Impact Block Striking Pile Helmet:** This is the primary source of noise during operation and can be substantially reduced by using a cushion with low impact resilience on the pile helmet.
- **Noise from Pile Helmet Impacting Piles:** Another major noise source, this can be mitigated by using a soft cushion to soften the impact and achieve noise reduction.
- **Noise from Piles Themselves:** Implementing the above measures significantly reduces structure-borne noise generated by piles. The type of piles used also influences noise levels; steel piles generally produce higher noise levels compared to concrete piles. Additionally, soil conditions impact noise development.



Warning Label for High Acoustic Pressure Emission

- **Effect of Soil Conditions on Noise Generation**

The type of soil significantly impacts the noise generated during pile driving operations. Rocky, arid, or hard soils tend to amplify vibration from pile impacts compared to coarse clay soils. This variation makes it challenging to accurately predict noise levels at specific construction sites.

- **Comparative Noise Levels**

Noise levels produced by diesel pile hammers during pile driving are generally higher than those generated by alternative methods such as rotary drilling, percussion drilling, or constructing diaphragm walls. However, when assessing noise impact on a construction site, it is crucial to consider not just the intensity of noise but also its duration. Proper evaluation of these factors shows that the noise annoyance caused by diesel pile hammers is relatively minor.

The data sheet below was made at the factory test stand on a refusal pile.

Diesel Hammer Type Sound pressure level dB(A) at distance from hammer

Diesel Hammer Type	Sound pressure level dB(A) at distance from hammer	
	7 m (13 ft)	300 m (984 ft)
D12	102	76
D19	106	79
D25	110	84
D30	110	84



D36	111	85
D46/ D50	111	85
D62	114	86
D80	116	88
D100	119	92
D128 / D138	n.a.	n.a.
D160 / D180	n.a.	n.a.
D225/D265	n.a.	n.a.

4. Putting into operation

4.1 Generality

Before starting, ensure you have read and fully understood all safety measures described in the manual. All installation work necessary to put the unit into operation must be performed by qualified and authorized personnel only.



CAUTION!

Fault Identification: If any faults are identified during the installation process, operation must not commence. Operation may only begin after all identified faults have been rectified.

Safety Compliance: Strictly adhere to all safety instructions outlined in Chapter 2 and throughout this manual. Ensure all personnel involved in operation are trained and competent in handling the machine.



CAUTION



4.2 Destination and Intended Operating Environment

4.2.1 Environmental Conditions

The Diesel hammer is designed for outdoor use on soil ground or over water, including marine environments.

Operation in Saltwater

- When operating in saltwater environments, ensure that all moving parts are cleaned and lubricated more frequently than scheduled in the maintenance chapter.

Material Durability



- The materials used in the Diesel hammer are selected to ensure the machine's longevity and strength in wet, hot, and cold conditions.

Special Conditions

- When using the Diesel hammer in diverse or critical environments characterized by chemical aggressiveness (such as exposure to corrosive substances), special components may be required. Please consult JUWEI for guidance under these conditions.

Prohibited Usage

- **Explosive Atmospheres:** It is strictly prohibited to use the Diesel hammer in explosive atmospheres.

4.2.2 Typical Use Conditions and Proper Use

Proper Use

The Diesel hammer is intended for driving suitable units into a supporting soil layer. These units include piles, pipes, sheet piles, and similar items that can withstand the impact forces generated by the Diesel hammer.

The Diesel hammer's carrier can operate on soil ground or over water bodies such as seas, lakes, and rivers. Operators must exercise caution to prevent any imbalance.

WARNING!

Weather Conditions: Avoid operating the Diesel hammer in critical weather conditions, especially over water.

! WARNING !

4.2.3 Improper Use and Forbidden Actions

Improper use of the Diesel hammer as specified in this manual should never be permitted under any circumstances.

Using the Diesel hammer for forbidden operations, improper uses, or neglecting maintenance can lead to dangerous situations for operators, personnel at the worksite, and compromise the integrity and safety of the machine itself. The following actions are absolutely forbidden:



DANGER!

Absolutely Forbidden Actions:

- Moving the Diesel hammer to a position not permitted.
- Lifting the Diesel hammer while operators or others are in the operation zone.
- Lifting the Diesel hammer with a machine not suitable for its weight.



- Using worn ropes to lift the Diesel hammer.
- Lifting the Diesel hammer without ensuring it is correctly hooked up.
- Lifting the Diesel hammer in critical weather conditions (strong wind, storms, etc.).
- Moving the Diesel hammer over people under any circumstances.



DANGER!

Be Absolutely Forbidden!

- Operating or standing under a lifting Diesel hammer.
- Operating or standing near the carrier during lifting or lowering maneuvers.
- Operating without reading and understanding the user handbook and without respecting safety norms and enforced national legislation.
- Operating without using suitable personal protective equipment (PPE).



DANGER!

Be Absolutely Forbidden!

- Operating on slope layers.
- Operating on muddy and/or slippery, unstable ground to support the carrier.
- Operating in critical weather conditions (strong winds, storms).



4.3 Examination before Using the Diesel Hammer

Examination of Rope and Rope Clamp

All visible parts of the rope and the connections of the rope clamp must be thoroughly inspected. The rope should be replaced under any of the following conditions:

- Surface abrasion or corrosion causing a reduction in rope diameter by more than 7%.



- Abnormal conditions such as flattening, twisting, bending, kinking, strand or wire protrusion, diameter increases, or partial waviness.
- Rope breakage within a specified distance as per the table below.
Broken ropes occurring at intervals less than 6 times the rope diameter.

Rope structure	Scope of the length of the broken rope	Number of the broken rope	
		Specification 6×37+1	Specification 18×19
alternate lay	6d	19	27
	30d	38	54
Ng-lay	6d	10	13
	30d	19	27

Table: Discarding Standard of the Broken Ropes

- Ensure the power unit, winch, hydraulic system, and electric system of the pile frame operate strictly according to the instructions.
- Use specified lubricant grease on the leader guide rail of the pile frame.
- Verify that the fuel and lubricant grease used in the pile hammer meet the requirements specified in the instruction manual.
- Inspect the operating condition of the trip gear of the Diesel hammer and apply lubricant grease. Replace or repair the trip gear if the surface abrasion of the top of the pawl exceeds 10mm.
- Use graphite powder instead of lubricant grease for the plug screw of the cleaning hole of the Diesel hammer.
- Examine the wear of the guide clamps of the Diesel hammer. Replace or repair the guide clamps if the wear on the orientation surface exceeds 10mm.
- Check the damping rings of the Diesel hammer and replace them if necessary.
- Inspect the connection between the Diesel hammer and the pile helmet. Replace the joint ropes if needed.
- Verify the lubrication status of every part of the Diesel hammer.
- Ensure that every joint screw or bolt in the Diesel hammer is tightened securely and intact.

5. Operation

5.1 Generality

To ensure the Diesel hammer operates safely and effectively, follow these guidelines. Always adhere to the safety measures outlined in Chapter 2.

- Operate the Diesel hammer and lead only when they are in perfect technical condition. Pay special attention to the guiding components and tripping device to ensure they show no signs of wear.

- Immediately cease pile-driving operations if a dangerous situation arises (e.g., unauthorized persons entering the danger zone or equipment damage). Resume operation only after resolving the hazardous situation.

WARNING!

Maintain a minimum distance of 4 meters from operating equipment. Unauthorized personnel must not enter the danger zone, which extends to 1.5 times the height of the lead. Secure the area and use signage in the local language to indicate the danger zone.

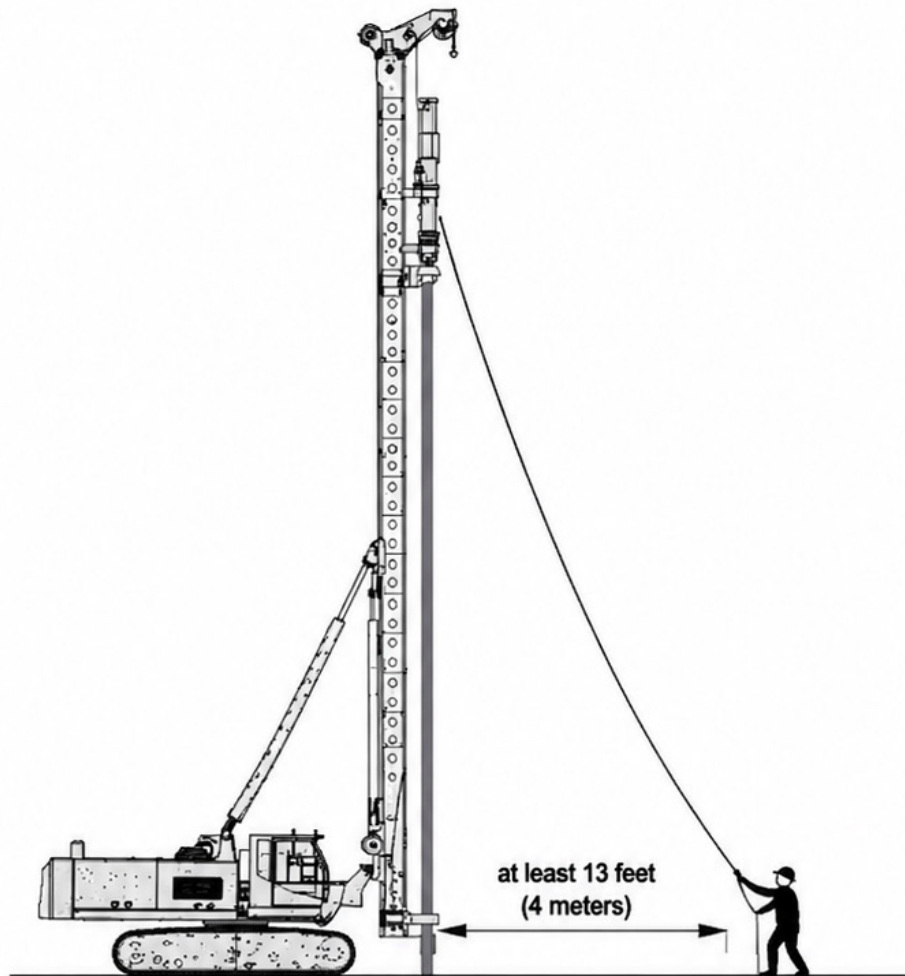
! WARNING !

Fig. 6 – Working Distance

- Ensure that the impact block never protrudes or becomes stuck. Improper positioning of the Diesel hammer with the impact block extended (e.g., due to stuck guides) can



damage the end ring and cylinder. A stuck impact block prevents the cylinder from freely dropping onto the impact head unit, possibly due to defective damping rings.

- Never drive piles eccentrically as this can damage the cylinder and guide components, as well as cause material vibrations.
- Ensure the allowable batter angle is not exceeded when driving batter piles. Regular and proper maintenance of the Diesel hammer is essential.
- Stop operation of the Diesel hammer if the penetration rate falls below 2 cm per blow. Reduced penetration is permissible but accelerates wear on the Diesel hammer. Regular and expert maintenance of the Diesel hammer must be ensured.

Blow area

A perpendicular and plane blow area is essential for proper pile driving.

Ensure the center line of the material to be driven aligns with the center line of the Diesel hammer to avoid jarring blows.

Jarring blows could result in:

- Cracks and deformation of the cylinder.
- Vibrations and damage to the material being driven.
- Directional deviation of the material being driven.
- Increased wear on the guide components.

Remedy

Use a pile helmet that is guided at the lead and matches the profile of the pile.

Select a pile helmet cushion optimized for both the material being driven and the impact energy.

If guiding the pile helmet at the lead is not feasible, ensure the material being driven is held at the lead with at least one pile guide.

Even under optimal conditions, deviations from the original direction of the material being driven can occur.

Therefore, it is essential for the foreman overseeing the pile driving work to continuously monitor the pile driving process and correct the lead when necessary.

Shutting off

Pull the center rope (at the shut-off valve) and keep it taut until the piston is completely at rest.

Alternatively, the Diesel hammer can be shut off by setting the fuel control pump to "0". To do this, jerk the left control rope as required.



3.2 Tripping device

The tripping device is an auxiliary means:

- To lift the Diesel hammer at the lead.
- To lower the Diesel hammer at the lead.
- To lift the piston when starting the Diesel hammer.

The tripping device is operated with the help of a winch on the carrier equipment or hydraulically.

5.2.1 Installation

DANGER!

Tripping device

You must use the tripping device supplied. Check the tripping device for damage prior to its installation. Use tripping devices that are technically perfect only.



Use a height safety device to prevent a fall (mandatory at a least height of above 5 m. Use only approved steel cable.

- Attach the two lower and one upper guide strip to the tripping device.
- Place the steel cable in the cable pulley. To do so, you must remove the cable pulley bolt and install it again when the steel cable is positioned.

DANGER!

Safety bolt

Use the bolt safety to secure the cable pulley bolt after its re-installation.



- Lift the tripping device and place the guide gibs.
- Install the second upper guide gib.
- Attach the 35 m long cable (in the toolbox) to the lever (ref, A2 in Fig 1).

DANGER!

Safety pulling cable

Use only the safety pulling cable supplied. We cannot guarantee a proper functioning with the use of other cable.



Pull the tripping device upward for approximately 6 m.

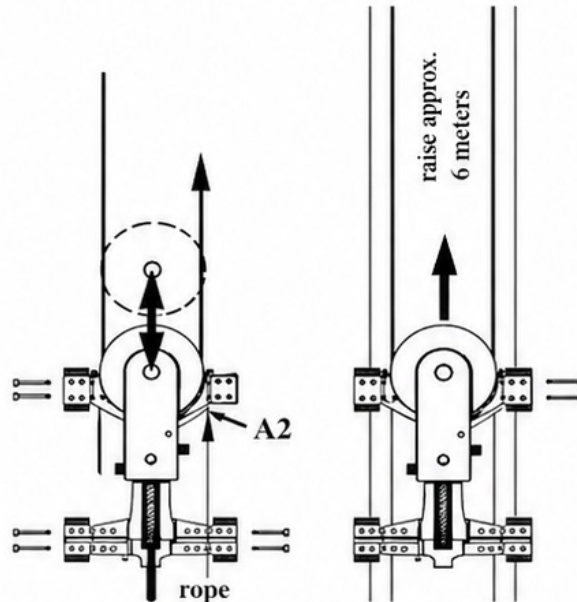
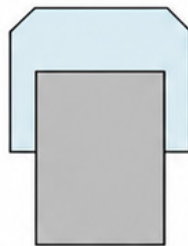


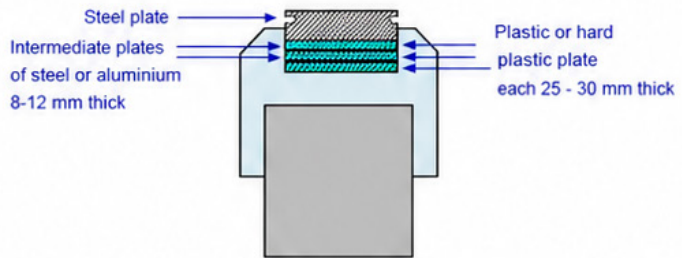
Fig. 7 How to pull the trip device

5.3 Assembly of pile helmet cushions

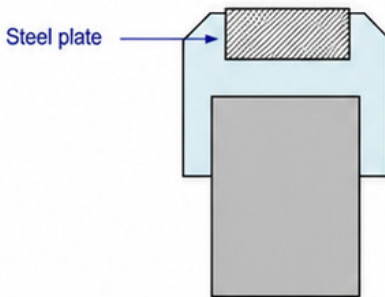
The pile helmet cushions transfer the impact from the impact block to the material to be driven. A targeted assembly can dampen the impact to a certain degree.



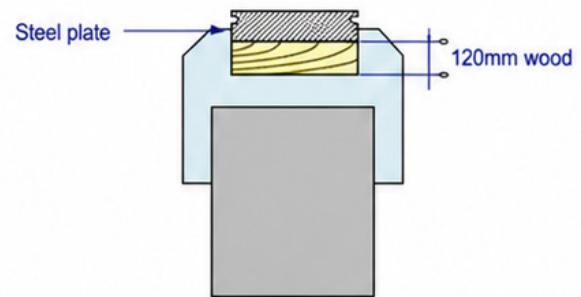
Reduction factor $R_f = 1$
No cushion = max. impact force P_{st}



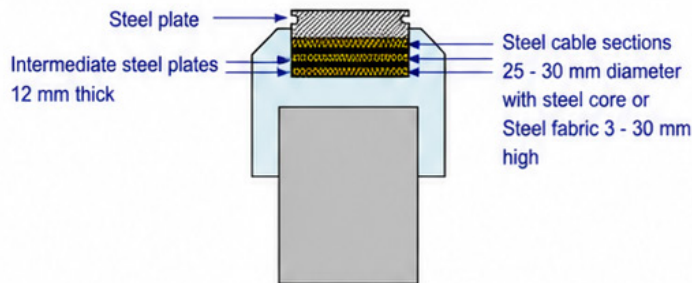
Reduction factor $R_f = 1.75 - 2$ (Tufnol, Resitex, Novotex)



Reduction factor $R_f = 1.1$

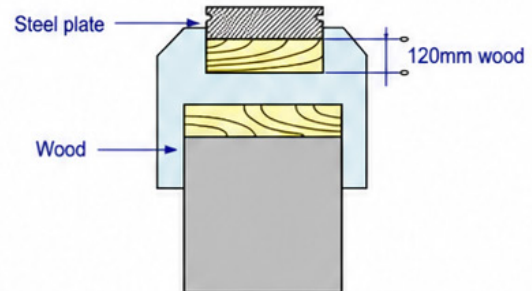


Reduction factor $R_f = 2.6$ (Boogossi)



Reduction factor $R_f = 1.22$ (Steel cable section)

Reduction factor $R_f = 1.42$ (Steel fabric)



Reduction factor $R_f \approx 4$

5.3.1 Assembly

- Position the pile helmet cushion as desired on the pile helmet.
- Attach the pile helmet cushions securely to the pile helmet using a suitable steel cable and appropriate clamps.
- Guide the provided cable section through the upper guide, if applicable (not necessary for pile helmets that are closed at the top).
- Secure the cable section tightly with a clamp.
- Insert the guide from the bottom into the pile helmet.
- Insert the other provided cable section into the lower guide.
- Secure this cable section with a clamp.
- Insert enough plates to ensure there is no more than a 2 mm gap between the lower cable section and the plates.
- Ensure all bolts are securely tightened (re-tighten if necessary).

DANGER!

For operators:

Ensure all bolted connections are securely tightened. Loose bolts can lead to serious injuries and property damage.

An incorrect attachment of the pile helmet cushions with the steel cable at the pile helmet can cause the cushions to fall out. This will invalidate the warranty!

5.4 Guiding for the Pile Helmet

Always guide the pile helmet at the lead and never at the impact block of the Diesel hammer.

CAUTION!

The pile helmet cannot be guided at the impact block of the Diesel hammer. Otherwise, lateral forces may cause damage to the impact block and the cylinder. This will invalidate the warranty!

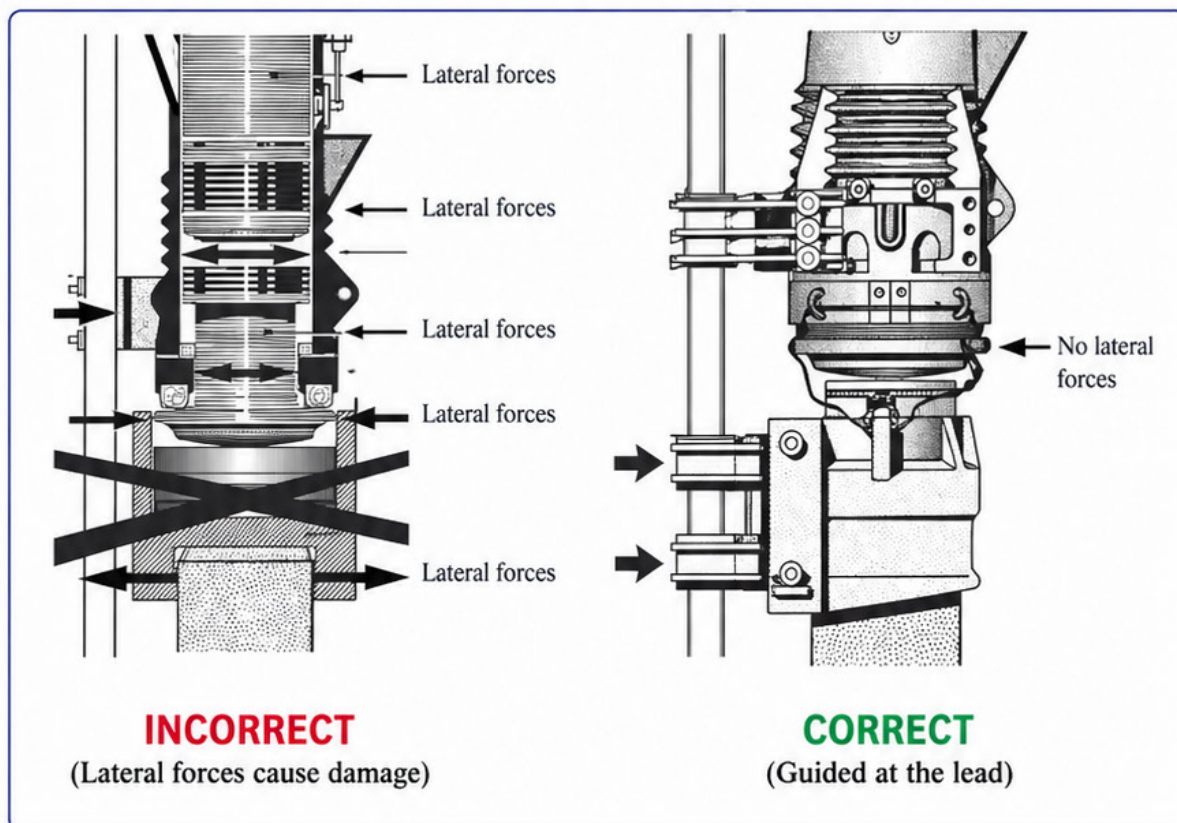


Fig. 8 – Guiding for the Pile Helmet

5.5 Bringing into the operating position of Diesel hammer and pile helmet

Danger!

Carrier Equipment

Observe the operating instructions of the carrier equipment!



Assembly and Setup Instructions

Safety Precautions:

- Use only approved steel cables as specified in the "Transport, Lifting, and Storage" chapter.
- Ensure all personnel wear appropriate safety gear: hard hats, safety gloves, safety boots, and suitable work clothes. A life-saving jacket is mandatory for work above water surfaces.

Assembly Steps:

1. Positioning the Diesel Hammer:

- Place the Diesel hammer in front of the lead.
- Loosen the bolts of the transport angles.
- Lift the Diesel hammer 30 cm horizontally.
- Remove the transport angles.

2. Preparing for Placement:

- Position the Diesel hammer on a sturdy wooden block capable of supporting its weight.
- Remove the transport cables.
- Loop the steel cables around the suspension plates (see Fig 1, ref. 2) and the hook of the carrier equipment.
- Carefully lift the Diesel hammer to a vertical position in front of the lead.

3. Installing Guide Brackets:

- Install two lower and one upper guide brackets.
- Lift the Diesel hammer by 1 meter and place the guide brackets securely.

4. Preparing for Pile Driving:

- Position the pile helmet beneath the Diesel hammer.
- Lower the Diesel hammer to rest on the pile helmet.

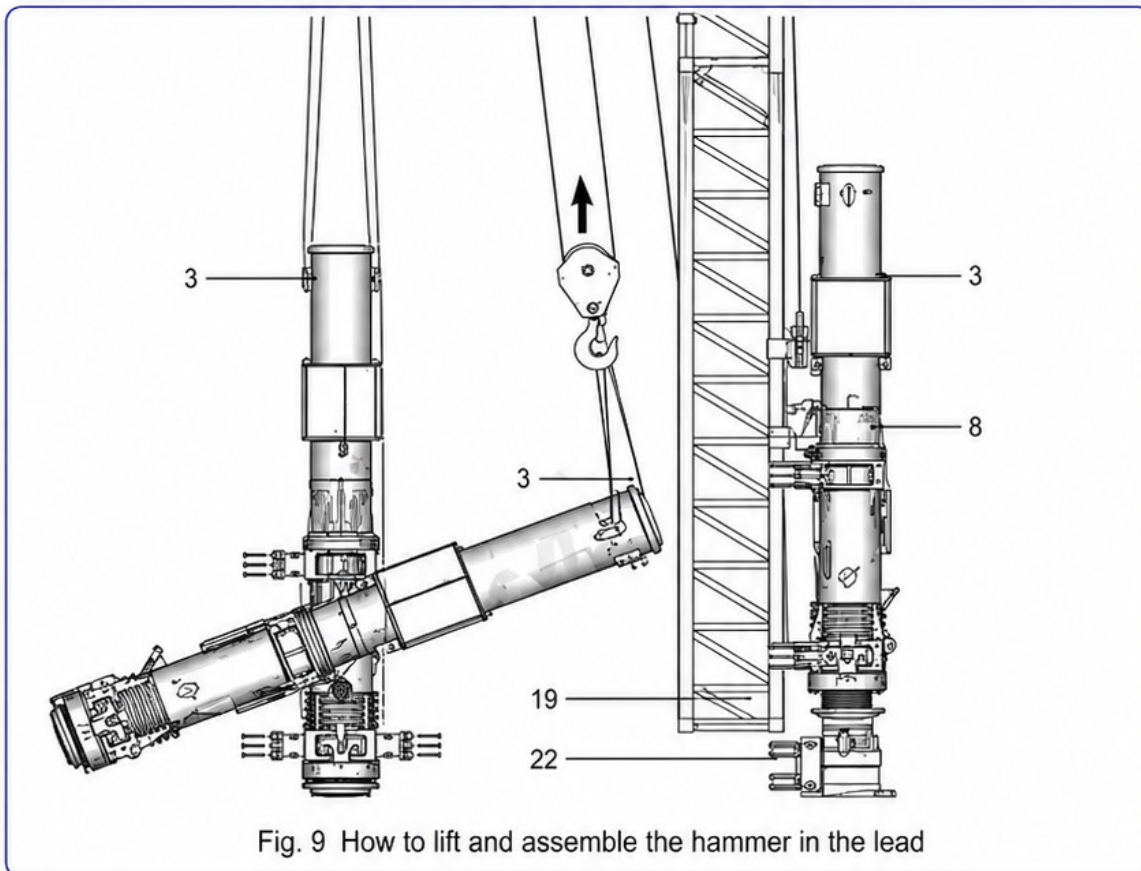
5. Attaching the Pile Helmet:

- Remove the locking screw (piston) and the impact block clamp.

- Raise the Diesel hammer until the impact block extends fully and hangs approximately 5 cm above the pile helmet cushion.
- Attach the pile helmet securely to the cylinder and ring using steel cables and clamps from the tool chest.
- Slowly lift the Diesel hammer while guiding the pile helmet through the lead.

6. Securing in Place:

- Allow the Diesel hammer to rest on an integral stop device of the lead.



DANGER!

Safety Device

The Diesel hammer must only be operated with installed and functioning safety devices. Failure to comply may result in sudden falling hazards.



- Remove the steel cable loops from the lifting plate and from the hook of the lifting equipment.

- Attach both ends of the 70-meter-long control cable (located in the toolbox) to the eyelets designated for the control cable of the fuel control pump.
- Attach the 35-meter-long rope to the shutoff valve (center eyelet) of the fuel control pump.
- Fill the fuel tank with diesel oil. Ensure that the filling nozzle on the tank indicates "Diesel".
- Fill the lubricant tank with oil. Ensure that the filling nozzle on the lubricant tank indicates "Oil".
- Remove the transport safety devices (such as protective hood, protective rail, exhaust cover, etc.).

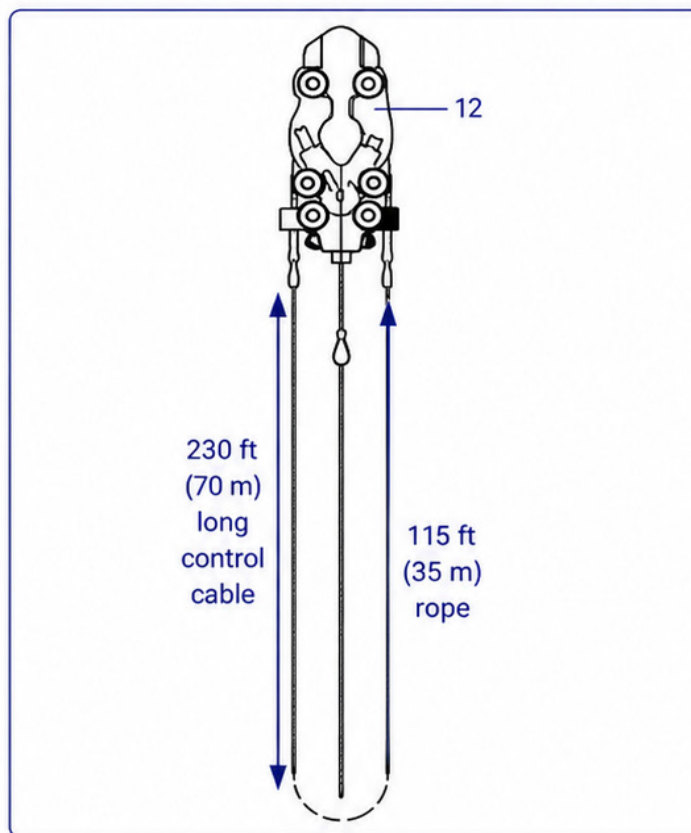


Fig. 10 Install the wire rope of fuel pump

5.6 Lifting of piles

DANGER!

Carrier Equipment

- Always follow the operating instructions for the carrier equipment.
- Use only approved steel cables.
- Follow the guidelines below to prevent the unit from overturning and to avoid damage to the lead and material being driven.



- Always wear a hard hat and suitable clothing. Additionally, wear a life-saving vest when working above water surfaces.



Never pull the material to be driven from the lead trip. This may cause an overturning of the carrier unit or may bend the lead end.

Always turn the unit in the direction of the impact point of the material to be driven. The inclined pulling force may cause the unit to overturn.

The material to be driven must always be lifted in such manner that:

- There is no permanent deformation.
- No cracks form in the material to be driven.
- The material to be driven hangs vertically after lifting it.

This achieves the following:

- The piles can be placed in an optimal manner,
- Sheet piles can be guided properly,
- The pile helmet is easy to place above the pile head.

Concrete piles and similar sensitive material to be driven must be treated with particular care.

The following illustrations show correct and incorrect ways to lift the material to be driven with one or two cables.

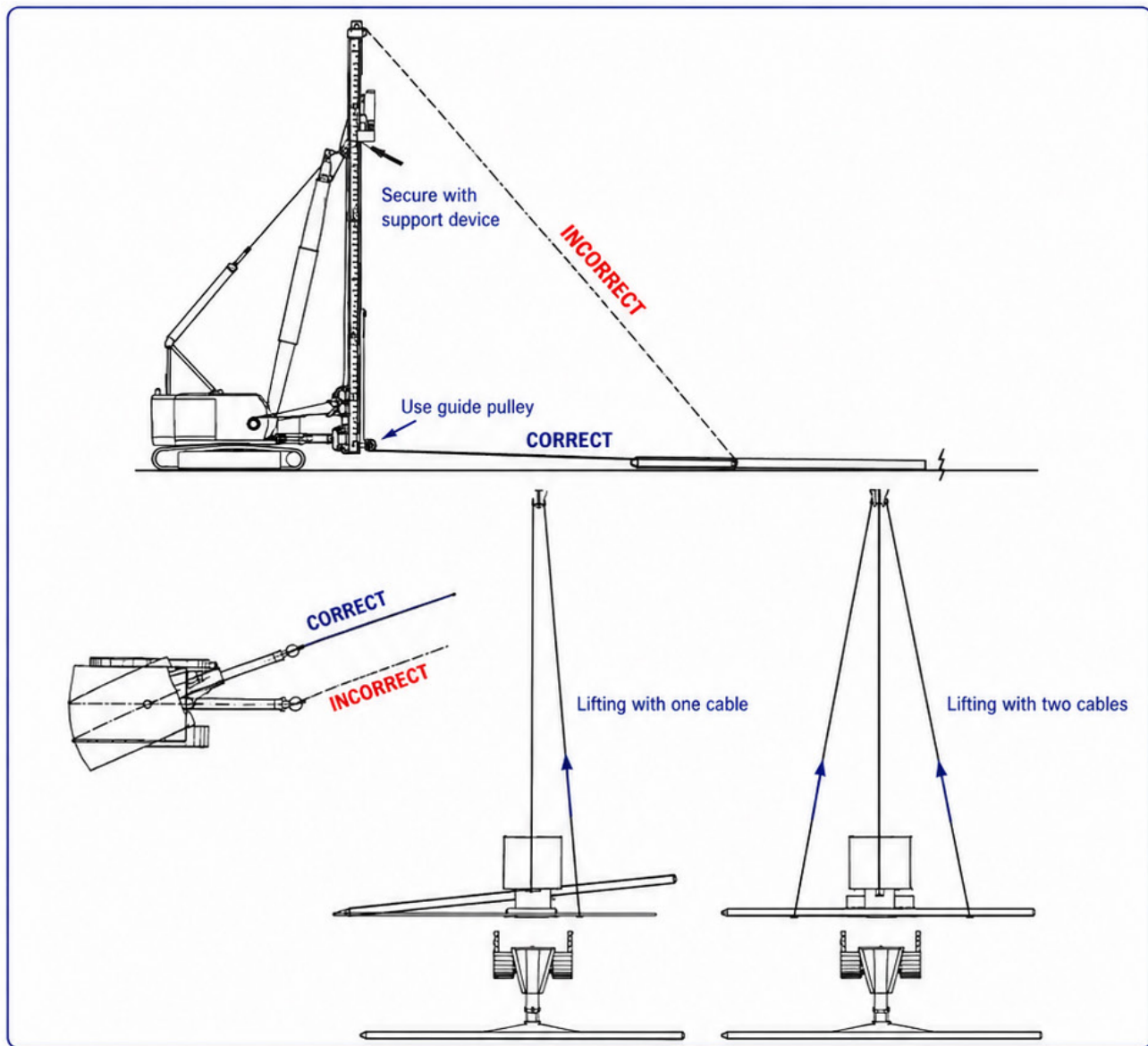


Fig. 11 – How to Lift the Pile

5.7 Operating mode

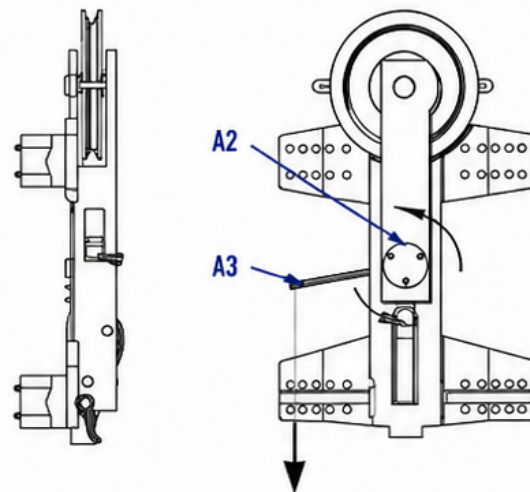
WARNING!

Maintain a minimum distance of 4 meters from the Diesel hammer at all times. Ensure that you are equipped with a hard hat, ear plugs, safety goggles, safety gloves, safety boots, and suitable work clothes. When working above a water surface, a lifesaving vest must be worn at all times.

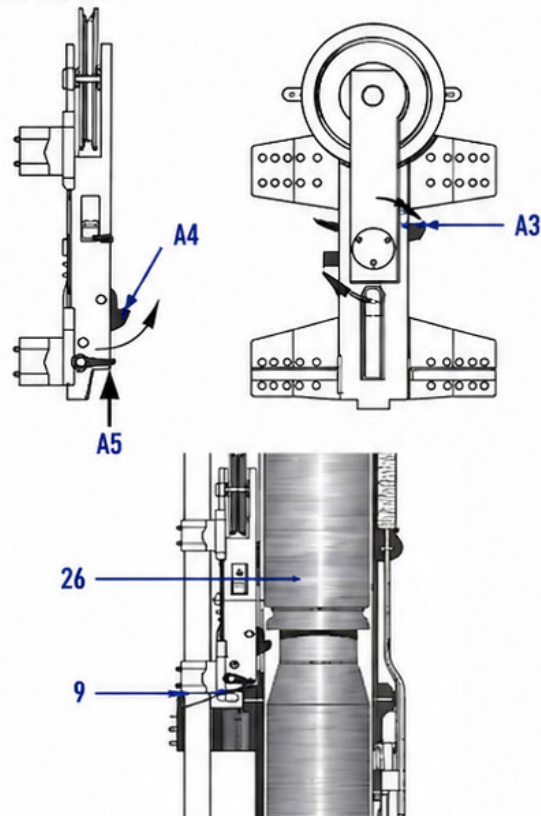
! WARNING !

5.7.1 Lowering the tripping device

- Pull the lever (ref. A2) down to the stop using the cable and keep it taut. This retracts the driving pin (ref. A3). The tripping device can move past the latches of the Diesel hammer.



- Lower the tripping device to the lower stop (ref. 9). The trip cam lever (ref. A5) is pushed upwards at the trip cam lever engaging point (ref. 9). Pawl (ref. A4) is thus pushed into the groove of the piston weight (ref. 26).
- Release the cable at the lever.



DANGER!**Risk of Fall!**

Always ensure the tripping device is lowered to the lower stop to ensure the latch is fully extended and locked. Failure to do so may cause the Diesel hammer to trip prematurely, posing a fatal hazard.

**WARNING!**

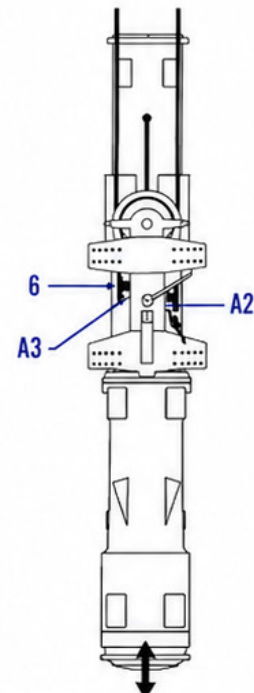
The pulling cable must always hang freely. Do not tie the pulling rope to the lead or any other locations. This could result in the Diesel hammer crashing down, posing a danger to life and risking damage to the tripping device.

**5.7.2 Lift/lower the Diesel hammer****WARNING!****Piston position**

Pay attention to the fact that the piston has indeed fallen into a notch of the tripping device during the lifting of the Diesel hammer.

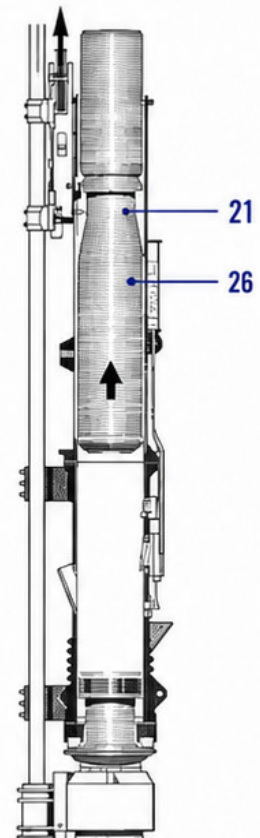


- Lower the tripping device as described above.
- Slowly pull the tripping device upward using the cable winch. Do not pull on the cable at the lever. During the lifting stage, the cams of rotating catch grasp below the catch (ref. 6) the Diesel hammer. It now hangs from the tripping device.
- Use the cable winch to place the Diesel hammer into the proper position.



5.7.3 Lifting the impact hammer

- Lower the tripping device as described above.
- Pull the lever down to the stop using the cable and keep the cable taut. This retracts the rotating latch.
- Use the cable winch to slowly pull the tripping device upwards. When pulling it upwards, the piston (ref. 26) is also pulled upward and automatically released the upper stop (ref. 21).



5.8 Fuel supply control

The fuel supply control pump determines the energy per blow and thus the drop height of the piston. The fuel control pump has five settings.

	Indicator pin position	Fuel supply
Setting 1	6 o'clock	49...64%
Setting 2	8 o'clock	66...77%
Setting 3	10 o'clock	83...90%
Setting 4	12 o'clock	100%
Setting 0	4 o'clock	shut off

The fuel supply can be cut off with the shutoff valve.

5.9 Mode of operation

WARNING!

You must keep a distance of at least 4 m from the Diesel hammer, and wear a hard hat, ear plugs, safety goggles, safety gloves, safety boots and suitable work clothes. A lifesaving vest must be worn when working above the water surface.

! WARNING !

5.9.1 Increase fuel supply

Jerk on the right rope to the stop and release the cable. This switches the fuel control pump to the next higher setting. Repeat this step until the desired setting has been reached (to a maximum setting of "4").

5.9.2 Decrease fuel supply

Jerk on the right rope to the stop and release the cable. This switches the fuel control pump to the next lower setting. Repeat this step until the desired setting has been reached (to a minimum setting of "0").

5.9.3 Fuel supply shut off

Pull on the center rope to the stop and keep the cable taut until the impact hammer is at rest. This has no effect on the setting of the fuel control pump.

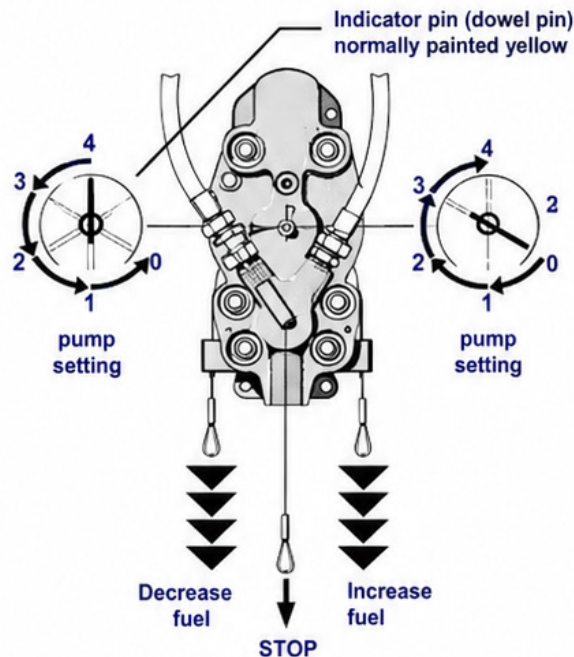


Fig 12 – Fuel Control Pump Setting

5.10 Bleed fuel control pump and injection valves

The fuel control pump and the injection valves must be bled:

- Prior to the first putting-into-operating,
- After repair work,
- When the Diesel hammer fails to operate due to a lack of fuel.

Take the following measures:

**WARNING!****Danger of Fall!**

Use a height safety device to prevent a fall (mandatory at a lead height of above 5 m).

Take the following measures:



Allow the Diesel hammer to cool down completely before bleeding it, especially in cases where it has stopped due to fuel depletion. This precaution is essential to prevent the risk of burns and fire.

WARNING!

You must wear a hard hat, ear plugs, safety goggles, safety gloves, safety boots and suitable work clothes. A lifesaving vest must be worn when working above the water surface.



Step 1: Pull the piston upward until the trip cam lever (A5 in Picture 1) of the tripping device is positioned approximately 20cm below the release point (ref. 21). This action blocks the fuel flow to the fuel control pump when the hammer is too low. The hammer will release automatically if pulled too far upward.

Step 2: Set the fuel control pump to setting “4” (full load).

Step 3: Unscrew the swivel joint at the injection valves by approximately 2-3 turns. Do not fully unscrew the swivel joint.

Step 4: Activate the pump using the right control rope until fuel without bubbles exits all swivel joints.

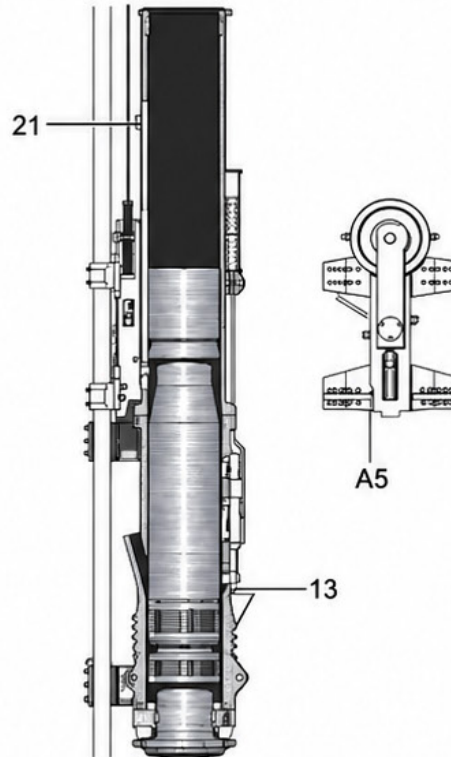
Step 5: Maintain tension on the control rope while simultaneously tightening all swivel joints.

Step 6: Release the control rope.

Step 7: Pull the center rope for approximately 5 seconds. This action opens the shutoff valve, allowing air to escape into the tank through the fuel lines.

Step 8: Release the center rope.

Step 9: Repeat step 3 through 8 three times.



5.11 Cleaning of combustion chamber

WARNING!

Combustion Chamber

The combustion chamber must be cleaned daily before the first startup of the Diesel hammer. Failure to do so may result in the ignition of accumulated lubricant within the combustion chamber during startup. This could cause the impact hammer to rebound against the catch groove (ref. 25) and result in damage.



DANGER!

Burns or Poisoning Risks!

- The Diesel Hammer must only rest on a pile or on the ground with appropriate support. Never place it on a support device.
- Maintain a distance of at least 4 m from the Diesel Hammer at all times.
- Never stand in front of it with an open combustion chamber bolt. Fuel, oil, dirt, and material residues can be ejected at high pressure.

- This poses a risk of eye or skin injuries, as well as burns and poisoning.
- Ensure you always wear a hard hat, safety goggles, safety gloves, safety boots, and suitable work clothes.



Take the following step:

- Set the fuel control pump to "0". To do so pull the left control cable as often as required.
- Remove the locking screw (ref. 16 in Fig. 12)
- Maintain a safe distance from the Diesel hammer, since dirt and material residues will be ejected at a high pressure.

WARNING!

Never stand in front of the combustion chamber opening of the Diesel hammer. Always stand at side of it!



- Raise the piston five times using the tripping device and let the piston catch at the upper stop. These cold blows allow oil and dirt to escape from the combustion chamber.
- Screw the plug back in.

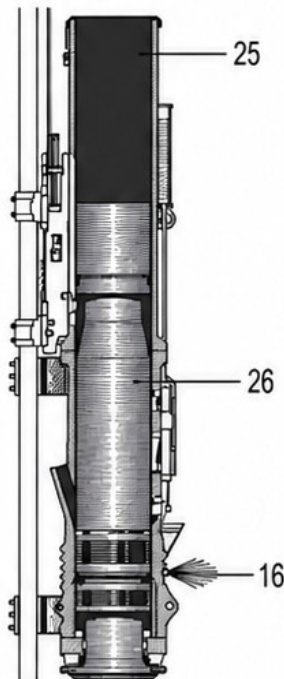


Fig 13 – Combustion Chamber Cleaning

5.12 Operational requirements of batter piling

During the operation of the batter piling, please follow the instructions given in this manual and the scope of the work.

The scopes of work of the batter piling of the Diesel hammer of all specifications are given in Fig. below.

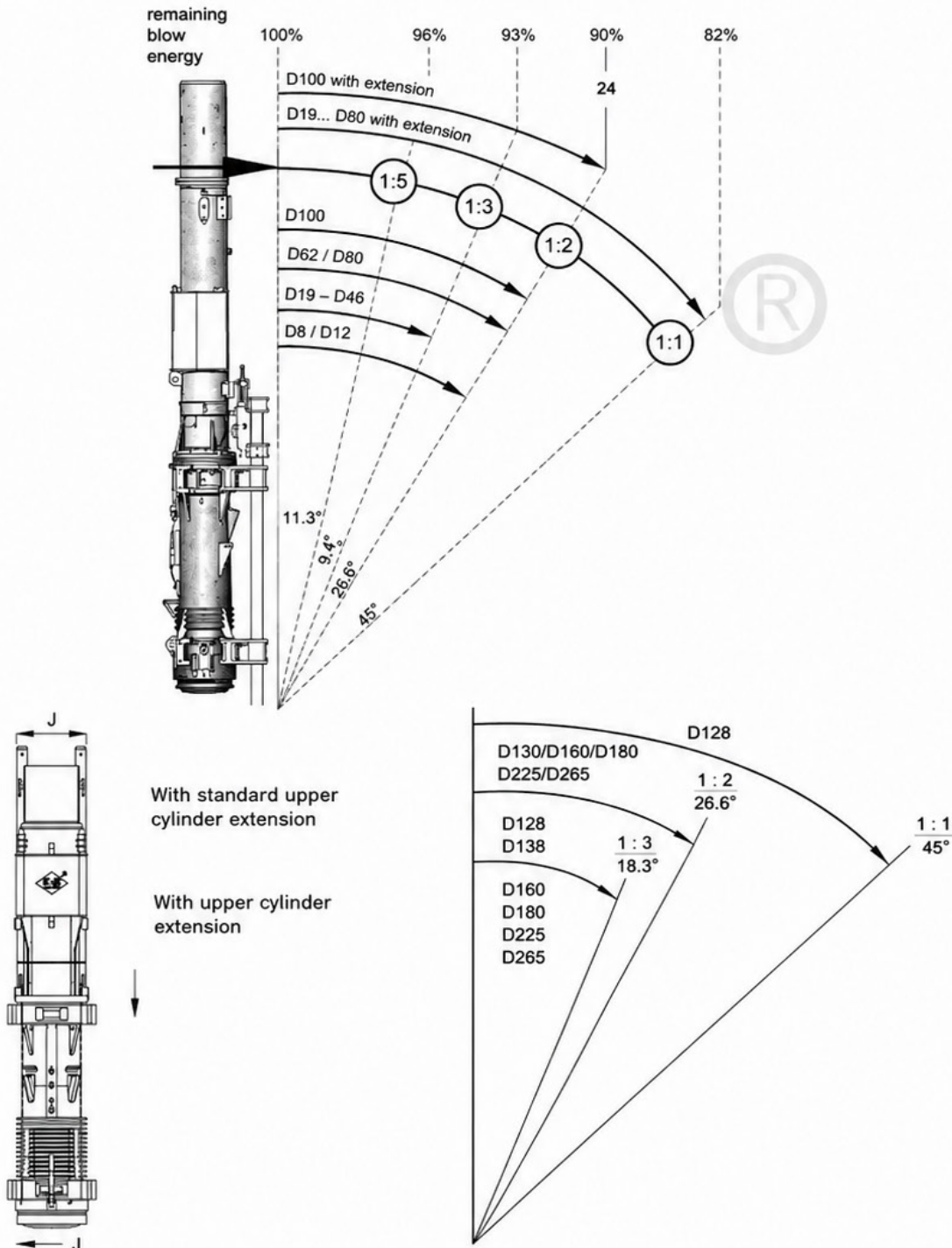


Fig. 14 – Operating Range of Batter Piling



5.13 Start and adjust

WARNING!

Start up

Follow all safety measures described in chapter 2.

! WARNING !

Conduct a comprehensive inspection of the entire driving equipment system before initiating operation. Inspect the unit for loose screws and bolts, cracks, wear, leaks, and damages. Assess the stability of the unit and ensure all damages are promptly repaired. Only operate the equipment after all necessary repairs have been completed.

Ensure that no individuals other than the operator and the foreman in charge of pile driving are within a distance of 1.5 times the lead height. Sound a horn to alert others before initiating operation of the unit.

Immediately cease pile driving operations in the event of a hazardous situation. Display a sign stating "Attention: Diesel hammer is out of order" and resume work only after addressing the dangerous situation.

5.13.1 Procedure

- Set the fuel control pump to "0". To do so, pull on the left control rope as often as required.
- Using the tripping device, pull the impact hammer and release it.
- For a pre-driven pile: set fuel control pump to "2" after the first blow. To do so, jerk the right control rope twice.
- For a newly placed pile: set the fuel control pump to the setting "3" after the first blow. To do so, jerk the right control rope three times.
- Continuously adjust the fuel injection quantity by jerking the control cables. Do not increase the injection quantity faster than one step per stroke.

5.13.2 Operating hints of the variable delivery-fuel pump

- The energy per blow (piston stroke) is controlled by the variable delivery-fuel pump. Adjusting the fuel setting device is done by pulling the regulating rope. Each pull of the rope moves the setting device one step forward or backward, limited by a stop.
- Pull the right-hand rope to switch from position 0 to 1, 2, 3, up to 4 (maximum).
- Pull the left-hand rope to switch from position 4 (maximum) down to 3, 2, 1, and finally to 0 (stop).
- Adjustments should only be made when the piston is resting on the impact block or during operation when the piston is hitting the block.

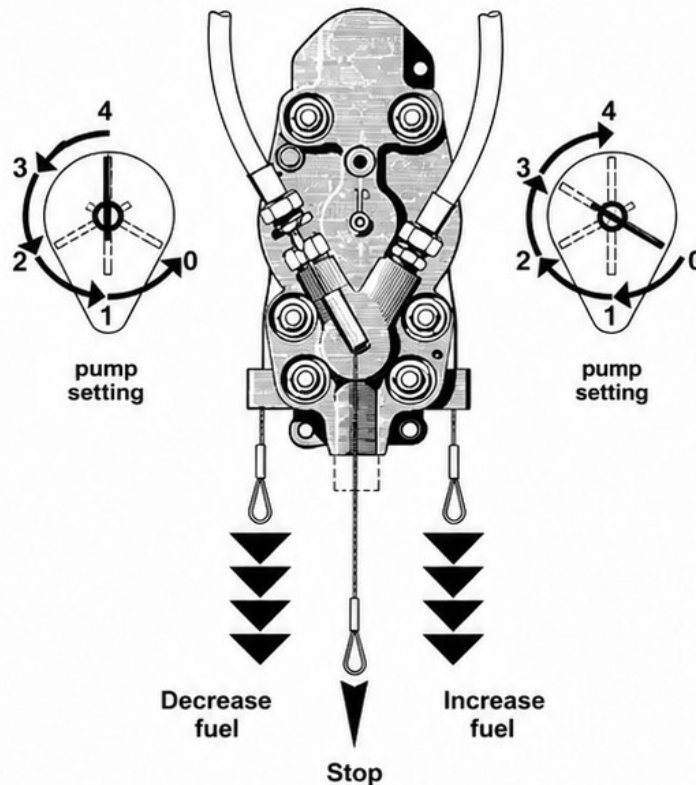


Fig. 15 – Adjusting Schematic Drawing of the Fuel Pump

CAUTION!

The position of the setting device can be checked on the dowel sleeve at the regulating shaft.



5.13.3 Fuel Bleeding Procedure for Variable Delivery and Injection Valves

- Fuel bleeding is essential for new hammers, after repairs, or in case of fuel stoppage. Ensure the piston is raised with the pump lever reloaded and the trip gear's pawl positioned approximately 20 cm below the upper catch.
- Set the fuel pump to position 4. Loosen the swivel joint on the injection valve (do not fully remove it) by 2-3 turns. Pump by pulling the regulating rope until bubble-free fuel flows from the swivel joint. Release the rope only after achieving this.
- Open the stop valve using its rope to release air through the fuel line and tank. Keep the stop valve open for about 5 seconds, then close it. Repeat this process three times.



5.13.4 Cleaning of the Combustion Chamber

- Clean the combustion chamber daily, immediately before the first startup, to remove accumulated lube oil. Failure to do so may result in combustion of excess lube oil, causing the piston to engage with the safety catch groove.
- Set the fuel pump to "0". Remove the plug from the combustion chamber.
- Perform five piston strokes (cold blows) to allow oil to escape through the threaded opening.
- Replace the plug upon completion.

5.13.5 Starting-Up

- Set the variable delivery fuel pump to "0" for the initial blow during startup.
- For subsequent starts, adjust to stage "3". Transition to stage "4" during operation of the pile hammer.
- Adjust the fuel injection amount as necessary for prevailing piling conditions by pulling the fuel regulating rope (see point 1 and "angle of energy per blow within the regulation possibility").
- Set the variable delivery fuel pump to position "4" while pumping between blows. Pull the right-hand rope firmly when the piston is at its top dead center.

5.13.6 Stopping

- Interrupt fuel supply by pulling the rope of the stopping valve. Hold rope until the piston has come to rest on the impact block.
- Set variable delivery fuel pump by pulling the left-hand rope to position "0".

CAUTION!

This measure may only be taken on piles with large set per blow.



DANGER!

Emergency Stop!

In case of any abnormal situation during the operation, please pull the steel rope to stop the Diesel hammer.





5.14 Range of energy per blow within the regulation possibility

When the variable capacity fuel pumps is at the different shift location, the impact force of the Diesel hammer may be different and the details are given in table below.

Table: Range of Energy per Blow

Type	Injection Quantity at setting 4 100% ±10%	Injection quantity (%) and blow energy* Nm			
		Setting 4 100%	Setting 3 83...90%	Setting 2 66...77%	Setting 1 49...64%
D12	2.10 cm ³ /stroke	46080	40550	30000	20500
D16	2.80 cm ³ /stroke	53460	44373	35282	25585
D19	3.54 cm ³ /stroke	65520	58300	47170	45680
D25	3.90 cm ³ /stroke	90000	71190	58560	39975
D30	4.70 cm ³ /stroke	102300	85350	70045	47970
D36	5.65 cm ³ /stroke	122760	94388	75055	55450
D46	7.15 cm ³ /stroke	165600	120603	95901	70850
D50	7.68 cm ³ /stroke	180000	131460	104530	80000
D62	8.70 cm ³ /stroke	218960	186000	148800	107050
D80	10.50 cm ³ /stroke	266830	239365	196420	171085
D100	12.50 cm ³ /stroke	333540	299200	257650	213860
D128	15.50 cm ³ /stroke	417000	371130	304410	250200
D138	17.50 cm ³ /stroke	461000	410290	345750	295000
D160	21.00 cm ³ /stroke	544000	484160	391680	331840
D180	23.50 cm ³ /stroke	610000	542900	451400	384300
D225	28.00 cm ³ /stroke	766000	658706	535588	397000
D265	30.00 cm ³ /stroke	901000	765842	613701	499000
D320	35.00 cm ³ /stroke	1084000	910521	737081	610000

**Range of energy per blow is the theoretical value, but its actual value can be deviated possibly due to the different geological conditions and soil.*

5.15 Instructions for Adjustment of Variable-Delivery Fuel Pumps

- These instructions are applicable only to variable-delivery fuel pumps and fuel injection devices with the specified order numbers as listed in the table.
- Periodically check the clearance dimension of the variable-delivery fuel pumps to ensure the proper operation of the Diesel hammers.
- This dimension, specifically the clearance between the pump seating face and the highest point of the pump lever when the pump is set to position 4, determines the stroke of the pump element and consequently the fuel delivery rate.



- Wear, such as on the pump lever or guide sleeve of the pump element, can reduce the fuel delivery rate. This wear can be rectified by adjusting the shim(s) in the thrust pin.

CAUTION!

Important Note:

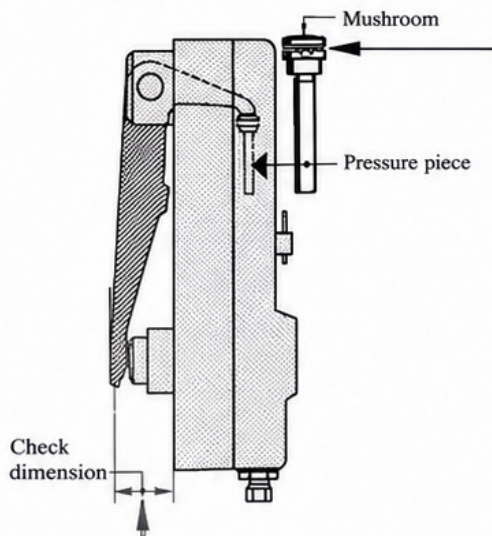
- This adjustment is applicable exclusively to piles requiring significant force per blow. Under no circumstances should the pressure piece or mushroom be ground.
- Ensure the use of only genuine JUWEI fuel lines. Verify that the valve pistons in the injection valves operate smoothly and maintain proper sealing at all times.



Table: Check Dimension and Fuel Delivery Rate of the Fuel Pump

Diesel hammer		Injection valve complete	Pump element complete diameter	Check dimension	Fuel delivery rate at full load (pump on position 4)
		quantity	mm	mm	cm ³ /stroke
D12		1	14	53.5±0.3	1.75
D16		1	16	53.5±0.3	2.4
D19		1	18.7	53.5±0.3	3.1
D25		1	20	54.5±0.3	3.90
D30		1	22	54.5±0.3	4.40
D36		2	24	53.5±0.3	5.65
D46		2	27	54.5±0.3	7.15
D50		2	27	54.5±0.3	7.15
D62		2	31	53.5±0.3	8.70
D80		4	32	55.0±0.3	10.50
D100		4	35	55.5±0.3	12.50
D128	Single pump	4	40.5	58±0.3	16.5
	Double pumps	4	28.5	58±0.3	8.2
D138	Single pump	4	43.5	58±0.3	19.3
	Double pumps	4	31	58±0.3	9.65
D160	Single pump	4	46	58±0.3	21.6
	Double pumps	4	33	58±0.3	11.1

D180	Single pump	4	48	58±0.3	23.5
	Double pumps	4	35	58±0.3	12.5
D225	Double pumps	4	40.5	58±0.3	16.5
D265	Double pumps	4	43.5	58±0.3	19.3



Measure the check dimension at full-load (control stage 4)
If there is any deviation from the specified value, fit thinner shim(s) between pressure piece and mushroom.

There are four shim sizes available which change the distance between the pump lever and pump seating face by the following values.

0.3	thick-0.75mm
0.4	thick-1.0mm
0.5	thick-1.25mm
0.6	thick-1.5mm

The limit of adjustment is reached when no more shims can be accommodated.

Fig. 16 – Check Dimension of the Variable Delivery-Fuel Pump

5.16 Oils

5.16.1 Fuel Oil Used for Diesel Hammer

- **Fuel Selection:**

- Ensure the diesel oil used is suitable for the respective season to avoid starting difficulties.
- Using summer diesel oil during cold periods (temperatures of -8 to -10°C) can cause paraffin separation, hindering the proper feeding of the fuel pump. At even lower temperatures, the fuel supply to the pump can be completely blocked.
- Winter diesel oil, available at filling stations during the cold season, can be used at temperatures as low as -30°C, provided it contains at least 50% fuel additives.

Recommended fuel additives include Motor Petroleum, Tractor Fuel, and Regular Gasoline as follows:

Table: Mixing ratio Diesel/Regular Gasoline or Engine Mineral Oil

Outside Temperature (°C)	Mixing Ratio	
	Regular Gasoline (%)	Engine Mineral Oil (%)
Above -10	0	0
-10 to -20	10	5
-20 to -30	20	10
Below -30	30	15



Outside temperature	Summer diesel fuel	Winter diesel fuel
above -10°C	90% / 10%	100% / 0%
-10 to -14°C	70% / 30%	100% / 0%
-14 to -20°C	50% / 50%	80% / 20%
-20 to -30°C	----	50% / 50%

5.16.2 Lubricating oil / grease used for Diesel hammer

CAUTION!

Lubricant Oil

The lubricant lines of the lubrication system must always remain filled with lubricant. Failure to maintain filled lubricant lines will result in the Diesel hammer being supplied with lubricant only after a delay, which can cause damage to the Diesel hammer.

Safety Requirements:

Always wear a hard hat.

Wear safety gloves, safety boots, and suitable work clothes.

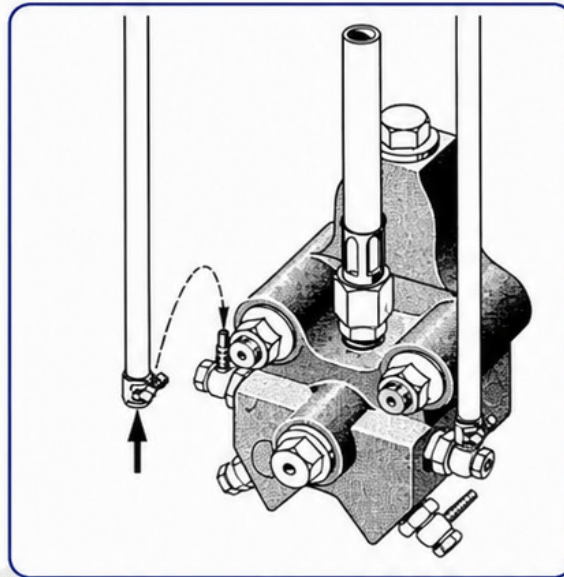


Lubricant System Replenishment

The lubricant lines of the lubrication system must be replenished prior to initial operation and after any repairs to the lubrication system. Follow these steps to ensure proper lubrication:

1. **Position the Diesel Hammer:**
 - Lay the Diesel hammer down in a horizontal position.
2. **Remove Lubricant Lines:**
 - Remove the lubricant lines from the lubricant pump by loosening the lubricant clamps.
 - Pull the lubricant lines from the connection fitting.
3. **Fill Lubricant Lines:**
 - Using a squirt can, fill the lubricant lines with motor oil. Continue filling from the bottom until oil exits all connection fittings.
4. **Secure Lubricant Lines:**
 - Reattach the lubricant clamps. Ensure all lubricant lines are securely attached to the connection fittings and retighten if necessary.
5. **Position the Diesel Hammer Vertically:**

- Return the Diesel hammer to a vertical position.
- 6. **Check Lubricant Level:**
 - Verify that the lubricant tank is full.



Vertical Pile Driving

Reliable lubrication of the upper cylinder part is ensured by the lube oil pump. The addition of lube oil additives is recommended (1L additive to 20L lube oil). Grease the impact block and cylinder end ring every 20 minutes of operation time with special grease (5-10 pump strokes per nipple from the grease gun). Lubrication points are identified; do not lubricate when the impact block is hanging out.

- **Lubrication of the Trip Gear:**
 - Lubricate with special grease (5 strokes per nipple with grease gun) every week.
- **Lubrication of the Guide Tubes:**
 - Lubricate the guide tubes of the lead once per week with multi-purpose grease containing MoS₂ or similar.

Piling Under Batter or Inclination

Reliable lubrication of the upper cylinder part is ensured by the lube oil pump. Additionally, grease the impact block and cylinder end ring every 20 minutes of operation time using a grease gun (5-10 pump strokes per nipple). It is also necessary to grease the upper cylinder part.

- **Lube Oil Additive:**
 - Use a ratio of 1:20 when batter piling at inclinations larger than 1:10.
 - BEL-RAY Moly Lube Friction Modifier



5.16 Oils (continued)

Should use specific brands of regular lube oil, including summer and winter. (See table below)

Table: Type of Lube Oil

Summer	Winter
Motor oil SAE 40/50	Motor oil SAE 20
Motor oil CC 40/50	Motor oil CC 20

Special Greases

When using regular special greases, it is recommended to use the following specific brands:

- Schaeffer Moly EP 274
- Bel Ray Molyube Extreme Pressure AC 2

5.17 Examination During the Working Process of the Diesel Hammer

- **Movement and Lifting Operations:**
 - The movement, swinging, lifting of piles, and lifting of hammers should not be performed simultaneously.
 - After lifting the pile, avoid any back-and-forth swinging or movement of the pile frame.
- **Lifting Restrictions:**
 - Do not lift piles from the side face or tow them from a far distance.
 - When lifting a pile from the right head, ensure the distance from prefabricated concrete piles does not exceed 4 meters, and from steel pipe piles does not exceed 7 meters.
 - Avoid collisions between the pile and the leader.
- **Alignment:**
 - Before starting the Diesel hammer, ensure the center line of the pile hammer, pile helmet, and pile are aligned to avoid eccentric piling.
- **Piling in Soft Soil:**
 - Turn off the fuel pump when piling in soft soil. Start the Diesel hammer when penetration is less than 100 mm.
- **Trip Gear Operation:**
 - Lift the trip gear before starting the Diesel hammer.
 - During piling, maintain a minimum distance of 2 meters between the trip gear and the top of the upper cylinder of the Diesel hammer.
- **Piston Height Monitoring:**



- Measure the height of the piston visually.
- Follow instructions strictly and reduce diesel oil once the specified height is reached to control the piston stroke.
- **Soil and Hammer Operation Monitoring:**
 - Pay attention to soil horizon changes and pile hammer operation. Take immediate action if any abnormal event occurs.
- **Pre-Ignition Protocol:**
 - Stop work immediately in case of pre-ignition and follow the specific instructions.
- **Pile Head Impact Surface:**
 - Ensure the impact surface of the pile head is square and level.
 - Align the center line of the pile accurately with the center line of the pile hammer to avoid rebounding impacts, which can cause cylinder cracks or buckling.
- **Use of Pile Helmet:**
 - Use a suitable pile helmet guided on the lead.
 - Even with a pile helmet, the pile may deviate slightly from its original line. The pile foreman must continuously monitor and correct the lead if the pile shifts out of line.
- **Holding the Pile:**
 - If the pile helmet is not guided on the lead, hold the pile with one or more pile guides.
- **Striking Energy Adjustment:**
 - Consider replacing the Diesel hammer with one that has a larger striking energy if the pile sinks less than 50mm per 10 impacts.
 - Shut down the pile hammer immediately if the pile sinks less than 20mm per 10 impacts.

CAUTION!

Slower penetration is possible, but it leads to more rapid wear of the pile hammer.



- **Pile Penetration:**
 - If pile penetration is slow, check for excessive piston rebound.
 - Ensure the piston does not strike the arrester groove in the upper cylinder.
 - Regulate the pile hammer and shut it down in time if necessary.
- **Safety Precautions:**



- Maintain a safe distance from the pile hammer while it is in operation to avoid accidents.
- **Guide Clamps and Guides:**
 - Conduct frequent checks to ensure that guide clamps and guides are firmly attached.
 - Replace worn or buckled guide clamps and gibs immediately to prevent the hammer from jumping out of the guide and causing an accident.

CAUTION!

The maximum clearance between the guide clamps or gibs and the guide tubes of the lead must not exceed the allowable values. Please check constantly.



Operational Guidelines for Pile Driving with Diesel Hammer

- **Lead Condition:**
 - Do not use a lead that is buckled or seriously worn, as it may lead to accidents.
- **Batter Piling Safety:**
 - Ensure that the batter angle used does not exceed the permissible limits specified for the pile hammer in use.
- **Damage Control:**
 - Immediately halt all operations and conduct a thorough inspection upon discovering or foreseeing any damage to the pile-driving equipment or the pile itself.
- **Lubrication Maintenance:**
 - Ensure that all parts are adequately lubricated at all times to optimize operational efficiency and longevity.
- **Pile Verticality:**
 - Correct the verticality of the pile after insertion into the ground. Avoid any movement or swinging of the pile once it has been driven 3 meters into the soil.
- **Batter Piling Procedure:**
 - When engaged in batter piling, ensure the pile frame remains vertical. Do not allow the pile to lean back or become retroverted. The Diesel hammer should not be lifted when the angle of inclination exceeds 18.5°.
- **Regular Inspection:**
 - Regularly inspect all fastening pieces and moving parts during operations to verify that they are secure and functioning correctly.

6.

Shutdown

The Diesel Hammer may be left in the lead for a temporary shutoff. There are two possibilities to safely support the machine:

- Let the Diesel Hammer rest on the material to be driven,
- Let the Diesel Hammer rest on the lower support device.

WARNING!

Danger of Fall!

Use a height safety device to prevent a fall (mandatory at a lead height of above 5 m).



Operational Safety Measures for Diesel Hammer

- **Stability of Carrier Unit:**
 - Ensure the carrier unit maintains sufficient stability, especially considering weather changes such as rain or storms. There is a risk of overturning if stability is compromised.
- **Handling Hot Components:**
 - Do not touch the Diesel Hammer immediately after operation to avoid burns. Allow hot components to cool sufficiently before handling.
- **Safety Zone Management:**
 - Operators and the foreman must ensure that no person is within 1.5 times the lead height during pile driving operations. Sound a horn to alert others before putting the unit into operation.
- **Operating Procedure:**
 - Follow these steps:
 - When resting on the pile: drive the pile to at least half its depth.
 - When resting on support devices: ensure the Diesel Hammer rests securely on the lower support device.
 - When resting on the pile: bring the Diesel Hammer to rest on the pile. You may turn off the fuel supply during the driving phase and wait until the piston comes to a complete halt.
 - Allow the Diesel Hammer to cool down completely.
 - Install the protection hood, protection rail, and exhaust covers as required.
 - Follow specific instructions to take the carrier unit out of operation.



- Secure the carrier unit by activating the locking brake, removing the ignition key, closing doors, windows, and hatches, and locking all access points.
- **Safety Zone Securing:**
 - Secure the danger zone within 1.5 times the lead height in accordance with local regulations for blocking off job sites.

6.1 Removal from the Lead

When the Diesel Hammer will not be operated for several days, it must be removed from the lead.

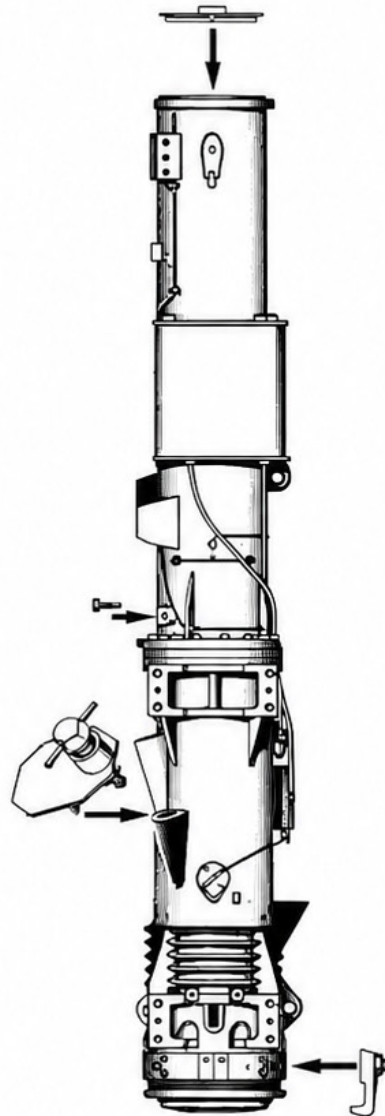


Danger of Burns!

Do not touch the Diesel Hammer shortly after operation. Allow sufficient time for hot components to cool down.

Procedure for Removal

1. **Place the Diesel Hammer**
 - Let the Diesel Hammer rest on the material to be driven or on the ground.
2. **Cooling Down**
 - Allow the Diesel Hammer to cool down completely.



Removal Procedure

- 1. Installation of Safety Equipment:**
 - Install the piston locking screws, piston safety, protective hood, protection rail, and exhaust covers.
- 2. Fuel Control Pump:**
 - Remove the ropes from the fuel control pump.
- 3. Attachment of Steel Cables:**
 - Place the steel cable loops around the lifting ears (ref. 3 in Fig 1) and on the hook of the carrier unit.
- 4. Lifting the Diesel Hammer:**



- Lift the Diesel hammer approximately 10 cm with the lifting equipment.

5. Removal of Hammer Guides:

- Remove all four hammer guides of the Diesel hammer.

6. Installation of Transport Angles:

- Install the transport angles. Then place the Diesel hammer horizontally on wooden blocks.

7. Removal of Steel Cables:

- Remove the steel cable loops from the lifting plates and from the hook of the carrier unit.

7. TRANSPORT, LIFTING AND STORAGE

7.1 Transport Safety Lock Device



DANGER



Crash and Impact Hazard

The Diesel hammer must only be transported with the locking screw (piston) and impact block clamp securely installed. Failure to do so may result in a shift in the center of gravity, causing sudden movements during lifting operations. This can lead to accidental crashes or impacts where the piston and impact block may move unexpectedly.



CAUTION



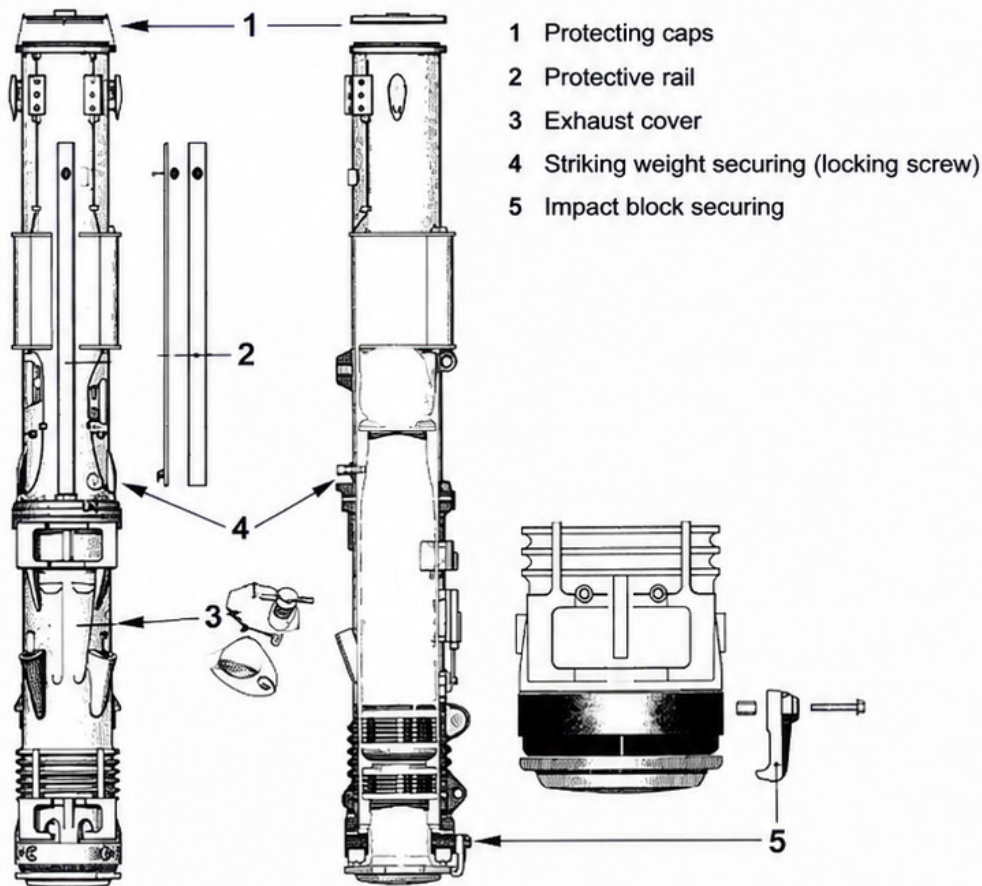
Package Inspection

The Diesel hammer and its accessories must be packaged, loaded, and transported with care to avoid damage. After delivery, thoroughly inspect the Diesel hammer and all accompanying accessories for completeness and any signs of damage. Promptly report any issues to the shipping agency or authorized dealer.

Transport Safety Devices Installation

Prior to transporting the Diesel hammer, ensure the following safety devices are installed:

1. **Protective Caps:** Attach the protective hood using two chains, securing each hook to the respective eyelet to prevent water, dust, and foreign objects from entering.
2. **Protective Rail:** Secure the protective rail by attaching its hook to the lifting slot of the upper cylinder section and locking it with the clamp screw to prevent dirt and sand from entering the combustion chamber.
3. **Exhaust Cover:** Screw the exhaust covers into their respective threads to prevent water, dust, and foreign objects from entering the exhaust system.
4. **Piston Locking Screw:** Install the locking bolts to secure the piston in the lower end position, preventing sudden shifts in the Diesel hammer's center of gravity and potential damage.
5. **Impact Block Securing:** Ensure the impact block clamp is securely fastened to prevent accidental movement of the impact block during transport.
6. **Transport Angles:** Install the transport angles to allow horizontal placement of the Diesel hammer during transportation, minimizing the risk of damage.



7.2 Transport Cables

DANGER!

Risk of Fall!

Before each use, visually inspect the transport cables thoroughly. Use only approved cables for transporting the Diesel hammer. Immediately remove and dispose of any cables found damaged.

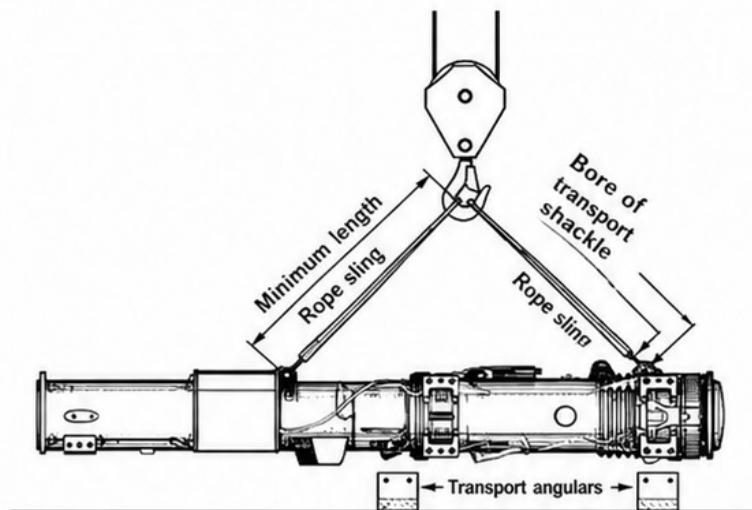


Table: Transport Requests

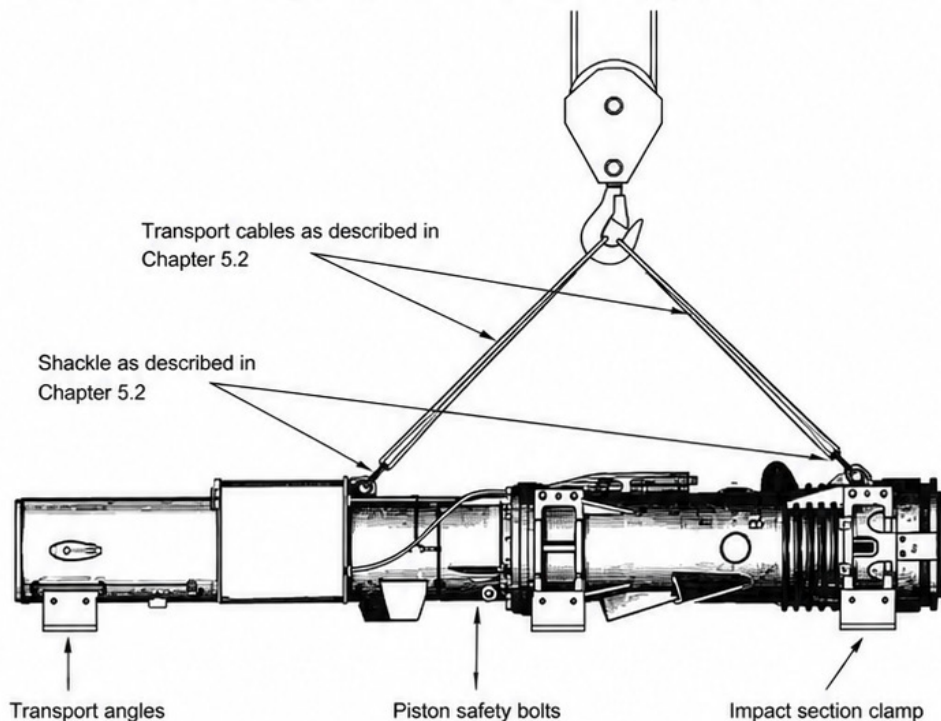
	D12 D16 D19 D25	D30 D36	D46 D50	D62	D80 D100
2 Wire rope slings (DIN3066)	Φ13/3.5m	Φ18/6.5m			Φ32/5.5m
Minimum breaking strength of the single rope at 1600N/mm ² (2 rope slings=4x)	79700N	153000N			522000N
Minimum length If other ropes or chains are used, they must be strong enough to be the weight of the pile hammer safely.	1.7m	1.9m	2.0m	2.3m	2.7m
Bore of the transport	Φ50mm	Φ50mm			Φ62mm
Shackles rate for	8t	8 / 10t			16 t

	D128 D138	D160 D180	D225 D265
2 Wire rope slings (DIN3066)	Φ32/8m	Φ36/8m	Φ40/8m
Minimum breaking strength of the single rope at 1700N/mm ²	680000N	850000N	1070000N
Minimum length If other ropes or chains are used, they must be strong enough to be the weight of the pile hammer safely.	4m	4m	4m
Bore of the transport	Φ75mm	Φ85mm	Φ95mm
Shackles rate for	32 t	40t	50 t

Never Walk Under Suspended Loads!

Use only lifting equipment that is in excellent technical condition, exhibits great stability, and is designed to lift the applicable loads. Ensure that only approved and suitable steel cables and shackles are used.

The Diesel hammer shall only be lifted with installed safety devices.



7.3 Storage

CAUTION!

Burns and fire!

Let the Diesel hammer fully cool down prior to storage.



You must wear safety gloves, safety boots, and suitable work clothes. A suitable breathing apparatus must be worn when required.

Storage Guidelines for the Diesel Hammer:

- Inspect the Diesel hammer for damage and wear regularly. Arrange for necessary repairs immediately to prevent work disruptions.
- Check the tanks and lines of the Diesel hammer for leaks and secure fittings.
- Replace damping rings and machine impact areas as needed.
- Drain the tanks (fuel, oil, ether) when necessary.

DANGER!

Explosion and Poison Risk:

Fuel, ether, and lubricants are highly flammable and explosive under certain conditions. Drain the tanks only in well-ventilated areas.

No smoking, open flames, or sparks are permitted during tank draining or in storage areas for fuel, ether, and lubricants.



- Clean filters.
- Close the drain openings of the fuel pump with a rubber plug.
- Remove and clean the piston, impact block, upper- and lower-cylinder section. Check all connection elements for a solid fit.
- Clean and check the tripping device as well as the guide components of the Diesel hammer and of the tripping device for damage and wear.
- Clean and check the pile helmet, attachment cables, pile helmet cushion and accessories (brindle, support devices) for damage and wear. Pile helmets cushions made of wood do not store well and are thus not to be stored for a long time.
- Check the tool chest and determine its completeness and the condition of the parts.



Replace missing or unusable parts with new parts. Check the control cables for the tripping device and fuel control pump for damage and wear. (Replace if necessary).

- Check the condition and completeness of protection devices and personal safety equipment such as:
 - Protective clothing, hard hat, safety gloves and safety boots,
 - Safety goggles and ear plugs,
 - Lifesaving vest,
 - Height safety devices.

**Personal Protection Equipment must meet local safety regulations.*

- Prepare the Diesel hammer for storage.
- Protect Diesel hammer against the effect of the weather. Cover the Diesel hammer and all accessories. If possible, store the machine in an unheated and dry room exhibiting minimal temperature changes. Do not store the Diesel hammer in direct sunlight.

7.3.1 Laying Up

The effectiveness of protection largely depends on the thickness and viscosity of the applied material. We recommend the use of Moly Grease, a dense grease suitable for application with a rag or brush.

Application Procedure:

- Disassemble the Diesel hammer following the installation guidelines.
- Thoroughly clean all components of dirt and rust, replacing any worn or damaged parts.
- Touch up any areas with fresh paint and allow it to dry completely.
- Pass corrosion protection oil through the fuel and lubricant pump.
- Lubricate the tripping device and apply rust protection oil using a brush.
- Brush rust protection oil onto the guide components of the Diesel hammer and tripping device.
- Spray rust-inhibiting oil into the tank interior, ensuring tanks are securely closed. Seal the fuel tank with the appropriate screw (without ventilation hole).
- Apply Moly Grease or similar grease by brush to all unpainted parts, including holes in the end ring, upper, and lower cylinder.
- Apply rust-inhibiting oil to all metal tools stored in the tool chest.

8. MAINTENANCE AND TROUBLESHOOTING

Maintenance work must only be performed by qualified and authorized experts.



- Ensure the Diesel hammer is deactivated before beginning any maintenance. Prevent unauthorized operation during maintenance.
- Display the following label prominently:
 - "Use a height safety device to prevent machine falls."
- Do not touch the Diesel hammer immediately after operation. Allow sufficient time for hot components to cool down.
- Never conduct repairs or maintenance while the Diesel hammer is in motion.
- Personal protective equipment required: hard hat, safety gloves, safety boots, and appropriate work attire. Wear a life-saving vest when working near water surfaces.

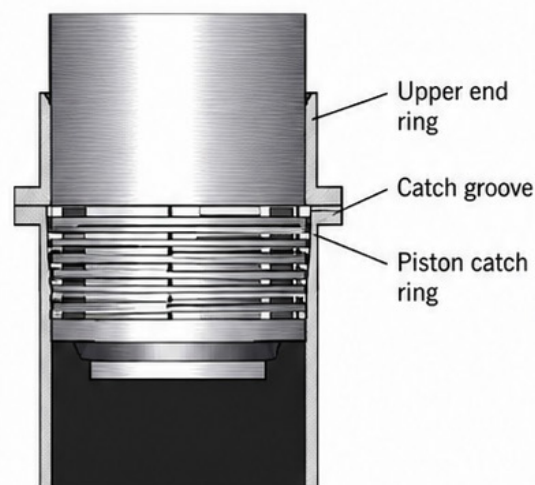
8.1 Catch Groove and Catch Piston Ring

In cases where the material being driven penetrates slowly, especially in dense soil or with a blunt pile, the drop height of the impact hammer may increase. To prevent the piston catch ring from bouncing into the catch groove of the upper cylinder section, promptly reduce the fuel supply.

Immediate cessation of Diesel hammer operation is necessary if the piston catch ring has bounced into the catch groove or if either component shows any sign of damage. Both the catch groove and piston catch rings must always be maintained in optimal condition. Machine any damaged catch grooves and replace damaged piston catch rings.

DANGER!

Operating the Diesel Hammer with a damaged catch groove is strictly prohibited.





- **Piston Travel and Catch Mechanism:**
 - In case of strong resistance during piling, the piston travel may increase, causing the catch ring to hit the catch groove in the upper cylinder part.
- **Immediate Action:**
 - If this occurs, promptly reduce fuel injection by adjusting the fuel pump setting or shut off the hammer completely to interrupt piling.
- **Maintenance Requirement:**
 - Ensure the catch groove and catch piston ring are always in perfect condition.
- **Safety Note:**
 - Immediately rework any damaged catch groove to prevent potential accidents.

8.2 Testing Compression

Insufficient compression can lead to starting difficulties. A significant decrease in compression during pile-driving operations may cause the piston to achieve lower heights, potentially resulting in the Diesel hammer stopping altogether under extreme conditions.

To check the compression:

WARNING!

Ensure you wear a hard hat, ear plugs, safety goggles, safety gloves, safety boots, and appropriate work clothes.

! WARNING !

Testing Compression

To ensure proper operation of the Diesel Hammer, perform the following compression test:

1. **Preparation:**
 - Place the Diesel Hammer on a hard pile or a test stand.
 - Set the fuel control pump to "0" by jerking the left rope as necessary.
2. **Testing Procedure:**
 - Pull the piston upward until it trips.
 - Observe the piston closely. Adequate compression is indicated if the piston rebounds after impacting the impact head and comes to rest after at least three additional upward and downward movements.

Causes of Low Compression:

- Defective or stuck piston rings.
- Inadequate lubrication of the impact block or piston.
- Grooves in the lower cylinder section below the exhaust opening.



- Damaged cylinder bushings.
- Irregular inside diameter of the lower cylinder section.
- Soft soil, light, pointed, or narrow material being driven ("running" pile).

Action Steps:

- Replace any defective components identified.
- Follow the maintenance schedule to lubricate the impact block and piston.

Addressing "Running" Pile Issues:

- If experiencing starting difficulties, allow the piston to drop multiple times with the fuel supply shut off (cold blows) until penetration resistance is sufficient for starting.

8.3 Screw / bolt connections

CAUTION!

Never check compression on hammer when same is secured on leads by means of the safety mechanism or safety fork.



Commissioning Note: When commissioning a new Diesel Hammer, inspect all nuts and bolts for tightness after 1.5 and 10 hours of operation.

Routine Checks: During piling operations, regularly inspect all screw joints, focusing particularly on the bolts of guide clamps on the hammer and the bolts of guide gibs on the tripping gear.

WARNING!

Immediately replace over-tightened screws with new ones of the same strength. Diesel Hammer cannot be operated safely with loose or over-tightened screws.



8.4 Guides

Prior to the driving of piles, it will be necessary to check the wear of the

- Guide sleeves of the Diesel Hammer,
- Guide strips of the tripping device,
- Guides of the pile helmet,

- Wear strips along the whole lead length.

Prior to the driving of piles, the wear strips must be lubricated daily with MoS2 containing multipurpose grease along the whole lead length.

WARNING!

Danger of Crash!

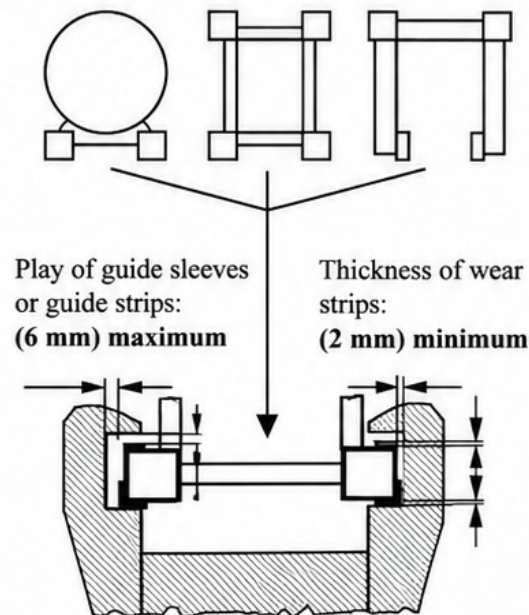
Worn guide parts must be replaced immediately. Wear strips at the lead that are too thin must be reinforced immediately. If this is not done, the Diesel hammer, impact block or tripping device may jump out of the guides.

! WARNING !

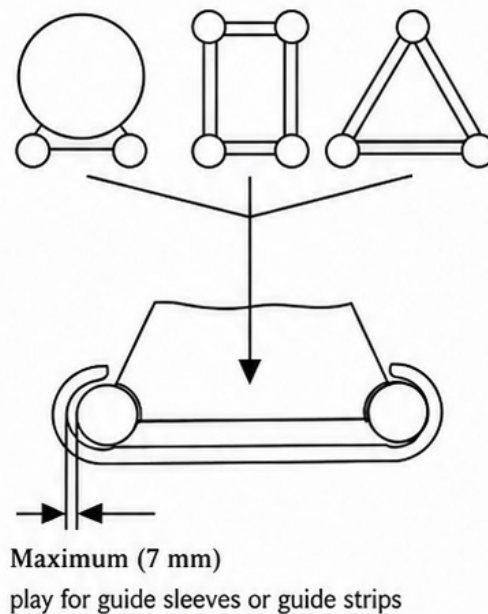
Use only original spare parts. JUWEI cannot guarantee the safe operation of the Diesel Hammer when other spare parts are used.

Follow the safety instruction.

The play for the guide sleeves and guide strips shall not exceed 6-7 mm.



When it exceeds the above values, the guide sleeves and guide strips must be replaced immediately. The wear strips must have a minimum thickness of 2 mm along the whole lead length.



When they are thinner, the guide strips must be reinforced by welding flat bars to them.

8.5 Tripping Device

The following checks must be performed daily before driving piles and whenever issues are suspected:

- Ensure the latch and tripping mechanism of the tripping device function correctly.
- Verify the alignment between the Diesel hammer and the tripping device along the entire length of the lead.
- Check for any excessive play in the guides of the tripping device.

Weekly Maintenance:

Lubricate the tripping device using LUB-D:

- Apply 5 strokes of grease from a grease gun per grease nipple.

WARNING!

Danger of Crash!

Do not operate the Diesel hammer if:

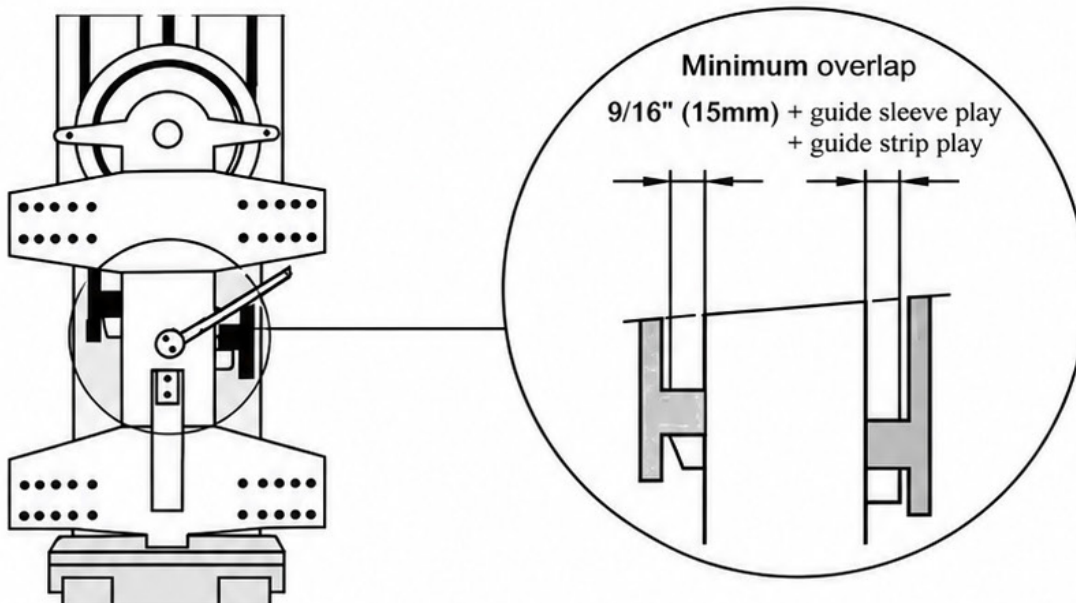
- The tripping device does not function properly.
- The overlapping distance between the machine and the tripping device is insufficient.

! WARNING !

Note: Tripping Device Overlap and Guide Strip Play

Along the entire lead length, ensure:

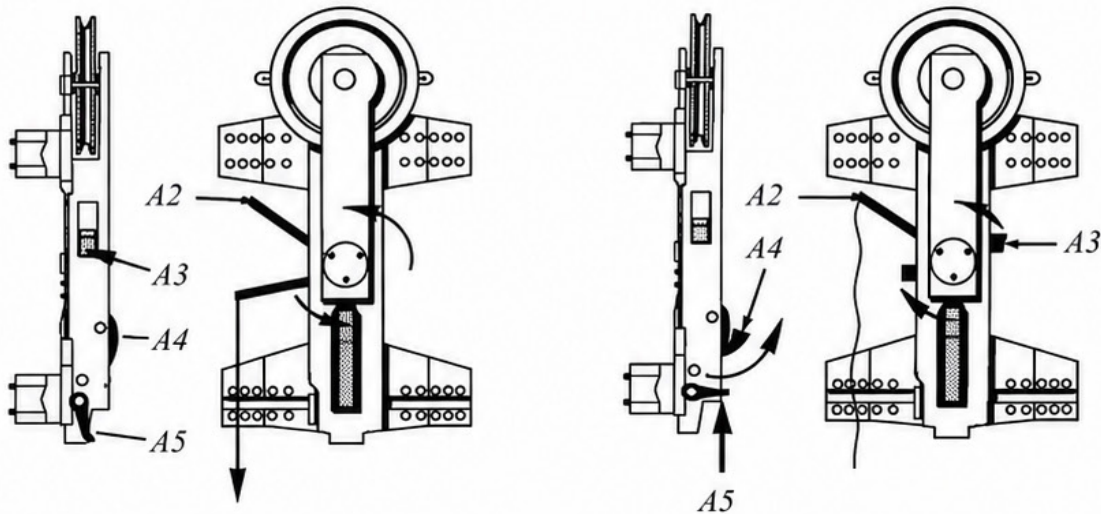
- The overlap of the latches between the Diesel hammer and the tripping device is at least 15 mm greater than the play of the guide strips.
- The play of the guide strips is less than 6-7 mm. If this tolerance is exceeded, replace the guide strips immediately.



8.5.1 Testing the Proper Operation

The tripping device is considered inoperative if any of the following criteria are not met:

- Lower the tripping device.
- Ensure the trip cam lever (A5) is pushed up when the tripping device impacts the lower support device. Simultaneously, ensure the pawl (A4) fully swings out and securely locks.
- Inspect the tension and screw connection of the flat spring.
- Pull down on the cable at lever (A2). Confirm the driving pin (A3) fully reaches its end position.
- Release the cable at lever (A2). Verify the driving pin (A3) swings out fully to a horizontal position.
- Check the proper functioning of the guide pulleys.
- Inspect the tripping device for wear, focusing on the pawl (A4), strips, bolts, and driving pin (A3) for signs of rounding or visible wear.



8.6 Pumps and Line Integrity

Use only genuine spare parts. JUWEI cannot ensure proper pump functionality with non-original parts.

WARNING!

Address issues with the fuel or lubricant systems promptly. These problems increase the risk of fire and could lead to damage to the Diesel hammer.

! WARNING !

8.6.1 Disassembly and Cleaning of Pumps

The fuel control pump and lubrication pump should be disassembled and cleaned as necessary. Remove all paraffin and dirt residues. Ensure all moving parts operate smoothly. Replace worn or defective parts.

Sealing Surface Installation:

- Carefully clean grease from the sealing surfaces and the support surface between the fuel control pump and upper cylinder section using a suitable grease remover. Allow the remover to fully evaporate.
- Apply a uniform coat of sealing material to the sealing surfaces, ensuring no bubbles are present.
- Allow the sealant to dry for approximately 10 to 15 minutes.
- Install the sealing surfaces.
- Check for leaks.
- The sealing surfaces can be separated and rejoined up to three times without applying new sealing material. Ensure no foreign material contaminates the sealing compound.



8.6.2 Lubricant Pump

After every 30 minutes of pile-driving work, ensure the upper cylinder section is adequately lubricated with a uniform thin film of lubricant. Additionally, check the following:

- **Lubricant Tank Level:** Verify the lubricant level in the tank.
- **Lubricant Lines:** Check for clogs or defects in the lubricant lines.
- **Pump Lever:** Inspect the pump lever for signs of wear.
- **Foreign Material:** Ensure there is no foreign material in the lubricant pump.

Operate the Diesel hammer only after addressing any identified issues. Use motor oil appropriate for the temperature range.

8.6.3 Fuel Control Pump

The control dimension of the fuel control pump significantly affects the quantity of fuel supplied with each stroke. An incorrect control dimension can lead to operational issues:

- **Excessive Fuel Supply:** A control dimension that is too long can cause an excessive fuel supply to the Diesel hammer, increasing the risk of the piston jumping into the catch groove.
- **Insufficient Fuel Supply:** Conversely, if the control dimension is too short, the Diesel hammer may not achieve its maximum blow energy.

Follow these steps to check and adjust the control dimension of the fuel control pump:

1. Set the fuel control pump to “4” (full load) by jerking the right control ropes as required.
2. Measure the control dimension.
3. If the measured control dimension deviates from the nominal dimension, reset it:
 - Adjust the control dimension by adding or removing shims between the pressure section and the mushroom. Typically, removing one shim or using a thinner shim is sufficient.
 - If the pump lever is worn and shims cannot be adjusted further, replace the pump lever and reset the control dimension.
4. Inspect the injection valve. Ensure the piston in the injection valves moves smoothly and closes properly. Replace the injection valves if necessary.

WARNING!

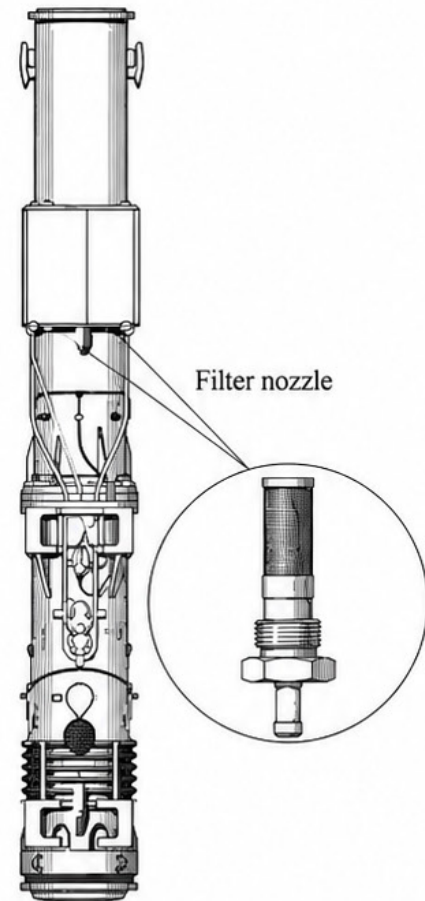
Never grind the pressure section or mushroom.



8.6.4 Filter

When required clean the filter of the fuel and lubricant tanks as described below:

- Drain the fuel tank.
- Pull the fuel line from the filter nozzle.
- Unscrew the filter nozzle.
- Clean the filter insert.
- Screw the filter nozzle back in.
- Push the fuel line again on the filter nozzle.
- Fill the fuel tank.
- Check the filter nozzle for leaks.
- Clean the filter of the lubricant tank in the same manner.



8.6.5 Grease nipple

WARNING!

Danger of Burns!

Be careful when working on a hot Diesel hammer. Do not touch hot components.

! WARNING !

Grease Nipples and Lubrication Opening: Ensure grease nipples and lubrication openings allow free flow of lubricant. Replace clogged grease nipples promptly.

Greasing Procedure: After shutting off the Diesel hammer, pump fresh grease into the grease nipple of the impact head, cylinder end ring, and upper cylinder section to prevent carbonization of grease in hot grease nipples.

8.7 Exchanging Rubber Ring (Damping Ring):

- Set the hammer down on the pile helmet and remove the impact block securing clamp.
- Raise the hammer until the impact block hangs out completely.
- Use a screwdriver to press the two-part rubber ring out of the dovetailed groove.
- Place the new rubber ring on the impact block flange.

- Lower the hammer. The hammer's weight will press the rubber ring into the dovetailed groove automatically.

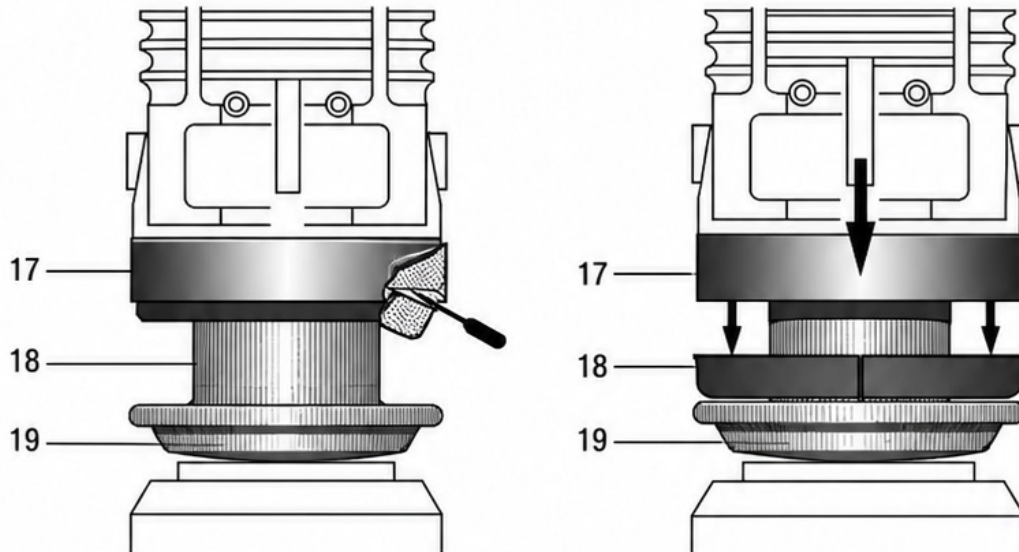


Fig. 17 – Exchanging of Rubber Ring

8.8 Changing the Inner Rubber Ring

- **Remove the rubber ring.**
- **Secure the impact block** with wedges to prevent tipping over.
- **Fit assembly plates** to the two-part cylinder end ring and screw in assembly bolts.
- **Remove all necked-down bolts** from the cylinder end ring.
- **Squeeze off the end ring** from the lower part of the cylinder using 4 necked-down bolts. (The squeeze-off distance is restricted by the assembly bolts which engage into the lower part of the cylinder).
- **Set down the pole hammer** on the impact block flange. Remove the assembly bolts.
- **Raise the hammer** and secure it at a level just high enough to allow the rubber ring to be replaced without difficulty.

- Reassemble in reverse order.

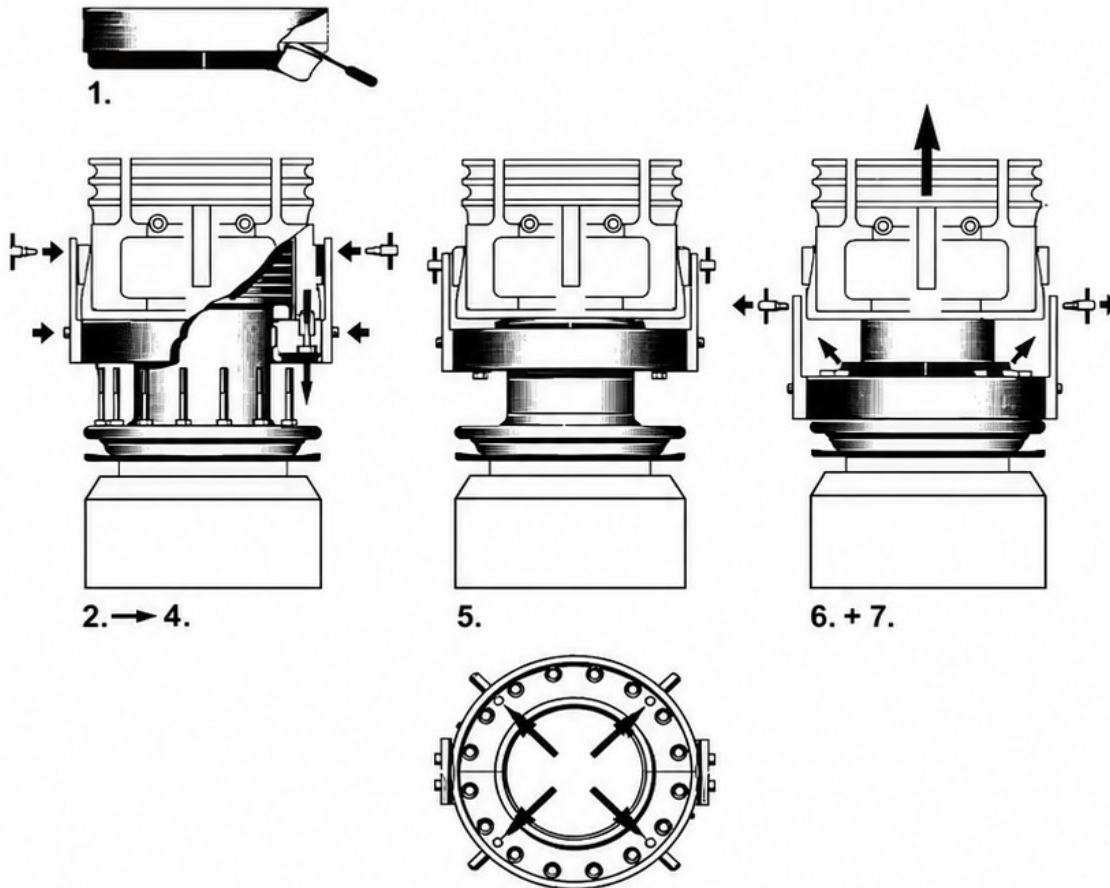


Fig. 18 Exchanging Inner Rubber Rings

8.9 Changing Piston Rings

- **Disassemble** using the same method as for replacing the inner rubber ring.
- **Raise the hammer** approximately 1 meter and secure it after removing the assembly bolts. The cylinder end ring, held together by the assembly plates, remains on the impact block flange.
- **Raise the piston** and stop shortly before reaching the carrier.

WARNING!

Danger of accident!

Pawl lever must not touch the carrier as otherwise the piston will be disengaged.





- **Screw in ring screw** into the piston, attach the pile rope to it, and raise the piston approximately 5 cm (2 inches). Push down the pawl lever by hand and lower the piston until all piston rings are easily accessible.
- **Exchange piston rings** using the piston ring installing pliers found in the toolbox. Apply special grease to the new piston rings.
- **Apply the piston ring installing band.**
- **Raise the piston** carefully until the pawl can be inserted into the piston groove by pressing the pawl lever upwards.

WARNING!

Hold piston ring installing band in place to prevent it sliding down when piston slides into the cylinder.



- **Set down piston** onto the pawl, then remove the pile rope and ring screw.
- **Lower the piston** using the trip gear until it reaches the lower carrier.
- **Place the piston ring installing band** around the impact block. Slightly raise the hammer and remove the catch fork. Then slowly lower the hammer over the impact block, ensuring the piston ring installing band is not caught on the cylinder end ring. Stop the downward movement in time and remove the installing band.
- **Fit the inner rubber ring.**
- **Set down the cylinder lower part** on the cylinder end ring and screw in the assembly bolts.
- **Raise the hammer** so the cylinder end ring can be screwed on.
- **Remove the assembly plates.** Place the two-part rubber ring on the impact block flange. Lower the hammer and press the rubber ring into the dovetailed groove.
- **Fit the impact block securing clamp.** Remove the wedges from underneath the impact block.

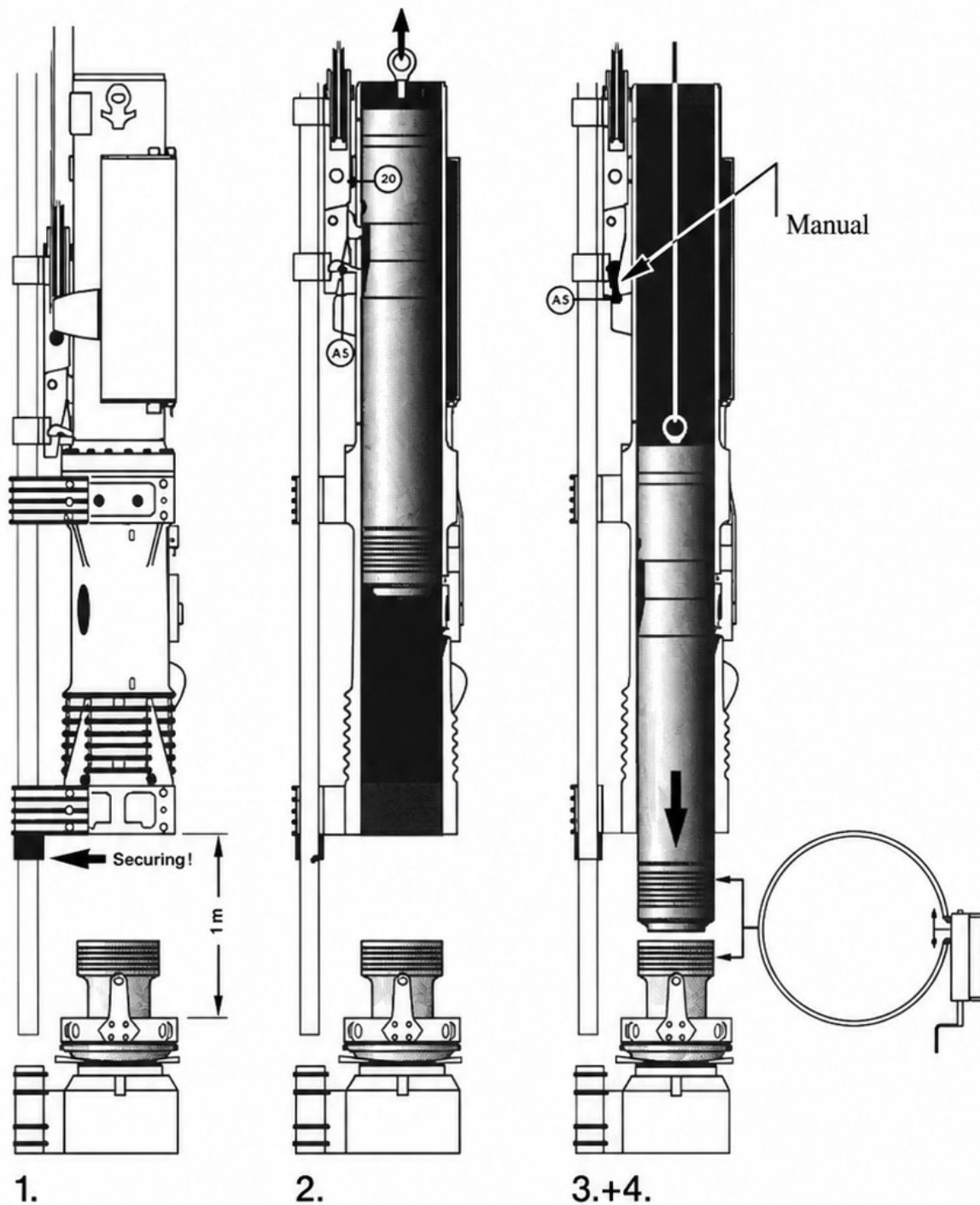


Fig. 19 – Changing Piston Rings (1)

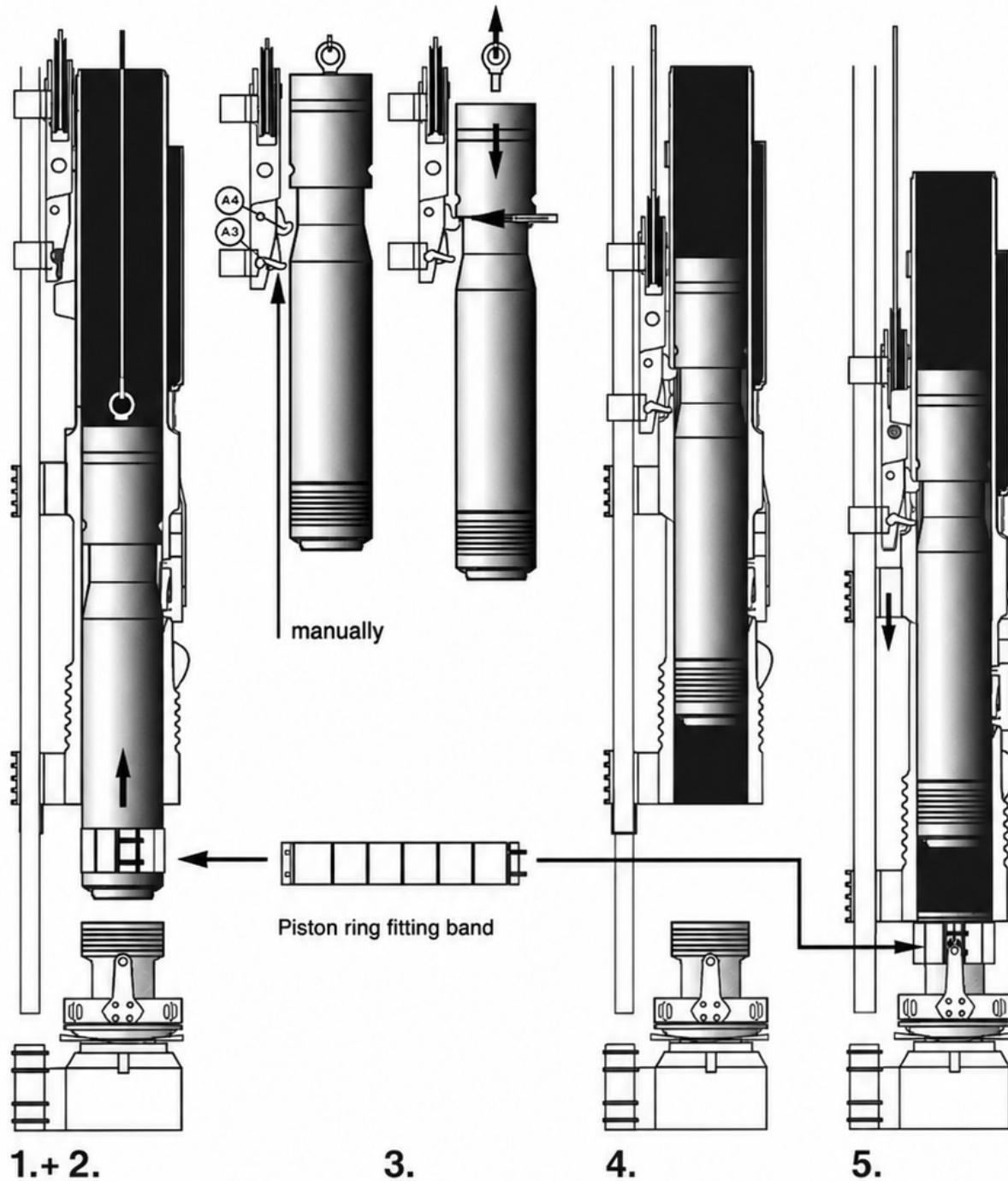


Fig. 20 – Changing Piston Rings (2)

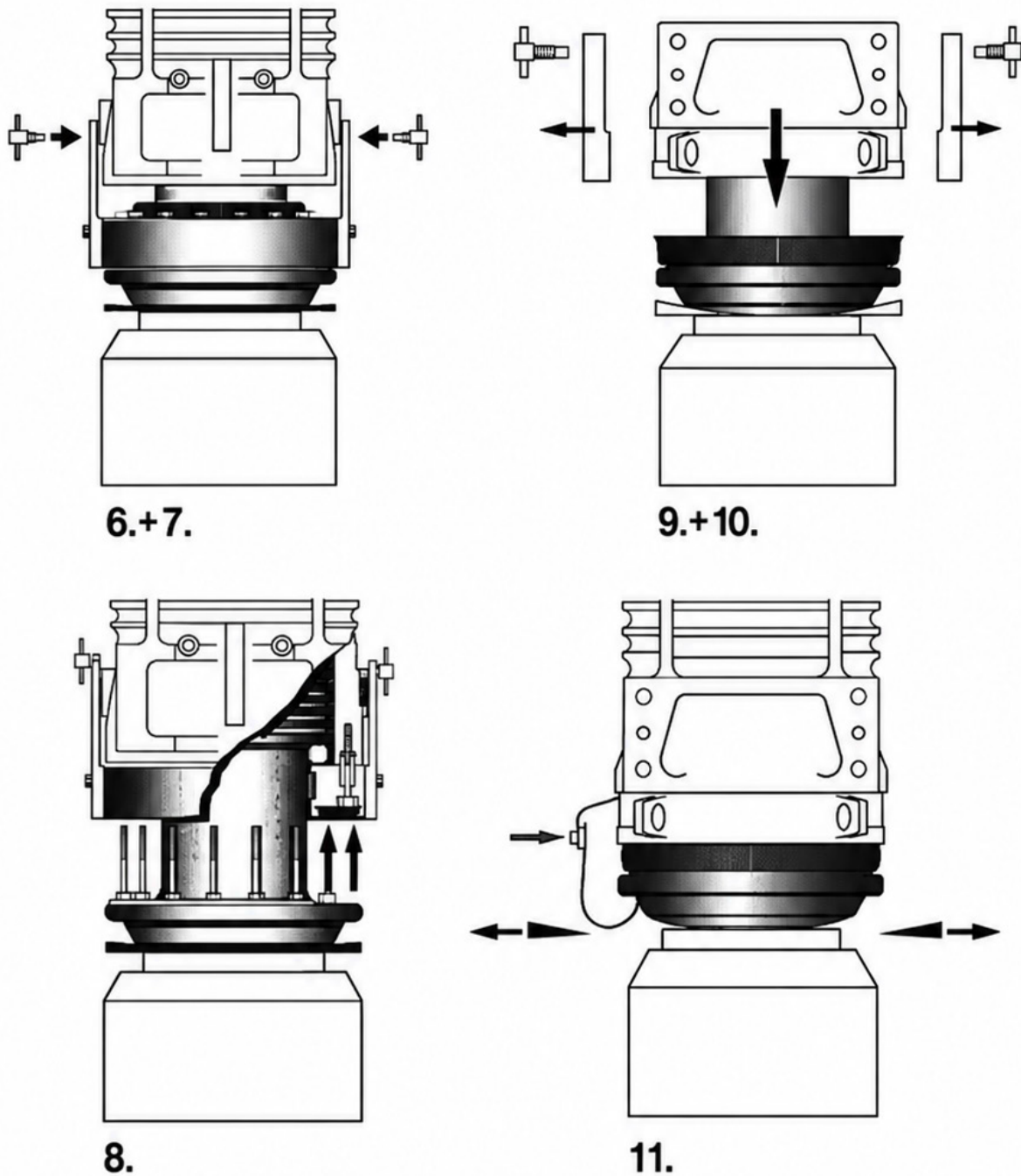


Fig. 21 – Changing Piston Rings (3)



8.10 Periodic table of maintenance operations

Maintenance work	Material	Maintenance interval							
		Daily prior to start-up	Daily after shut-down	*Every 20 minutes	Every hour	Every 2 hours	Once a week	Once a	When required
Tightening of all screws and bolts on the cylinder and ring and upper cylinder section, fuel control pump, lubricant pump, injection valve cover, guide sleeves and guide strips.		◆				◆			◆
Check for wear at guide sleeves for the Diesel hammer, guide strips of the tripping device and guides for the pile helmet.		◆							
Check for wear at damping rings.		◆							
Check for wear at wear strips on the leads. Weld a flat bar as reinforcement, when the thickness of the wear strips is less than 2 mm.		◆							
Check the opening mode of the tripping device.		◆							◆
Lubricate the wear strips on the leads.	Multipurpose grease containing MoS ₂	◆				◆			
*Lubricate the impact block and any cylinder end ring (generally 5 strokes per grease nipple with a grease gun, 10 strokes on heavy pile-driving work). Impact block must be in place.	LUB-D	◆	◆	◆					
Lubricate the tripping device (5 strokes per grease nipple with a grease gun).	LUB-D						◆		
Lubricate the upper cylinder section (10 strokes per grease nipple with a grease gun).	LUB-D	◆	◆		◆				

8.

Maintenance & Troubleshooting



Maintenance work	Material	Maintenance interval							
		Daily prior to start-up	Daily after shut-down	*Every 20 minutes	Every hour	Every 2 hours	Once a week	Once a month	When required
Check the degree of overlapping of the catch between the Diesel hammer and the tripping device over the whole lead length.		◆							◆
Check the reference value for the fuel control pump.									◆
Check the upper cylinder section for a uniform oil film.						◆			
Check all cables (driving cables, pile cables, pile helmet cables, pulling cables for fuel control pump and tripping device) for damage and replace if required.		◆							◆
Clean the fuel and lubricant filters.									◆
Clean the combustion chamber.		◆							◆
Clean the Diesel hammer and attached components.									◆
Disassemble and clean the fuel control and lubricant pumps.									◆
Replenish the fuel tank.	Add Fuel Oil	◆							◆
Replenish the lubricant tank (with each refilling of the gas tank)	Add Lubricating Oil	◆							◆



8.11 Troubleshooting

Regular Failure	Reasons of Failure	Elimination Methods
Diesel Hammer being unable to be started	Soil texture being soft, resistance force of piles being small	Set fuel pump to position "0" and conduct empty striking for several times on that pile Hammer
	External temperature is low	Set fuel pump to "0" and conduct empty striking for several times to improve the temperature of combustion chamber Adopt fuel oil containing much cetane
	Water in the combustion chamber	Dismantle locking screws of lower cylinder, close accelerator and conduct empty striking for several times, eliminate moisture inside the cylinder and then install locking screws properly
	Fuel oil having such impurities as water and dust	Release fully the fuel inside the fuel tank and add fresh fuel oil
	Fuel Supply System having air	Conduct venting for fuel supply system
	Oil filter blocking, fuel being unable to be supplied	Clean oil filter and pipeline and remove sundries
	Oil pump not supplying oil, being damaged and not work	Check and clean pump element inside oil pump and repair or replace the damaged components
	Air leakage due to over abrasion of piston ring of either piston or impact block, not reaching the required compression ratio or piston ring being fractured and snapped	Disconnect to conduct inspection and replace damaged or invalid piston ring
	injection valve complete blocking	Clean the injection valve complete



Regular Failure	Reasons of Failure	Elimination Methods
Operation of Diesel Hammer being abnormal	Fuel oil having impurities, the combustion being incomplete	Replace fuel oil
	Fuel oil having air	Conduct venting
	Oil line and filters blocking	Disconnect to clean
	Quantity of oil being too large, producing backfire (fire emitting at air outlet)	Decrease the position of delivery fuel pump
	Insufficient oil supply of fuel pump	Check the height dimensions of pump lever Clean pump element complete
	Temperature of cylinder being excessively high	Stop hammer immediately and lift upper piston to cool
	Insufficient lubrication	Check lubrication system
	Abrasion of piston, piston ring and cylinder being excessively large, causing air leakage and fuel oil being unable to burn completely	Replace piston ring Check piston and cylinder and replace if necessary
Sudden stop of Diesel hammer	No fuel oil	Fill up fuel oil
	Oil line blocking	Check oil line and remove sundries
	Oil pump being damaged	Check oil pump and replace damaged components
	Piston getting stuck	Check whether the piston ring is fractured or not and replace if necessary



Regular Failure	Reasons of Failure	Elimination Methods
Oil leakage for fuel pump, lubricating oil pump and oil Line	Joints being loose or sealing ring being damaged	Screw up joints and replace seal ring
	Weld joint of fuel tank vibrated and being fractured	Weld well fissure
	Oil pipe being damaged	Replace oil pipe
Collision sound inside Diesel hammer	Sundries falling into cylinder	Check and clean sundries and repair damaged parts
	Piston ring being fractured	Take out fractured piston ring, clean ring slot and replace piston ring
Piston jumping up too high	Quantity of oil injection being too much	Regulate quantity of oil supply and check oil pump
	Resistance force of piles being too great	Check whether degree of effective penetration exceeding stipulation and stop immediately if exceeding stipulation
Smoking around cylinder lower part	Cylinder lower part cracked	Replace cylinder lower part
	Bolts of oil injection vale complete and plug screw of cleaning hole not been screw up	Screw up fasteners
Smoking between Flange below cylinder lower part and impact block	Abrasion of piston ring on impact block being too great or fractured	Check and replace damaged piston ring
Malfunction of trip gear	Gap between guide clamp and guide rail being inappropriate	Check the guide clamp and if abrasion is too great, then it shall be replaced Check the guide rail and if abrasion is too great, then it shall be repaired



9.1 Warranty Period and Scope

If the customer follows all safety, operation, maintenance, transport, and lifting instructions provided, and the machine fails to operate properly due to a manufacturing defect within **six (6) months** from the date of delivery, the manufacturer will be responsible for repair or replacement of defective parts.

9.2 Exclusions

The warranty does not cover failures or damage resulting from the following:

- **Improper Geological or Site Conditions:** Equipment failure or damage caused by unsuitable soil conditions, geological formations, or pile-driving environments.
- **Failure to Follow Instructions:** Equipment failure resulting from not adhering to the safety, operation, or maintenance procedures in this manual.
- **Unauthorized Modifications:** Equipment failure caused by alterations to components or use of non-approved spare parts.



TECHNICAL DATA	Unit	D12	D16	D19	D25	D30	D36	D46	D50	D62	D80
PERFORMANCE DATA											
Batter piling degree	—	1:2	1:2/1:1	1:2/1:1	1:3/1:1	1:3/1:1	1:3/1:1	1:3/1:1	1:3/1:1	1:2/1:1	1:2/1:1
Impact weight (piston)	kg	1280	1600	1820	2500	3000	3600	4600	5000	6200	8000
Energy per blow	kNm	20.50–46.08	25.58–53.46	45.68–65.52	39.98–90.00	47.97–102.30	55.45–122.76	70.85–165.60	80.00–180.00	107.05–218.96	171.09–266.83
Blow rate	min ⁻¹	35–52	36–52	35–42	35–52	36–52	36–53	35–53	35–52	36–50	36–45
Max. explosion pressure on pile	kN	606	686	686	1304	1304	1695	1695	1770	1800	2600
Suitable pile weight	kg	5000	5000	6600	7500	9000	12000	16000	20000	25000	30000
Max. rope diameter (trip device)	mm	Ø20	Ø20	Ø20	Ø22	Ø22	Ø38	Ø38	Ø25	Ø38	Ø30
CONSUMPTION & CAPACITY											
Diesel oil (Max)	L/h	4.5	5.5	7.5	8	10	11.5	16	17.6	20	25
Lubricant oil (Max)	L/h	0.5	1	0.6	1	1	1.5	1.5	3	3.2	2.9
Diesel oil tank	L	24	32	32	67	67	89	89	83	98	155
Lube tank	L	6.5	9	9	19	19	17	17	20.9	31.5	32
WEIGHT											
Hammer approx.	kg	2735	3250	3550/ 3695	5330/ 5810	6030/ 6310	7990/ 8400	8990/ 8400	11400	11870/ 12280	16365/ 16905
Trip device approx.	kg	100	100	100	180	180	400	400	600	400	750
Package approx.	kg	11	11	11	20	20	31.5	31.5	45	72	135
Protection approx.	kg	15	15	15	23	23	25	25	25	34	220
Tool box approx.	kg	75	75	75	100	100	100	100	100	125	125
DIMENSIONS											
Length of diesel pile hammer (a/a1)	mm	4770	4730/ 5570	4865/ 5705	5450/ 6290	5450/ 6260	5470/ 6285	5470/ 6285	5560	5910/ 6910	6200/ 7200
Outer diameter of impact block (b)	mm	Ø440	Ø440	Ø440	Ø560	Ø560	Ø660	Ø660	Ø670	Ø710	Ø820
Overall dimensions measured over fastening screws of the guide jaws (c)	mm	560	560	560	780	780	880	880	900	828	1110
Width of diesel pile hammer (d)	mm	440	485	485	640	640	785	785	1002	800	890
Width for connection of guides (e)	mm	320	320	320	540	540	640	640	660	560	800
Center distance between hammer to pump protection (f)	mm	335	345	345	405	405	445	445	460	490	550
Center distance between hammer and guide screw (g)	mm	245	280	280	235	235	275	275	320	380	350
Horizontal width of hammer (h)	mm	610	665	665	715	715	848	848	880	970	1110
Centre distance from hammer to the lead guide (H)	mm	340	360	360	440	440	500	500	544	560	720
Centre distance of lead width (L)	mm	—	—	—	330 × (Ø70)		—	—	600 × (Ø102)		
NOTICE: With the development in technology, the above specifications may be subject to change.											



TECHNICAL DATA	Unit	D100	D128	D138	D160	D180	D225	D320	D400	
PERFORMANCE DATA										
Batter piling degree	—	1:5/1:1	1:3/1:1	1:3/1:2	1:3/1:2	1:3/1:2	1:3/1:2	1:3/1:2	1:3/1:2	
Impact weight (piston)	kg	10000	12800	13800	16000	18000	22500	32000	40000	
Energy per blow	kNm	333.54~ 213.86	417.00~ 250.20	461.00~ 295.00	544.00~ 331.84	610.00~ 384.30	766~ 377	1084~ 499	1320~ 760	
Number of blows	min ⁻¹	36~45	36~45	36~45	36~46	36~46	36~45	36~45	36~45	
Max. explosion pressure on pile	kN	2600	3600	3985	4600	5100	6340	7240	9600	
Suitable for driving piles up to	kg	40000	50000	70000	90000	100000	180000	212000	324000	
Max. rope diameter for trip device	mm	Ø30	Ø30	Ø30	Ø38	Ø38	Ø42	Ø45	Ø50	
CONSUMPTION & CAPACITY										
Diesel oil (Max)	L/h	30	36	39	45	54	68	96	112	
Lubricant oil (Max)	L/h	2.9	3.6	4	5	5	6.5	7.7	12	
Diesel oil tank	L	155	190	190	240	240	460	460	700	
Lube tank	L	32	60	60	80	80	100	150	150	
WEIGHT										
Hammer approx.	kg	19820/ 20360	23500/ 24320	25900	31200	34030	48000	66200	82700	
Trip device approx.	kg	750	750	750	1300	1300	2400	4000	6000	
Package approx.	kg	135	135	135	150	150	200	280	280	
Protection approx.	kg	220	220	220	220	220	280	280	320	
Tool box approx.	kg	125	125	125	125	125	125	125	125	
DIMENSIONS										
Length of Diesel pile hammer (a/a1)	mm	6358/ 7358	6663/ 7783	7983	7855	8365	8785	8950	9400	
Outer diameter of impact block (b)	mm	Ø820	Ø910	Ø910	Ø1045	Ø1045	Ø1235	Ø1330	Ø1330	
Overall dimensions measured over fastening screws of the guide jaws (c)	mm	1110	1210	1210	1260	1260	1460	1560	1560	
Width of Diesel pile hammer (d)	mm	890	1030	1030	1156	1156	1380	1500	1680	
Width for connection of guides (e)	mm	800	850	850	900	900	1100	1200	1300	
Center distance between hammer to pump protection (f)	mm	550	560	560	610	610	820	820	960	
Center distance between hammer and guide screw (g)	mm	350	370	370	440	440	465/565	465/610	550/650	
Horizontal width of hammer (h)	mm	1110	1220	1220	1420	1420	1690	1810	2120	
Centre distance from hammer to the lead guide (H)	mm	720	765	765	950	950	1060	1110	1110	
Centre distance of Lead width (L)	mm	600 x (Ø102)					600/900			

NOTICE: With the development in technology, the above specifications may be subject to change.



TECHNICAL DATA	Unit	D12	D16	D19	D25	D30	D36	D46	D50	D62	D80
PERFORMANCE DATA											
Batter piling degree	—	1:2	1.2:1	1.2:1	1.3:1	1.3:1	1.3:1	1.3:1	1.3:1	1.2:1	1.2:1
Impact weight (piston)	lb	2,820	3,530	4,010	5,510	6,610	7,940	10,140	11,020	13,670	17,640
Energy per blow	ft-lbf	14,800–33,150	18,900–39,400	33,700–48,350	29,500–66,400	35,400–75,500	40,900–90,500	52,200–122,100	59,000–132,800	78,950–161,420	126,160–196,780
Blow rate	blows/min	35–52	36–52	35–42	35–52	36–52	36–53	35–53	35–52	36–50	36–45
Max. explosion pressure on pile	lbf	136,200	154,200	154,200	293,000	293,000	380,800	380,800	398,000	404,800	584,500
Suitable pile weight	lb	11,000	11,000	14,550	16,530	19,840	26,450	35,270	44,090	55,120	66,140
Max. rope diameter (trip device)	in	Ø0.79	Ø0.79	Ø0.79	Ø0.87	Ø0.87	Ø1.50	Ø1.50	Ø0.98	Ø1.50	Ø1.18
CONSUMPTION & CAPACITY											
Diesel oil (Max)	gal/h	1.19	1.45	1.98	2.11	2.64	3.04	4.23	4.65	5.28	6.60
Lubricant oil (Max)	gal/h	0.13	0.26	0.16	0.26	0.26	0.40	0.40	0.79	0.84	0.76
Diesel oil tank	gal	6.3	8.5	8.5	17.7	17.7	23.5	23.5	21.9	25.9	40.9
Lube tank	gal	1.7	2.4	2.4	5.0	5.0	4.5	4.5	5.5	8.3	8.4
WEIGHT											
Hammer approx.	lb	6,030	7,165	7,825–8,140	11,750–12,810	13,300–13,910	17,615–18,520	19,820–20,720	25,130	26,170–27,090	36,085–37,290
Trip device approx.	lb	220	220	220	397	397	882	882	1,323	882	1,654
Package approx.	lb	24	24	24	44	44	69	69	99	159	298
Protection approx.	lb	33	33	33	51	51	55	55	55	75	485
Tool box approx.	lb	165	165	165	220	220	220	220	220	276	276
DIMENSIONS											
Length of diesel pile hammer (a/a1)	in	187.8	186.2–219.3	191.5–224.6	214.6–247.6	214.6–246.5	215.4–247.4	215.4–247.4	218.9	232.3–271.7	244.1–283.5
Outer diameter of impact block (b)	in	Ø17.3	Ø17.3	Ø17.3	Ø22.0	Ø22.0	Ø26.0	Ø26.0	Ø26.4	Ø28.0	Ø32.3
Overall dimensions measured over fastening screws of the guide jaws (c)	in	22.0	22.0	22.0	30.7	30.7	34.6	34.6	35.4	32.6	43.7
Width of diesel pile hammer (d)	in	17.3	19.1	19.1	25.2	25.2	30.9	30.9	39.4	31.5	35.0
Width for connection of guides (e)	in	12.6	12.6	12.6	21.3	21.3	25.2	25.2	26.0	22.0	31.5
Center distance between hammer to pump protection (f)	in	13.2	13.6	13.6	15.9	15.9	17.5	17.5	18.1	19.3	21.7
Center distance between hammer and guide screw (g)	in	9.6	11.0	11.0	9.3	9.3	10.8	10.8	12.6	15.0	13.8
Horizontal width of hammer (h)	in	24.0	26.2	26.2	28.1	28.1	33.4	33.4	34.6	38.2	43.7
Centre distance from hammer to the lead guide (H)	in	13.4	14.2	14.2	17.3	17.3	19.7	19.7	21.4	22.0	28.3
Centre distance of lead width (L)	in	—	—	—	13.0 × (Ø2.76)		—	—	—	23.6 × (Ø4.02)	
NOTICE: With the development in technology, the above specifications may be subject to change.											



TECHNICAL DATA	Unit	D100	D128	D138	D160	D180	D225	D320	D400	
PERFORMANCE DATA										
Batter piling degree	—	1.5:1:1	1.3:1:1	1.3:1:2	1.3:1:2	1.3:1:2	1.3:1:2	1.3:1:2	1.3:1:2	
Impact weight (piston)	lb	22,050	28,220	30,420	35,270	39,680	49,600	70,540	88,180	
Energy per blow	ft-lbf	245,965~ 157,675	307,360~ 184,620	340,160~ 217,450	401,430~ 244,270	450,250~ 283,350	565,170~ 367,140	799,480~ 450,370	974,640~ 561,210	
Number of blows	blows/min	36–45	36–45	36–45	36–46	36–46	36–45	36–45	36–45	
Max. explosion pressure on pile	lbf	584,500	809,300	895,300	1,033,300	1,146,800	1,425,700	1,798,000	2,157,600	
Suitable for driving piles up to	lb	88,180	110,230	154,320	198,420	220,460	396,830	467,410	714,400	
Max. rope diameter for trip device	in	Ø1.18	Ø1.18	Ø1.18	Ø1.50	Ø1.50	Ø1.65	Ø1.77	Ø1.97	
CONSUMPTION & CAPACITY										
Diesel oil (Max)	gal/hr	7.90	9.50	10.30	11.90	14.25	17.95	30.50	35.45	
Lubricant oil (Max)	gal/hr	0.77	0.95	1.06	1.32	1.32	1.72	2.03	3.17	
Diesel oil tank	gal	40.9	50.2	50.2	63.4	63.4	121.5	184.9	184.9	
Lube tank	gal	8.4	15.9	15.9	21.1	21.1	26.4	39.6	39.6	
WEIGHT										
Hammer approx.	lb	43,700/ 44,890	51,810/ 53,590	57,100	68,790	75,040	105,820	119,050	182,400	
Trip device approx.	lb	1,650	1,650	1,650	2,870	2,870	5,290	8,820	13,230	
Package approx.	lb	298	298	298	331	331	441	617	617	
Protection approx.	lb	485	485	485	485	485	617	705	705	
Tool box approx.	lb	276	276	276	276	276	276	276	276	
DIMENSIONS										
Length of Diesel pile hammer (a/a1)	in	250.3/ 289.7	262.3/ 306.4	314.3	309.3	329.3	345.3	352.8	370.1	
Outer diameter of impact block (b)	in	Ø32.28	Ø35.83	Ø35.83	Ø41.14	Ø41.14	Ø48.62	Ø52.36	Ø52.36	
Overall dimensions measured over fastening screws of the guide jaws (c)	in	43.70	47.64	47.64	49.61	49.61	57.48	61.42	61.42	
Width of Diesel pile hammer (d)	in	35.04	40.55	40.55	45.51	45.51	54.33	54.33	66.14	
Width for connection of guides (e)	in	31.50	33.46	33.46	35.43	35.43	43.31	47.24	51.18	
Center distance between hammer to pump protection (f)	in	21.65	22.05	22.05	24.02	24.02	32.28	32.28	37.80	
Center distance between hammer and guide screw (g)	in	13.78	14.57	14.57	17.32	17.32	18.31/22.24	20.08/24.02	21.65/25.59	
Horizontal width of hammer (h)	in	43.70	48.03	48.03	55.91	55.91	66.54	67.72	83.46	
Centre distance from hammer to the lead guide (H)	in	28.35	30.12	30.12	37.40	37.40	41.73	41.73	43.70	
Centre distance of Lead width (L)	in	23.62 × (Ø4.02)					23.62/35.43			

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