

Operating Instructions Diesel Hammers

D6 through D280

Hera Hammers
2e Havenstraat 6
1976 CE IJmuiden
The Netherlands

Telephone: + 31 (0)255-531844
Email: info@hera-hammers.com
www.hera-hammers.com

-
- 1. General information**
 - 2. Safety information**
 - 3. Technical data**
 - 3.1. Conversion factors
 - 3.2 Diesel hammer data (English unit)
 - 3.3 Sound emission values
 - 3.4 Exhaust / Emission information
 - 4. Transport**
 - 4.1. General preparation
 - 4.2. Lifting cables – ground support
 - 4.3. Possible cable damage
 - 5. Assembly and mode of operation**
 - 5.1 Components of diesel pile hammer
 - 5.2 Section view
 - 5.3 Operating principle
 - 5.4 Pile driving equipment – general inform.
 - 5.5 Diesel pile hammer conversion for driving batter piles
 - 5.6 Assembly and disassembly of the upper cylinder extension
 - 5.7 Safety devices
 - 6. Starting the Diesel hammer**
 - 6.1 Filling lubricant lines
 - 6.2 Assembly of pile and helmet cushion
 - 6.3 Guiding for the pile helmet
 - 6.4 Lifting the pile
 - 6.5 Mounting the diesel pile hammer into the lead system
 - 6.6 Tripping device: assembly
 - 6.7 Fuel supply –bleeding of fuel control pump and injection valves
 - 6.8 Cleaning of combustion chamber
 - 6.9 Start and control
 - 7. Pile driving instructions**
 - 7.1 General information
 - 7.2 Blow energy and regulation- mechanical and hydraulic controlled fuel pump
 - 8. Shutting down – storage**
 - 9. Maintenance**
 - 10. Servicing & Troubleshooting**

GENERAL INFORMATION

Thank you for choosing a our **Diesel Hammer**. This machine will provide the utmost reliability with a minimum of effort and maintenance on your part.

We appreciate your business and want to continue to deserve it.

YOU CAN RELY ON US !

Prior to assembly

These operating instructions must be read prior to assembly and prior to putting the unit into operation. The operating instructions must be stored at a safe place for later use. Confirm on the form enclosed in Appendix A4 that you have read and fully understood these operating instructions!

These operating instructions:

- must be used by anyone who assembles, converts, disassembles, operates, maintains or repairs a Diesel pile hammer
- simplify all work in connection with a Diesel pile hammer
- inform you about some basics of the operating mode and use of Diesel pile hammers
- help you with the required calculations
- contain important information for the safe and proper handling and operation of the Diesel pile hammer

The manufacturer will not accept any liability, if it is determined that these operating instructions were not read or ignored!

Inform the operators about the obligation to read the operating instructions.

Safety indicators

The following symbols are used in these operating instructions:

Please read these operating instructions carefully. The safety information must be observed!



Caution indicates a potentially hazardous situation which, if not avoided may result in minor or moderate injury



Warning indicates a potentially hazardous situation which, if not avoided could result in death or serious injury

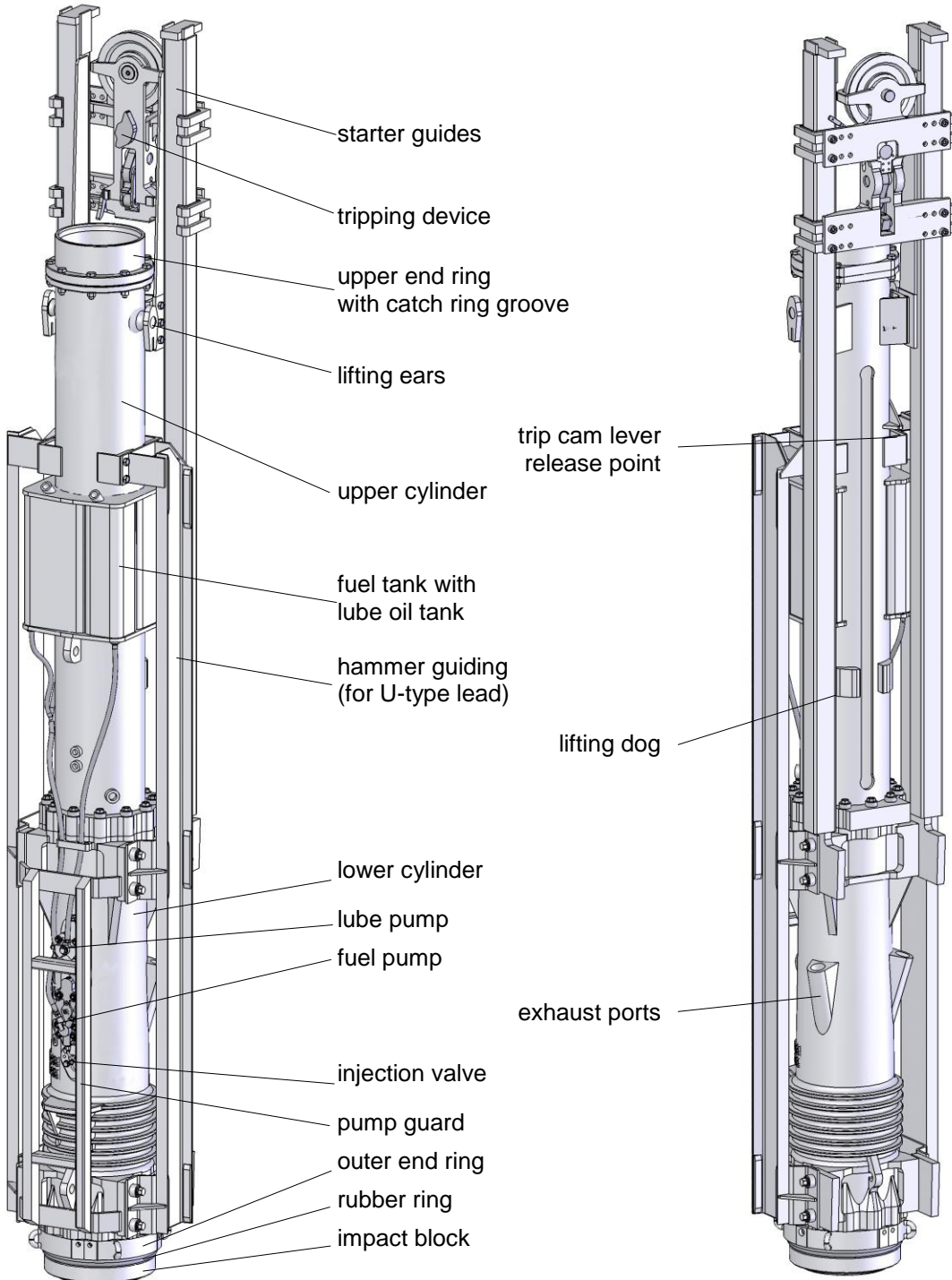


Danger indicates an imminently hazardous situation, which if not avoided will result in death or serious injury

General and special safety information is contained in Chapter 2 "Safety Regulations". Safety information relation to a specific handling step is shown prior to the description of this handling step.

Components of Diesel Pile Hammer

The picture below should make you familiar with the diesel hammer components to understand the following safety information correctly.



Important: We do not guarantee pile helmets, striker plates and cushion material !

2. Safety Regulations

The safety information is provided to keep the risk for workers and property as low as possible

2.1. Proper and improper use

The proper use of Diesel pile hammers is defined as the driving of suitable units into a supporting soil layer. Said units may be piles, pipes, sheet piles etc. that will not be

destroyed by the impact forces applied by the Diesel pile hammer.

All other uses such as the deforming or compacting of materials or the removal of piles constitute an improper use and are thus not permitted for safety reasons! Danger to life!



LIFT HAMMER WITH TRIP GEAR AGAINST THE LIFTING DOGS ONLY AS DESCRIBED IN OPERATING MANUAL. DO NOT LIFT TRIP GEAR AGAINST TOP OF THE STARTER GUIDES.



“WARNING: DO NOT LET TRIP REST ON THE LIFTING DOGS WHILE HAMMER IS OPERATING”

NEVER PLACE ANY PART OF THE BODY UNDERNEATH THE HAMMER. ALWAYS SECURE HAMMER BEFORE MOVING LEADS.

Attach warning notice supplied with hammer in good visible position on piling rig.



2.2. General Safety Information for the handling of the Diesel Pile Hammer.

Safety is basically a matter of common sense! There are safety regulations that must be observed at all times! Beyond that, each situation exhibits peculiarities that cannot always be indicated in the safety regulations! Always watch for safety risks and problems! Plan ahead and take care of problems as early as possible.

Please keep these operating instructions for Diesel pile hammers with the documents for the carrier equipment! Keep both at an easily accessible location! Inform the operators regarding the obligation to read these operating instructions and about the location where documentation is kept!

You must read every page of these operating instructions prior to handling the Diesel pile hammer. Observe the safety information and instructions when working with the Diesel pile hammer. A lack of the above may endanger your life and that of other persons!

The Diesel pile hammer shall be inspected prior to the first time that it is put into operation and then annually by an expert! Said thorough inspection must be carried out by persons that have participated in an extensive training program in our facilities. Such an expert inspection is also required after any structural change! The results of the inspections must be indicated in writing!

Prior to putting the unit into operation, it will be necessary to determine if the last expert inspection was carried out within the last 12 months.

Only properly trained and authorized personnel shall work with the diesel pile hammer



You must observe local safety regulations issued by the respective legislature or by unions and similar organizations! Take the necessary measures with respect to sound and vibration emissions occurring during the operation of the Diesel pile hammer.

Obstacles in the work and transport areas, the load capacity of the soil as well as the safety barriers for public traffic areas must be taken into account. It is particularly important to pay attention to changing weather conditions, wind, decreasing visibility and changing soil conditions! Stop work for critical conditions (e.g. storms!). Visibility must be sufficient to allow a proper operation of the pile-driving equipment by driver and operator without risking their lives and that of others! Lights must be used for work carried out under poor visibility conditions or in darkness. The lighting fixtures must provide a brightness of at least 100 lx for the work areas! For transports in darkness, moving equipment must be fitted with lights providing a distance light level of at least 10 lx (23 feet (7 meters) ahead of the equipment measured in the driving direction!) Keep a safe distance from

- Earth cables, water pipes, sewage water pipes and other pipes located below ground
- Overhangs, edges, slopes and unsafe soil!
- High-voltage overhead lines, phone lines and other overhead lines

Prior to beginning your work, ask the superintendent about the location of supply and disposal pipes and about the safe distances to be maintained!

All workers must be healthy and strong enough to meet the physical challenges! Under no circumstances shall a worker be allowed to work under the influence of drugs, alcohol, medications or similar!

SAFETY INFORMATION



Hard hat, safety gloves, safety boots and suitable work clothes must be worn at all times when working with the Diesel pile hammer. Reflective clothing shall be worn if conditions warrant this! This reduces the risk of injuries! Ear plugs should also be worn when operating the Diesel pile hammer! A permanent hearing impairment may result otherwise (See Chapter 4 "Technical Specifications" for Sound Emission Data).

The pile hammer must be fitted with at least two fire extinguishers! The fire extinguishers

- * must have a minimum capacity of 13 pounds (6 kg),
- * must be suited to extinguish oil and electric fires,
- * must be placed on the same side of the pile-driving equipment
- * shall not be placed in areas exposed to a high fire risk,
- * must be placed as close as possible to the operator and between the operator and the area with the greatest fire risk (at a very visible and easily accessible location for remote-controlled Diesel pile hammers),
- * must be attached such that they can be removed without tools!

Familiarize yourself with the location and handling of the fire extinguishers prior to beginning work!

Maintain a **minimum safe distance** of 13 feet (4 meters) from the units to be driven during the operation of the Diesel pile hammer! Make sure that only the excavator operator, operator and the foreman in charge of the pile-driving work move within an area of 1.5 times the lead height (or the height of the excavator/crane)! Close this area off, if required!

Please note that the mixture of fuel, exhaust gas, soot and air is at a high pressure blown out of the combustion chamber bolt opening when cleaning the combustion chamber! Maintain a safe distance and wear **safety glasses!** Danger of injuries!

Do not touch the Diesel pile hammer immediately after its operation! Danger of burns! Particularly the impact head, exhaust and components located adjacent to the combustion chamber must be allowed to cool for a sufficient period!

Diesel fuel and lubricants are very flammable and can explode under certain conditions! Diesel fuel, ether and lubricants must be handled carefully! Take appropriate measures to prevent a spilling, igniting, inhalation, swallowing as well as skin or eye contact with Diesel fuel, ether or lubricants! The work area of the Diesel pile hammer must always be well ventilated. Under no circumstances will smoking or other activities with open flames or sparks be allowed during fueling or in storage areas of Diesel fuel, ether and lubricants! Diesel fuel, ether and lubricants should never be stored in foodstuff containers! Danger to health (poisonous, caustic) and the environment!

Exhaust gases forming during operation are poisonous! Do not inhale exhaust gas! Danger to health!

Work on a Diesel hammer (maintenance, repair, converting...) shall be performed while the hammer is not running! The Diesel pile hammer must rest on the pile or ground or on the lower support device!

Avoid touching moving parts! Danger of injury!

Pay careful attention at any time for components that come loose and fall from the Diesel pile hammer, lead, impact head, pile guiding system or from the pile itself!

2.3. Safety information for the excavator operator

Use only excavators/leads/cranes that exhibit a sufficient load capacity for the Diesel pile hammer, pile helmet and the piles!

Make sure the accessories are safely stored away prior to converting the equipment! Secure all loose components! Keep the load as close as possible to the ground during the conversion stage! Drive very carefully on a rocky or slippery ground or on a slope!

You must personally make sure that nobody will be placed into a dangerous situation with the moving of the equipment! Seek the assistance of a helper! Accept signals from one person only! No co-driver, please!

Lights must be turned on in darkness or in low visibility conditions!

Observe traffic signs and rules when driving on public traffic areas!

Do not hold on to the steering wheel column, control console or operating levers when entering or leaving the vehicle! This may cause accidental motions! Danger of accidents!

Always work up or down a slope and not laterally to the slope! Prevent any actions that could cause the equipment to overturn! When the equipment nevertheless begins to overturn or slide laterally, it will be necessary to immediately lower the equipment and point the vehicle down the slope!

Keep the job site tidy! Danger of injuries!



Never exceed the maximum speed on a down slope! Always change – to a lower gear prior to reaching the down slope! You may lose control of the vehicle otherwise!

Never leave the driver's seat when the vehicle is still moving or the Diesel pile hammer is still in operation! Never leave the vehicle unattended with the motor running!

You must or must not do the following when you come into contact with a power line carrying a high voltage:

- Do not leave the vehicle
- Drive the vehicle out of the danger zone, if possible
- Warn other persons not to come closer to or touch the equipment
- Arrange for the power to be turned off
- Leave the vehicle only after the power has been turned off!

Familiarize yourself with the emergency exit through the front window!

Report all problems to the foreman in charge of the pile-driving work. Make sure the necessary repairs are carried out immediately!

Check the steel cables daily for wear and possible damage (see chapter 4.3) Worn and damaged cables have to be replaced immediately!

2.4. Safety information for the operator

Wear a hard hat, safety boots, safety gloves, ear plugs, safety glasses and suitable, possibly reflecting, work clothes when working with the Diesel pile hammer! This reduces the risk of injuries and prevents permanent hearing and eye damage!

Familiarize yourself with the operating instructions for the Diesel pile hammer and all of its accessories prior to putting the unit into operation! Make sure you have a complete set of operating instructions!

The Diesel pile hammer shall be operated only by trained personnel that have been authorized by the foreman in charge of the driving work!

Operate the Diesel pile hammer only when it is in safe working condition! Carry out a thorough inspection prior to putting the

2.5. Safety information for the foreman in charge of the pile driving work

The foreman in charge of the pile-driving work must have been trained with this unit and must be at least 18 years old. Provide the operator and excavator operator with information ensuring a safe execution of the work! You are responsible for safety and all events in the work area of the Diesel pile hammer!

Please familiarize yourself with the operating instructions for the Diesel pile hammer and all of its accessories prior to putting the equipment into operation!

The pile-driving work cannot be resumed with a defective unit! Inform the pile-driving personnel and the superintendent about the defects! Have the defects remedied prior to putting the equipment into operation! Make



equipment into operation! Make sure all warning signs are placed at the hammer and easy to read. Do not operate a Diesel hammer that is damaged or exhibits operating problems! Inform the foreman in charge of the pile-driving work about damages! All problems must be remedied prior starting the hammer.

You must take into account that the operation of the Diesel pile hammer causes blows, impact forces and vibrations in the whole pile hammer structure and in the immediate vicinity!

Never work under the Diesel pile hammer, lead or material to be driven! Avoid standing in the area, in which the material to be driven touches the ground! Make sure repairs are carried out only by trained experts!

Make sure your operating instructions are complete!

Make sure the equipment and associated attached units are inspected daily for obvious defects prior to putting them into operation! Make sure all warning signs are placed and readable Defects are found most often in the following components: -

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

sure only properly trained personnel carry out repair work! Do not operate the equipment until all defects have been fully

remedied Carry out a thorough inspection prior to putting the unit into operation.

Prior to putting the equipment into operation, you must make sure that nobody is on or below the equipment. Sound the horn to warn persons of the impending starting of the diesel hammer!



2.6. Assembly, conversion, disassembly, maintenance, repair

The Diesel pile hammer shall be inspected prior to the first time that it is put into operation and then annually by an expert! Said expert inspection must be carried out by persons that have participated in an extensive training program in our facilities.

Assembly, conversion, disassembly, maintenance and repair work shall be carried out only by qualified and authorized personnel!

The Diesel pile hammer must be shut off prior to carrying out any work on it! Danger to life!

Make sure another person cannot put the equipment into operation where work is carried out! Danger to life!

The following must be observed for repair and maintenance work.

You must take into account that the operation of the Diesel pile hammer causes blows, impact forces and vibrations in the whole pile hammer structure and in the immediate vicinity!

Never work under the Diesel pile hammer, lead or material to be driven! Avoid standing in the area, in which the material to be driven touches the ground.

- At least two persons must be present. Both must be familiar with the operating instructions and must know how to address safety questions!

- One person must be located at the main operating station to monitor the safety of the other persons! Said person must have access to an EMERGENCY switch (or shutoff cable for the fuel supply) in all situations!

- An uninterrupted communication must be possible between the involved persons!

- The work area must be fully lighted!

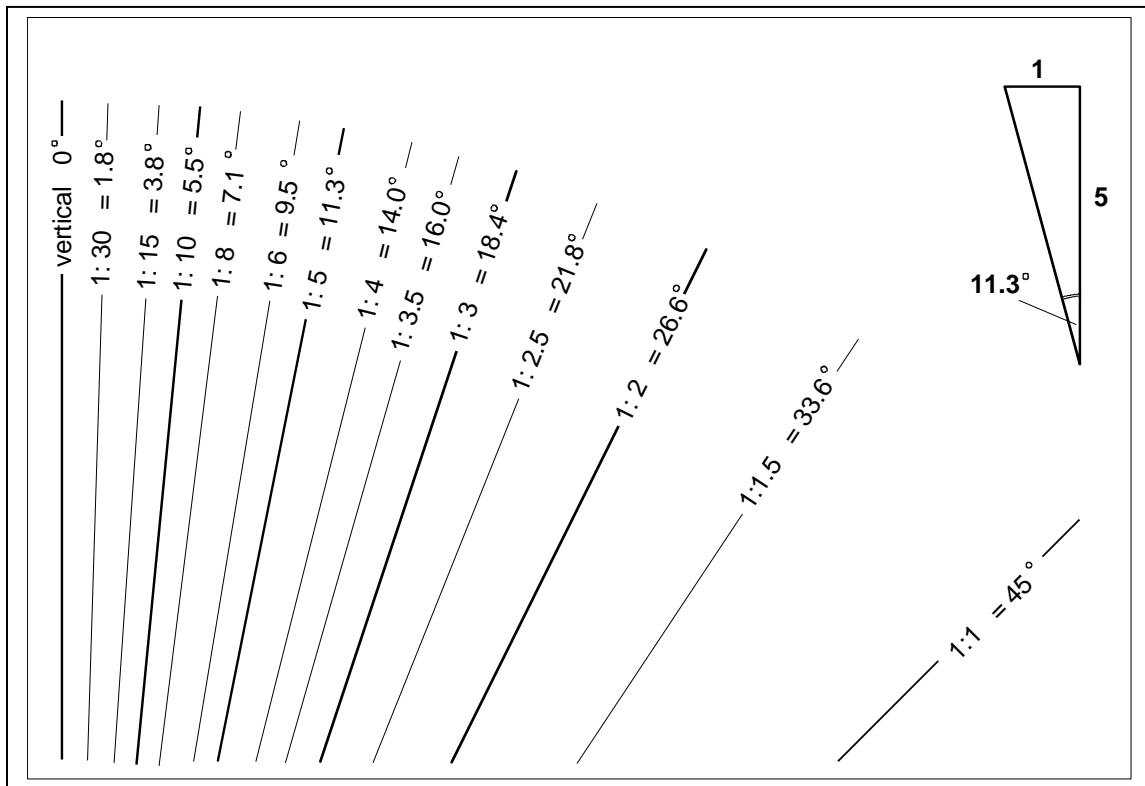
Maintenance and repair work can be carried out by one person only, when the pile hammer is completely shut off and all means to put it into operation are blocked!

TECHNICAL DATA

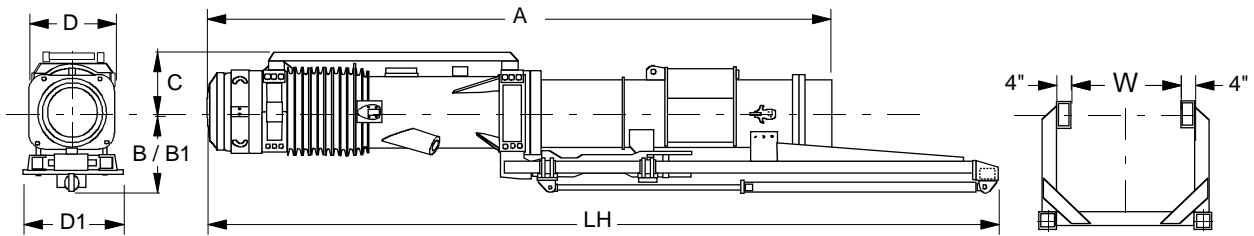
3.1. Conversion Factors

mass	1 t (metric)	=	1000 kg	1 kg	=	0.001 t (metric)
	1 t (metric)	=	1.102 t (US)	1 t (US)	=	0.9072 t (metric)
	1 kg	=	2.204 lbs	1 lbs	=	0.4536 kg
force	1 kN	=	102 kp	1 kp	=	0.0098 kN
	1 kN	~	220 Lbf (lb)	1 lbf	=	0.0045 kN
energy	1 Nm	=	0.102 kpm	1 kpm	=	9.81 Nm
	1 Nm	=	0.7375 ft.lbs	1 ft.lbs	=	1.356 Nm
distance	1 mm	=	0.0393 inch	1 inch	=	25.4 mm
	1 cm	=	0.3937 inch	1 inch	=	2.54 cm
	1 m	=	39.37 inch	1 inch	=	0.0254 m
	1 m	=	3.2808 ft	1 ft	=	0.3048 m
	1 m	=	1.0936 yd	1 yd	=	0.9144 m
area	1 cm ²	=	0.155 in ²	1 in ²	=	6.4516 cm ²
	1 ft ²	=	0.093 m ²	1 m ²	=	10.764 ft ²
volume	1 cm ³	=	0.061 in ³	1 in ³	=	16.38 cm ³
	1 l	=	1000 cm ³	1 cm ³	=	1.000 ml
	1 l	=	0.2642 gal	1 gal	=	3.785 l
	1 m ³	=	1000 l	1 m ³	=	264.17 gal

3.2. Angle conversion



3.3. Diesel Hammer data



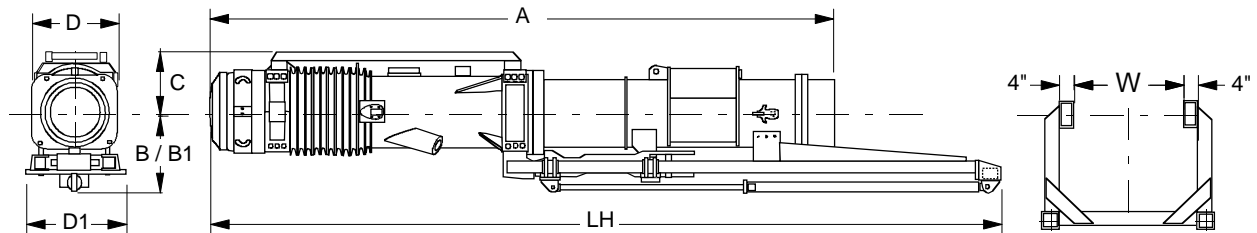
Model		D6-32	D8-22	D12-42	D19-42	D25-32	D30-32
App. piston weight	lbs.	1,320	1,770	2,820	4,015	5,515	6,615
Blows per min. ¹⁾							
Minimum	bl./min.	39	37	37	37	37	37
Maximum	bl./min.	52	52	52	52	52	52
Energy per blow ²⁾,							
Maximum	ft.lbs.	12,570	18,760	29,840	42,480	58,300	69,990
Minimum	ft.lbs.	7,090	9,480	15,100	21,510	29,510	35,435
Consumption ³⁾							
Diesel fuel	gal./hr.	0.96	1.00	1.2	2.00	2.11	2.64
Lubrication oil	gal./hr.	0.06	0.13	0.13	0.16	0.26	0.26
Capacity							
Diesel fuel	gal.	4.9	5.3	6.3	20.0	17.7	17.7
Lubrication oil	gal.	1.3	1.6	1.7	5.0	5.0	5.0
Weight ³⁾							
Hammer	lbs.	3,570	4,000	5,730	8,365	12,370	13,472
Hammer with standard guiding	lbs.	4,920	5,350	7,100	9,700	14,800	15,900
Dimensions							
A – Length	ft.	14.1	15.4	15.8	16.8	17.8	17.8
LH – Length , standard	ft.	18.0	19.0	19.2	19.2	21.3	21.3
– Length with hydr. start	ft.	-	-	-	-	22.5	22.5
B – Center to trip	inch	13.0	13.0	14.0	14.0	17.5	17.5
B1 – Center to trip cylinder	inch	-	-	-	22.0	24.0	24.0
C – Center to pump guard	inch	15.0	15.0	15.0	16.0	19.0	19.0
D – Width of hammer	Inch	18.3	16.5	19.0	19.5	25.0	25.0
D1 – Width of trip	inch	22.1	24.5	24.5	24.5	32.0	32.0
W – Min. lead width	inch	21	21	21	21	26	26

1) Depends on fuel pump setting, and kind of soil and kind of pile

2) Potential energy calculated by multiplying piston weight and stroke. The stroke of the ram is a result of the blow rate

3) Consumption and weights are approximate, weight of guiding depends on type and size

TECHNICAL DATA



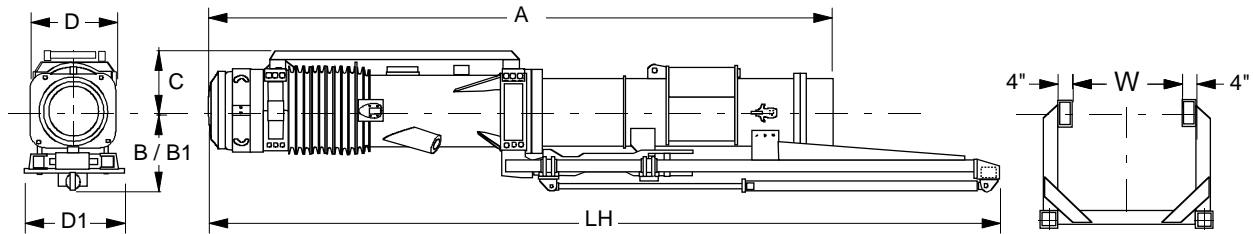
Model		D36-32	D46-32	D62-22	D80-23	D100-13	D125-32
App. piston weight	lbs.	7,940	10,145	13,670	17,640	22,045	27,560
Blows per min. ¹⁾							
Minimum	bl./min.	37	37	35	36	36	36
Maximum	bl./min.	52	52	50	45	45	45
Energy per blow ²⁾							
Maximum	ft.lbs.	83,950	107,280	161,640	197,150	246,390	308,025
Minimum	ft.lbs.	42,500	54,320	79,200	126,180	157,685	197,135
Consumption ³⁾							
Diesel fuel	gal./hr.	3.04	4.23	5.28	6.60	7.93	9.5
Lubrication oil	gal./hr.	0.39	0.39	0.53	0.68	0.68	0.95
Capacity							
Diesel fuel	gal.	23.5	23.5	25.8	40.9	40.9	50
Lubrication oil	gal.	4.5	4.5	8.3	8.4	8.4	15.8
Weight ³⁾							
Hammer	lbs.	17,375	19,580	27,077	37,275	44,894	53,616
Hammer with standard guiding	lbs.	19,900	22,100	29,300	41,200	48,800	-
Dimensions							
A – Length	ft.	18.3	18.3	22.6	23.6	24.1	25.5
LH – Length, standard	ft.	21.3	21.3	24.8	28.1	28.1	27.8
– Length with hydr. start	ft.	22.5	22.5	25.8	28.1	28.1	27.8
B – Center to trip	inch	19.0	19.0	20.0	26.0	26.0	28
B1 – Center to trip cylinder	inch	26.0	26.0	27.0	33.0	33.0	30.5
C – Center to pump guard	inch	20.5	20.5	25.5	23.0	23.0	22.5
D – Width of hammer	Inch	28.5	28.5	32.5	35.0	35.0	41.0
D1 – Width of trip	inch	37.0	37.0	35.5	47.5	47.5	47.5
W – Min. lead width	inch	32	32	32	42*	42*	42*

4) Depends on fuel pump setting, and kind of soil and kind of pile

5) Potential energy calculated by multiplying piston weight and stroke. The stroke of the ram is a result of the blow rate

6) Consumption and weights are approximate, weight of guiding depends on type and size

TECHNICAL DATA



Model		D138-32	D160-32	D180-32	D225-22	D250-22	D280-22
App. piston weight	lbs.	30,420	35,275	39,680	49,600	55,110	61,720
Blows per min. ¹⁾							
Minimum	bl./min.	36	36	36	36	36	36
Maximum	bl./min.	45	46	46	50	50	50
Energy per blow ²⁾							
Maximum	ft.lbs.	340,000	394,250	443,500	564,930	631,300	700,625
Minimum	ft.lbs.	217,600	241,470	271,650	292,780	331,870	365,060
Consumption ³⁾							
Diesel fuel	gal./hr.	10.2	11.9	13.1	16.9	19.0	21.2
Lubrication oil	gal./hr.	0.95	1.32	1.32	1.53	1.53	1.53
Capacity							
Diesel fuel	gal.	50	63	63	121.5	121.5	121.5
Lubrication oil	gal.	15.8	21.1	21.1	26.4	26.4	26.4
Weight ³⁾							
Hammer	lbs.	57,360	68,785	75,700	99,840	106,560	113,506
Hammer with standard guiding	lbs.	64,000	74,500	82,600	108,215	115,000	121,880
Dimensions							
A – Length	ft.	25.9	25.8	26.4	26.6	27.1	27.3
LH – Length , standard	ft.	27.8	25.8	25.8	30.0	30.6	30.8
– Length with hydr. start	ft.	27.8	25.8	25.8	30.0	30.6	30.8
B – Center to trip	inch	30.5	33.7	33.7	39.1	39.1	39.1
B1 – Center to trip cylinder	inch	31.0	33.7	33.7	39.1	39.1	39.1
C – Center to pump guard	inch	22.5	24.5	24.5	33.0	33.0	33.0
D – Width of hammer	Inch	41.0	45.5	45.5	53.1	53.1	53.1
D1 – Width of trip	inch	47.5	51.2	51.2	52.7	52.7	52.7
W – Min. lead width	inch	42*	48*	48*	54*	54*	54*

7) Depends on fuel pump setting, and kind of soil and kind of pile

8) Potential energy calculated by multiplying piston weight and stroke. The stroke of the ram is a result of the blow rate

9) Consumption and weights are approximate, weight of guiding depends on type and size

3.4. Sound emission

The amount of noise produced when driving piles with a Diesel pile hammer depends on several factors:

1. Explosion and exhaust noise

The explosion and exhaust noise is not, as often supposed, the main source of noise. A noise reduction mantle would reduce the overall sound level only a very small degree. The installation of a noise reduction mantle also inhibits proper escape of the exhaust gases and, therefore, reduces the fresh air supply for scavenging. This would impede the proper function of the pile hammer.

2. Noise generated by the piston hitting the impact block.

This noise is inside the lower cylinder of the hammer, so it is not the main source of noise.

3. Noise generated by impact block hitting the pile helmet.

This is where the main noise develops. It can be reduced to a large extent by using a very "soft" pile helmet cushion.

4. Noise generated by the pile helmet hitting the piles.

This is another main source of noise. In order to soften the impact it is necessary to use a soft cushion here, too, so that a reduction of noise can be achieved.

5. Noise generated from the piles themselves.

By taking the above-mentioned measures the structure-borne noise generation of the piles can be diminished considerably. Of course, the noise development also depends on the kind of piles used. If steel piles are used, the noise development will be higher than for concrete piles. Moreover the soil conditions have an effect on the generation of noise. If the soil is rocky, arid, or hard, there will be more vibration of the piles than if the soil consists of coarse clay.

For the above reasons it is impossible to predict the exact noise level for a particular construction site

The noise levels measured when pile driving with a Diesel pile hammer is actually somewhat higher than the noise levels generated by alternate methods of pile installation: rotary drilling, percussion drilling or construction of diaphragm walls,

But when examining the noise on a construction site, it is important to compare the noise level in relation to the duration of the noise. If this is done, the noise irritation caused by a Diesel pile hammer will be the relatively insignificant.

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

Diesel Hammer Type	Sound pressure level dB(A) at distance from hammer	
	7m (13 ft)	300m (984 ft)
D6-32	100	73
D8-22		
D12-42	102	76
D16-32	106	79
D19-42		
D25-32	110	84
D30-32		
D36-32	111	85
D46-32		
D62-22	114	86
D80-23	116	88
D100-13	119	92
D125/D138	n.a.	n.a.
D160/D180	n.a.	n.a.
D225~D280	n.a.	n.a.

Screening the diesel pile hammer and the pile was not very successful because the

pile hammer performance decreased because of the fouling of the air supply.

Screening steel pipe pile and helmets reduced the sound pressure somewhat, but was uneconomical.

3.5. Exhaust emission

For diesel hammers a reliable quantitative exhaust research does not exist. Following reasons don't allow any warranted statement:

the fuel consumption depends on the driving conditions

the fuel burning depends on the climate conditions

exactly measurements under jobsite conditions require a huge effort and measurement results will be falsified by imperfect conditions

Calculated emission values based on fuel consumption are theoretical and don't consider any driving conditions neither climate nor fuel combustion conditions.

For an estimate of exhaust emission below is given a table with calculation results based on the fuel consumption.

Diesel hammer type	Energy Output range (kW)	NMHC + Nox (g/kWh)	CO (g/kWh)	PM (g/kWh)
D6-32	22	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
D8-22	24	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
D12-42	27	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
D16-32	30	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
D19-42	45	7.5 (5.6)	5.5 (4.1)	0.6 (0.45)
D25-32	48	7.5 (5.6)	5.0 (3.7)	0.4 (0.30)
D30-32	60	7.5 (5.6)	5.0 (3.7)	0.4 (0.30)
D36-32	69	7.5 (5.6)	5.0 (3.7)	0.4 (0.30)
D46-32	96	6.6 (4.9)	5.0 (3.7)	0.4 (0.30)
D62-22	120	6.6 (4.9)	5.0 (3.7)	0.4 (0.30)
D80-23	151	6.6 (4.9)	3.5 (2.6)	0.2 (0.15)
D100-13	181	6.6 (4.9)	3.5 (2.6)	0.2 (0.15)
D125-32	220	6.6 (4.9)	3.5 (2.6)	0.2 (0.15)
D138-32	250	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)
D160-32	288	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)
D180-32	325	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)
D225-22	372	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)
D250-22	415	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)
D280-22	450	6.6 (4.8)	3.5 (2.6)	0.2 (0.15)

More environmental fuel types are suitable as replacement for diesel fuel with minor reduction of diesel hammer performance (see enclosure A2). Attention is required in some case for the specification of the lubrication oil and additional maintenance.

4. Transport of Diesel hammer

! WARNING !

4.1. General preparation

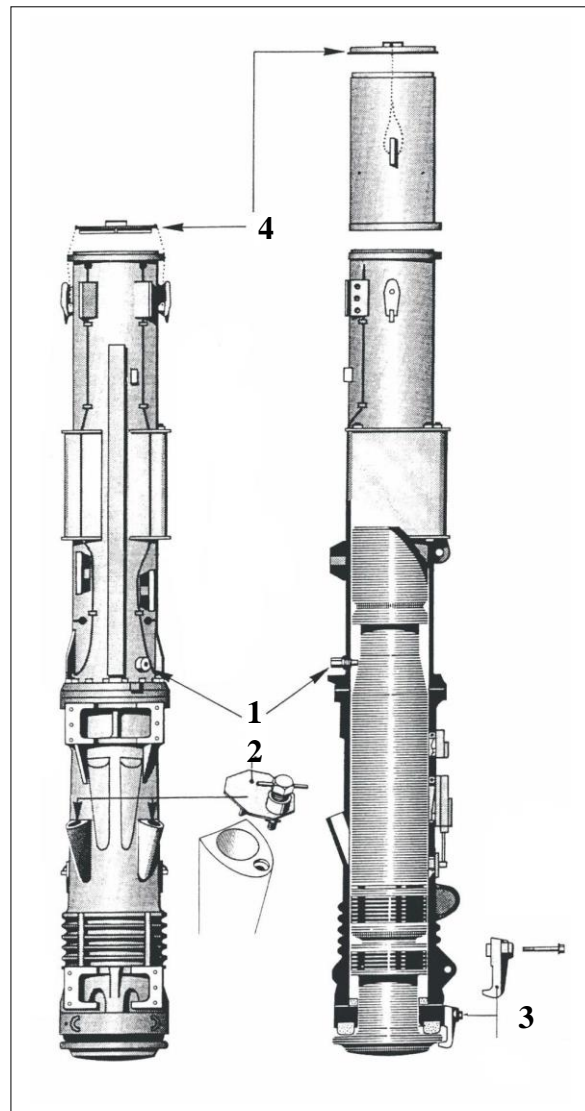
The Diesel pile hammer shall only be transported with an installed locking screw (1) and impact block clamp (3). If this is omitted, a shift in the center of gravity could cause sudden movements of the Diesel pile hammer! The piston and impact block may accidentally crash to the other end position! Crushing and impact danger!

The Diesel pile hammer and its accessories must be packaged, loaded and transported carefully to prevent damage! Check the Diesel pile hammer and all accessories regarding completeness and damages after delivery! Immediately notify the shipping agency or the appropriate dealer about problems!

The following transport safety devices must be installed prior to transporting the Diesel pile hammer

1 Locking screws. These piston locking screws prevent moving of the piston during transport. This prevents sudden shifts in the center of gravity of the Diesel pile hammer. Omitting the installation of these bolts may cause sudden movements as well as damages, e.g. to the catch ring! The piston safety screws must be screwed in fully and tightened! The piston must be in lowered position! Two piston safety bolts must be used for types D80-23 through D100-13

2 Exhaust cover. The exhaust covers (2) pieces; 4 pieces for type D80 and above) prevent the entering of water, dust and foreign bodies. Screw the exhaust covers into the respective thread fitted at the exhaust



3 Impact block clamp. The impact block clamp prevents a moving of the impact block during transport. Without the impact block clamp, the impact block may accidentally fall to the other end position! Install the impact block clamp as shown in the illustration

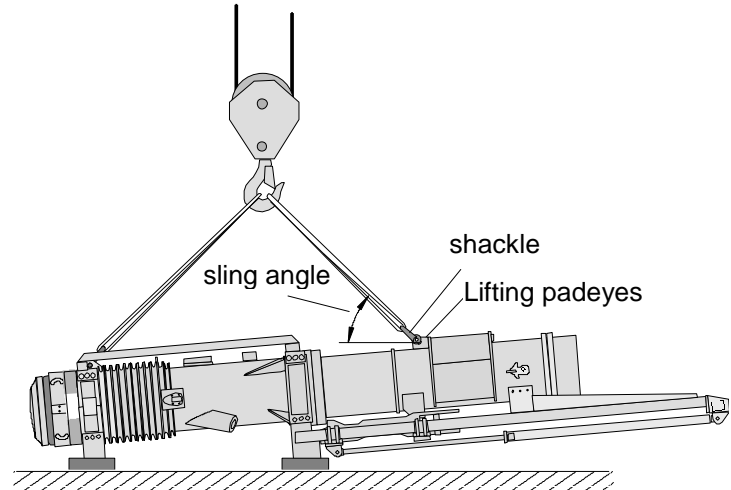
4 Protective cap. The protective cap prevents the entering of water, dust and foreign bodies. Attach the protective cap with the help of the two chains. Attach the hook located at the end of each chain to the respective eyelet.

TRANSPORT

4.2. Lifting cables and ground support



Prior to each use, the transport cables must be inspected visually. Use only approved cables to transport piles! Immediately remove and dispose of damaged cables (cable damage in accordance with DIN 15020, Sheet 2, Pages 5-4)! Use only steel cables that exhibit the proper load capacity and length. (see table below)!



Never walk under suspended loads! Danger to life!

Minimum required cable diameters for lifting the diesel hammer (based on maximum safe working for wire rope slings)










Type of diesel pile hammer	Max. total weight (lbs.)	2 steel cable at sling angle sling diameter in (inch)	approx. min. sling length (ft)	Shackle size	Eyelet Diam.	
D6-42	5100	1./2" at 45°	5.75	17 ton	1.97"	
D8-22	5350					
D12-42	7100	9./16" at 45°				
D19-42	9700	5./8" at 45°	6.25			
D25-32	14800	7./8" at 45°				
D30-32	15900					
D36-32	19900	1" at 45°	6.75			
D46-32	22100					
D62-22	29300	1-1./8" at 45°	7.75			
D80-23	41200	1-3./8" at 45°	9.00	25 ton	2.44"	
D100-13	48800					
D125-32	53600	1-1./2" at 45°	10.00			
D138-32	64000					
D160-32	68800	1-3./4" at 60°	15.00		40 ton	3.22"
D180-32	82600					
D225-22	113000	2-1./8" at 60°				
D250-22	119800					
D280-22	126700					

Make sure that the ground for laying down the diesel hammer is even and level !
If you don't set down the diesel hammer to a concrete slab area, use 3" thick wood planks to prevent the hammer sinking into the ground or tipping over!

**You must wear a hard hat, safety gloves, safety boots and suitable work clothes!
Danger of injuries!**



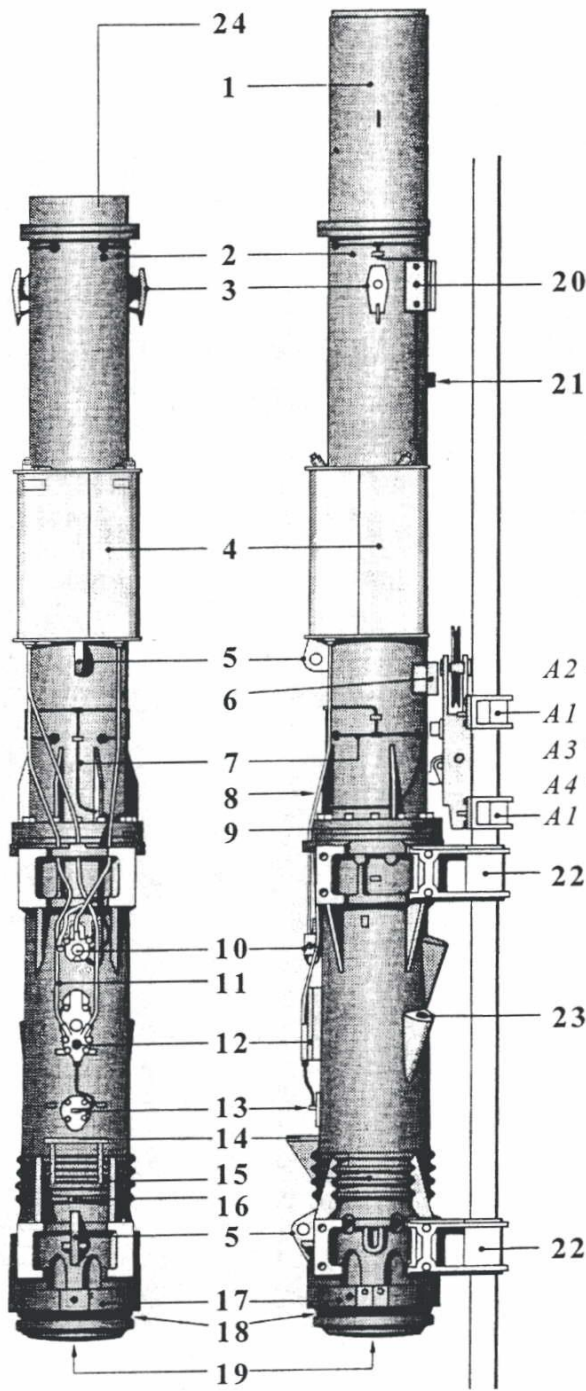
4.3. Possible cable damage

	<p>Flattening caused by rolling over flattening causes increased wire rope breaks which leads the rope to taken out of service</p>
	<p>Constrictions Replace steel cables exhibiting strong constrictions! Possible cable damage</p>
	<p>Knots Replace the steel cable, when many knots have formed</p>
	<p>Breakouts or "contracted loops" Replace rope</p>
	<p>Breaks and Kinks Replace cable</p>
	<p>Corkscrew-like configuration Replace the steel cable, when X (see illustration) is larger than or equal to 1/3 of the cable diameter at the worst damage location!</p>
	<p>Basket formation Steel cable must be replaced even when it exhibits only a small basket formation !</p>
	<p>Loop formation Replace the cable, when the loop formation of individual wires causes a substantial change in the cable structure</p>
	<p>Loosening of individual wires Replace the cable, when loose wires were caused by rust or wear. When the loosening effect is caused in another hammer, a decision regarding the replacing of the cable must be made on the basis of the wire breaks that are sure to follow.</p>

ASSEMBLY & MODE OF OPERATION

5. Assembly and Mode of Operation

5.1. Components of Diesel Pile hammer

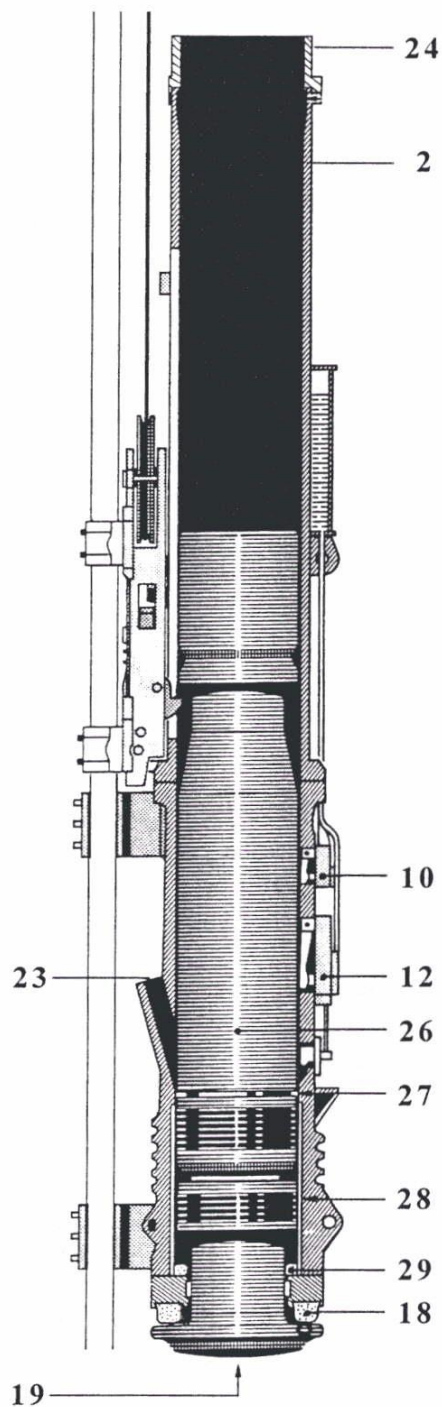


- 1 – upper cylinder extension with catch ring groove
- 2 – upper cylinder
- 3 – lifting ears
- 4 – fuel tank with integrated lube oil tank
- 5 – Lifting padeyes
- 6 – lifting dogs
- 7 – lubrication lines
- 8 – locking screw (piston)
- 9 – trip cam lever engaging point
- 10 – lubrication pump
- 11 – fuel / breather line
- 12 – fuel control pump
- 13 – injection valve
- 14 – pump guard
- 15 – lower cylinder

- 16 – blow out plug
- 17 – outer cylinder end ring
- 18 – rubber ring
- 19 – impact block
- 20 – key plate bolts
- 21 – trip cam lever release point
- 22 – hammer guides (offset version)
- 23 – exhaust ports
- 24 – flange with catch ring groove

- A – tripping device
- A1 – guide gibs
- A2 – lever for activating driving pin
- A3 – driving pin
- A4 – trip cam lever

5.2. Section View of Diesel Pile hammer



- 2 – upper cylinder
- 10 – lubrication pump
- 11 – fuel ventilation line
- 12 – fuel control pump
- 18 – rubber ring
- 19 – impact block
- 23 – exhaust ports
- 24 – upper endring with catch ring groove
- 26 – piston
- 27 – piston catch ring
- 28 – cylinder sleeves
- 29 – inner damping ring

ASSEMBLY & MODE OF OPERATION

5.3. Operating principle

Diesel pile hammers are used to drive piles into a supporting soil layer. The mode of operation is similar to that of a hammer used to drive a nail.

The piston activates the pump lever during its fall. The Diesel fuel is in that manner sprayed onto the surface of the impact block (1). The air in the cylinder is compressed as soon as the piston runs past the exhaust openings. The strongly increasing compression pressure drives the piston and the impact head below it on the material to be driven.

The following occurs when the hammer impacts (2):

- The pile is driven into the soil
- The Diesel fuel is atomized

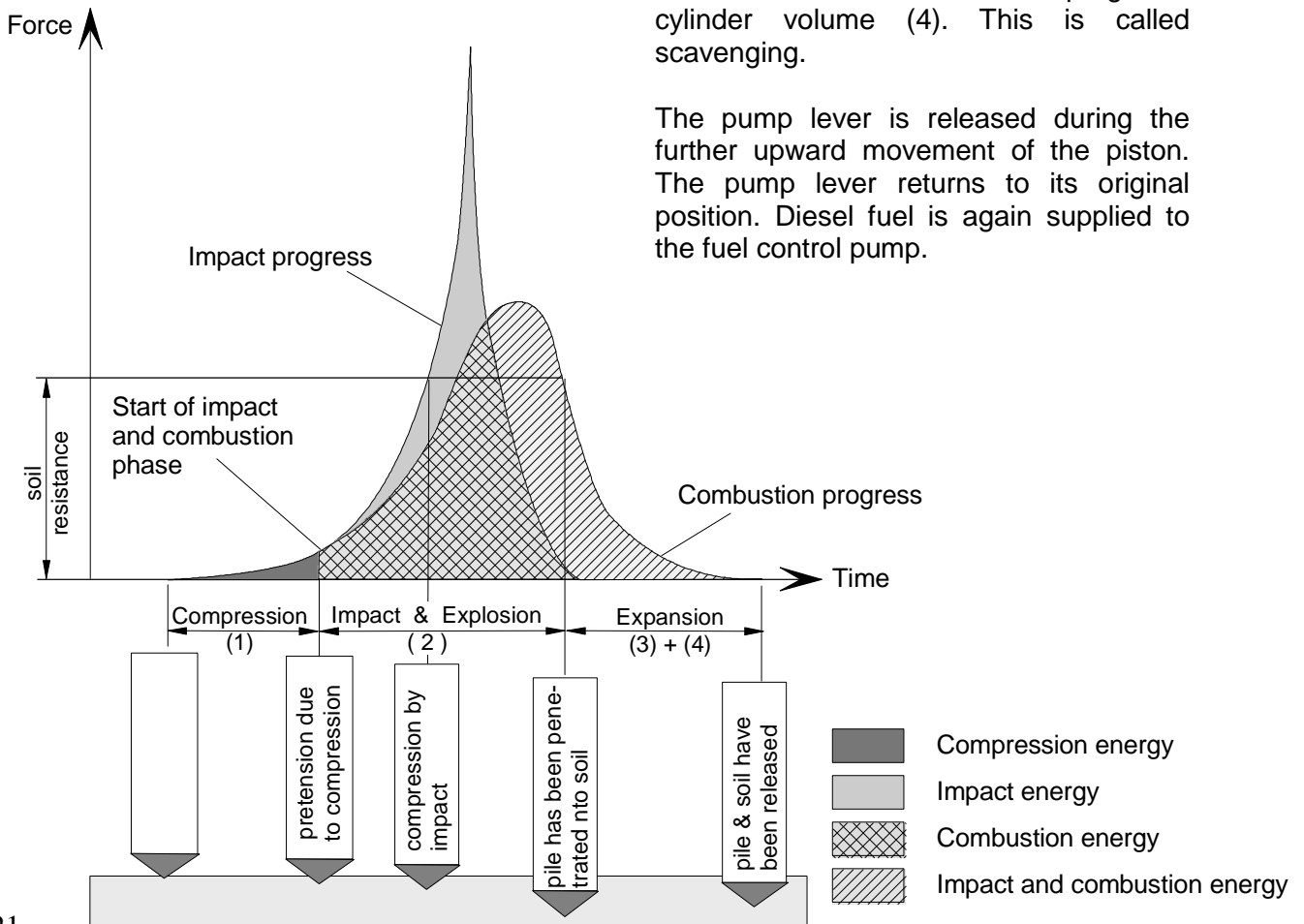
The atomized Diesel fuel ignites, because the enormous compression causes a substantial increase in the air temperature of the cylinder volume (working principle of the Diesel engine). There is an explosion. The explosion causes the following:

- It drives the pile further into the soil,
- The piston is driven upward (stroke).

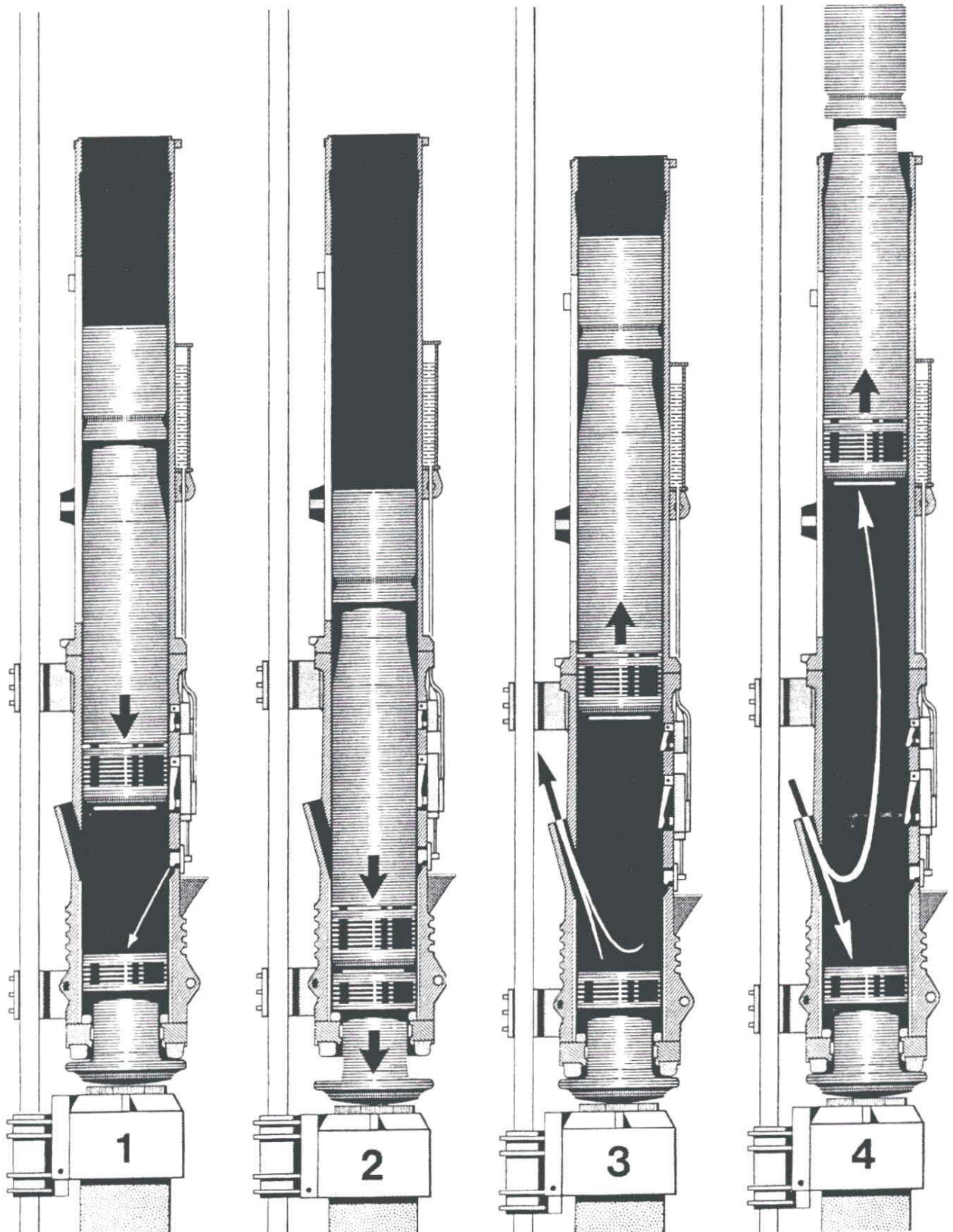
The exhaust openings become exposed with the upward driving of the piston. The pressure in the cylinder volume causes the exhaust gases to be pushed through the exhaust (3). This reduces the pressure in the cylinder to zero.

The piston continues to move upward. This causes a suction effect (vacuum) in the cylinder volume. Said vacuum ensures that fresh air is suctioned in to purge the cylinder volume (4). This is called scavenging.

The pump lever is released during the further upward movement of the piston. The pump lever returns to its original position. Diesel fuel is again supplied to the fuel control pump.



ASSEMBLY & MODE OF OPERATION



5.4. Pile driving equipment – general information

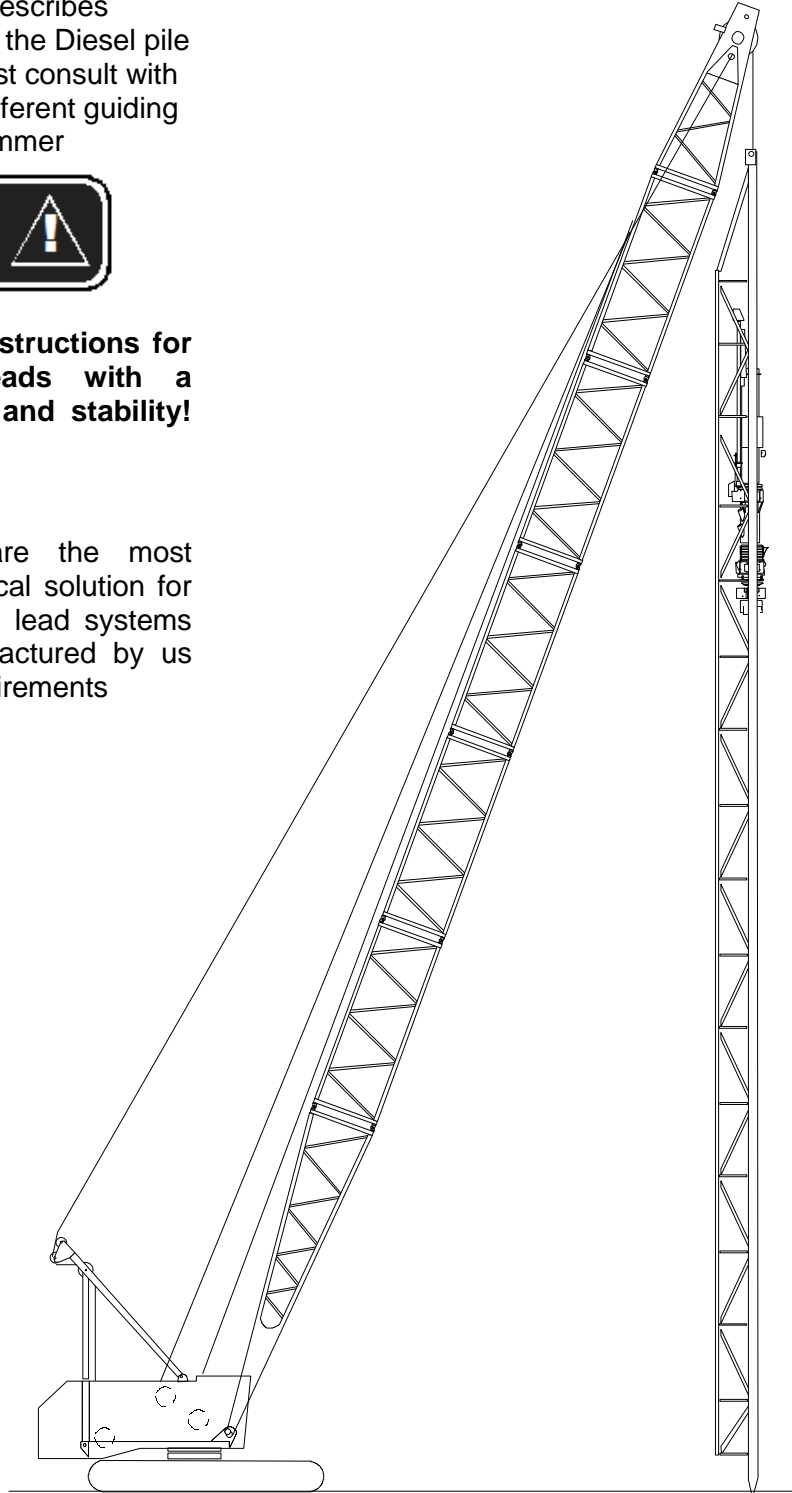
5.4.1. Leadsystems - guiding options

The following indicates and describes different possibilities to guide the Diesel pile hammer with a lead. You must consult with us should you decide on a different guiding system for the Diesel pile hammer

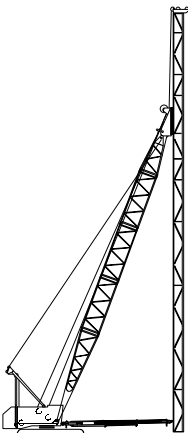
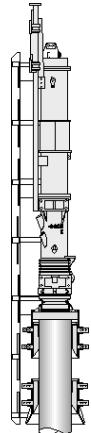
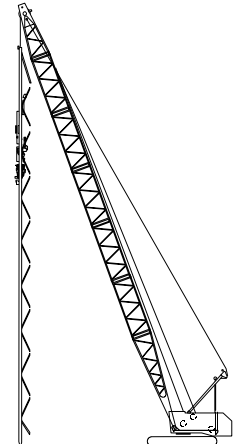
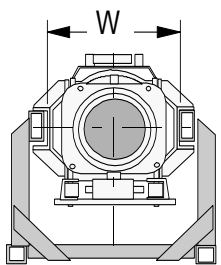
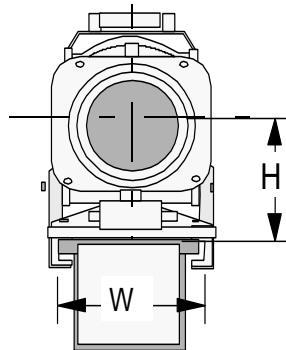
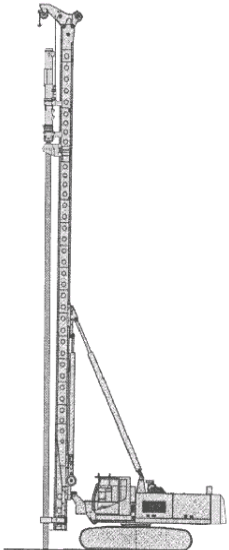


Following the operating instructions for the lead! Use only leads with a sufficiently high capacity and stability! Danger to life!

U-type lead systems are the most common and most economical solution for pile driving, Different U-type lead systems (see following page) manufactured by us accomplish different job requirements



ASSEMBLY & MODE OF OPERATION

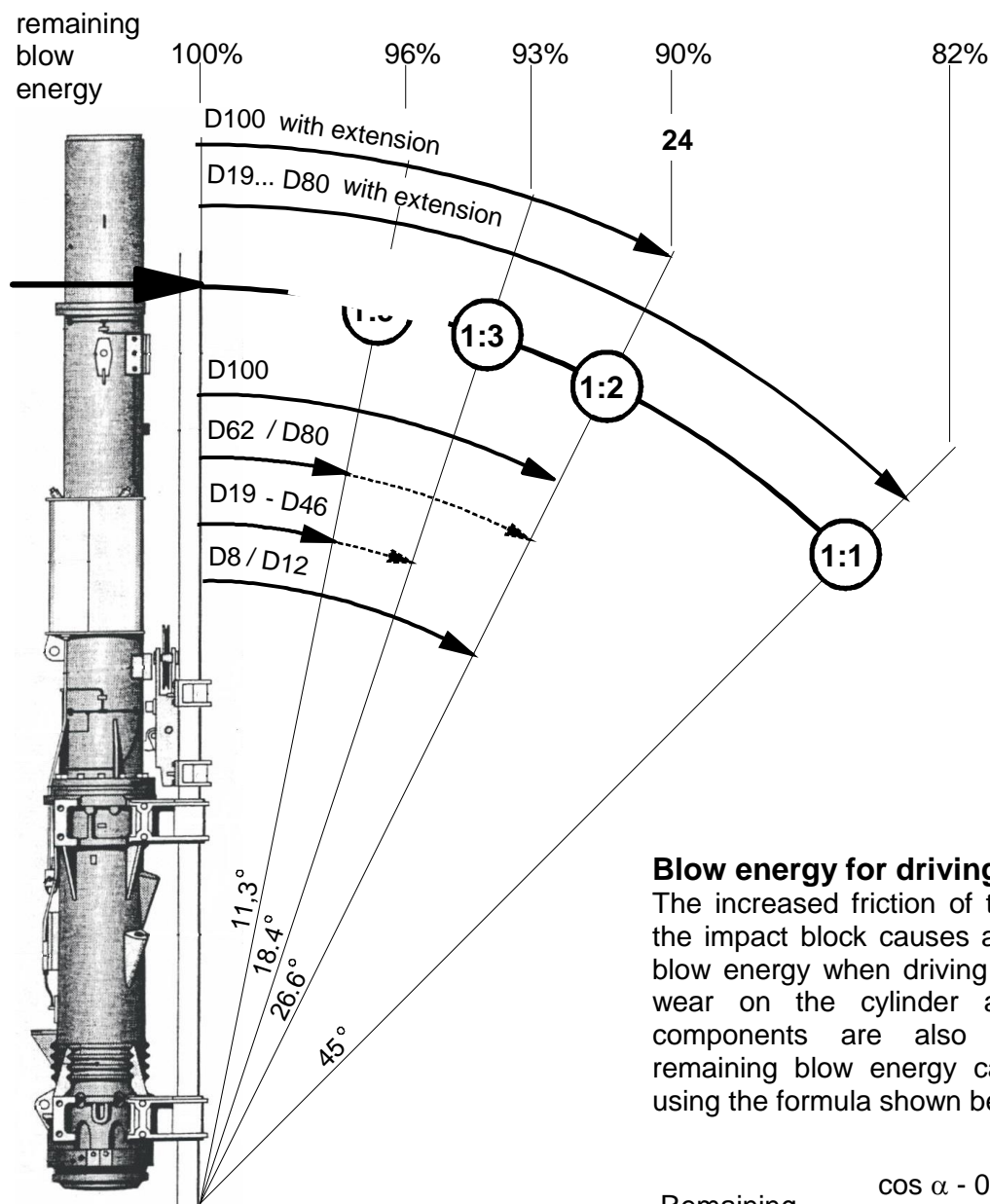
U-type lead systems			
			
Fixed lead	Caisson type or Offshore lead		Swinging lead
	Type	W inch	max. suitable diesel hammer size
standard U-leads	U21 U26 U32 A104-36 A104-42 A104-48 A104-60	21-1/2 26-1/2 32-1/2 42-1/2 48-1/2 54-1/2 66-1/2	up to D19 up to D30 up to D62 up to D100 up to D125 up to D125 up to D160
Box lead or Pogo lead - type			
	Standard distance H from the center of the diesel pile hammer to the front edge of the guide		
European style lead or drilling rig masts - hammer guiding is adaptable to various lead dimensions and lead profiles - starting device is directly guided at the lead profile	Type of Diesel pile hammer	H inch	
	D6-42 D8-22 D12-42 D19-42 D25 / D30-32 D36 / D46 -32 D62-22 D80 / D100-13 D125/D138-32 D160/D180-32 D225/D250-22 D280-22	15 15 15 15 17-3/8 19-5/8 19-5/8 26 32 40 40 40	

5.5. Diesel pile hammer conversion for driving of batter piles

Driving batter piles with a larger inclination than shown below requires an upper cylinder extension. This upper cylinder extension replaces the upper end ring with a catch groove bolted to the upper cylinder.

- Is the available hammer suited for the required batter
- Is it necessary to install the upper cylinder extension
- Is the blow energy still at sufficient level

Calculate the required batter prior to putting the equipment into operation. Check the following points using the diagram below:



$$\text{Remaining blow energy} = \frac{\cos \alpha - 0.1 * \sin \alpha}{\cos \alpha + 0.1 * \sin \alpha} \times 100$$

5.6. cylinder extension Assembly and Disassembly of the

When required, the upper cylinder section of diesel pile hammers D19-42 through D100-13 can be extended. For these Diesel pile hammers, such an extension is required for a batter of more than 1:5.



Conversion work can be carried out only on a safely supported diesel pile hammer in the lower position in the lead, resting on the material to be driven!

Use a height safety device to prevent a fall when climbing up the lead!

Conversion work shall only be carried out by qualified and authorized personnel!

Hard hat, safety boots and suitable work clothes must be worn! A life vest must be worn when working above a water surface!



Work stages:

1. Disassemble the upper end ring (24)! To do so, unscrew all hexagonal bolts of the upper end ring! Remove the upper end ring by lifting it upward!
2. Install the supplied extension for the upper cylinder section (1)!
3. Bolt the extension of the upper cylinder section (1) to the upper cylinder section (2)! Use the bolts of the upper end ring. Solidly tighten the bolts (bolt torque values see chapter 10.3 "Screwed / bolted connections")!

Replace missing or damaged bolts or nuts with new ones!

4. Install the supplied extension for the lubricant line!

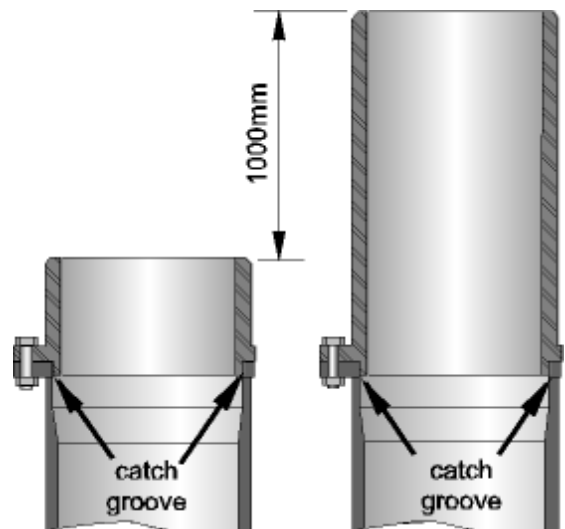
The disassembly of the extension is the reverse of the above!



Diesel pile hammers D12-42 through D100-13 shall be operated only with an installed upper end ring or extension of the upper cylinder section!

If the upper end ring is not mounted the piston can jump out of the cylinder when overstroking. – **DANGER TO LIFE !**

The catch groove designed with the upper ending or the upper cylinder extension is the point where the the piston catch ring can snap in to prevent falling out.



ASSEMBLY & MODE OF OPERATION

5.7. Safety devices

5.7.1 Bridle

Unless a legislative body specifically asks for a certain type of safety device, the Diesel pile hammer can be secured by other means such as a bridle.

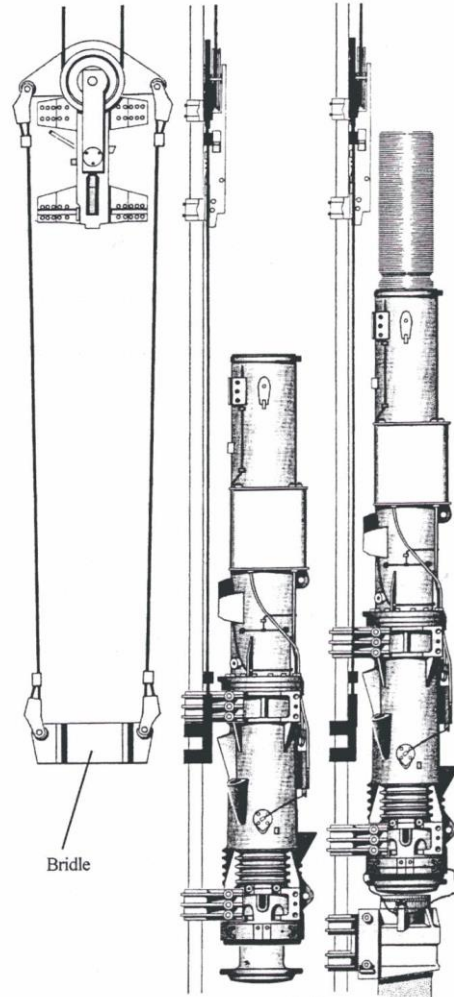
For small hammers up to the D8 exists a solution which connects the tripping device with the upper hammer guiding clips, where a safety bridle like shown is not needed.

! WARNING !

The bridle should never be used to lift the Diesel pile hammer! The Diesel pile hammer should only be moved upward using the tripping device! This is the only way to ensure safe conditions for the Diesel pile hammer!

The bridle must be positioned approximately at the center between the upper and lower guide prior to putting the Diesel pile hammer into operation. The

bridle must be adjusted continuously to match the driving progress. The bridle will be destroyed otherwise!



STARTING THE DIESEL HAMMER

6. Starting the Diesel hammer



Carefully read and follow Chapter 3 “Safety measures” prior to putting the unit into operation!

All installation work required to put the unit into operation must be carried out by qualified and authorized personnel!

6.1 Filling of lubricant lines with oil



The lubricant lines of the lubricant system must always remain filled with lubricant! Otherwise, the Diesel pile hammer will be supplied with the lubricant only after some time has passed! This will damage the Diesel pile hammer!



You must wear a hard hat, safety gloves, safety boots and suitable work clothes! Danger of injuries!

The lubricant lines of the lubricant system must be replenished prior to the first putting-into-operation and after repairs to the lubrication system:

1. Lay the Diesel pile hammer down in a horizontal position (see chapter 4 “ ”)
2. Remove the lubricant lines from the lubricant pump (note: D80 through D100 have two (2) lubricant pumps). To do so, loosen the lubricant clamps! Subsequently pull the lubricant lines from the connection fitting!

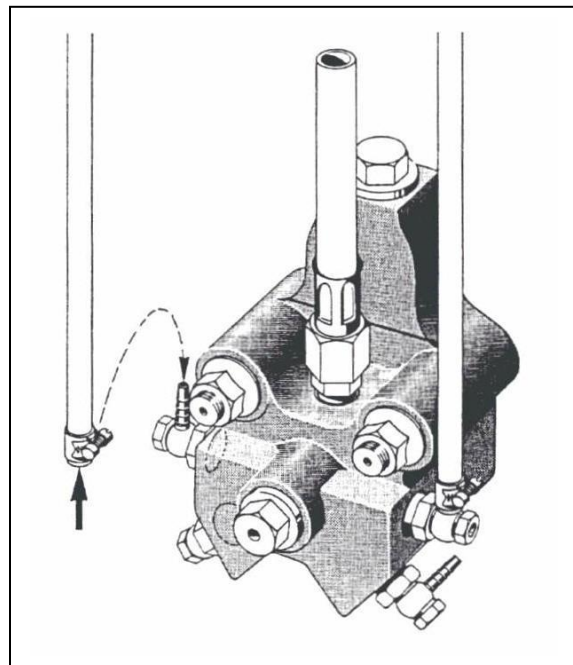
3. Fill the lubricant lines with motor oil using a squirt can (EO 20, 40 or 50 as a function of the application temperature; see Chapter 11 “Maintenance”)! Keep on filling the lubricant lines from the bottom with oil, until oil exits at all connection nozzles!

4. Push the lubrication lines back on the respective connection fittings!

5. Tighten the lubricant clamps again! Make sure all lubricant lines are solidly attached to the connection fittings (retighten, if necessary).

6. Put the Diesel pile hammer into a vertical position (See Chapter 5 “Transport”)!

7. Check the lubricant level in the lubricant tank! The tank must be full!



Use motor oil SAE 20W or SAE 40W for lubrication or see chapter 9 for special cases

STARTING THE DIESEL HAMMER

6.2 Assembly of pile helmet cushions

The pile helmet cushion transfers the impact from the impact block to the material to be driven. A targeted assembly can dampen the impact to a certain degree (See Appendix A3 "Reduction factors for different pile helmet cushions").

We recommend a combination plate pile cushion material for several sizes consisting from:

- 1/2" aluminum cushion
- 1" phenolic cushion
- 1/2" aluminum cushion

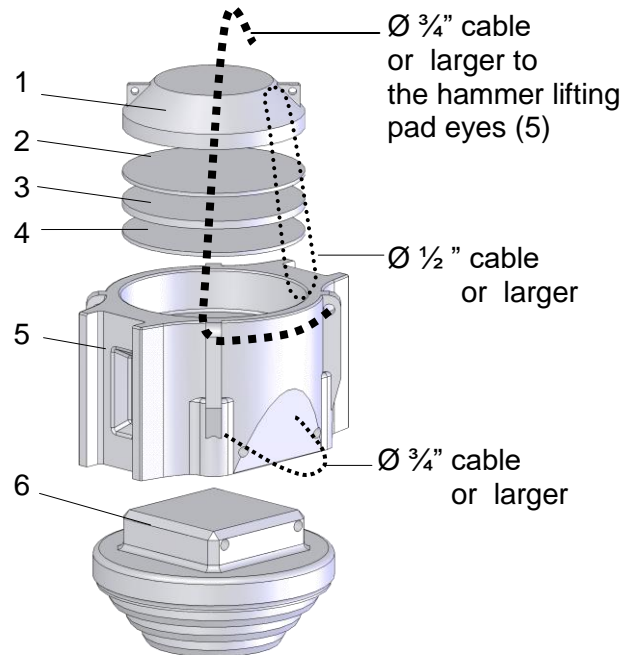
The function of the aluminum plate is taking out the heat from the phenolic cushion plate caused by the impact.

Assembly

1. Place the pile helmet cushion of the desired arrangement in the pile helmet. Different cushion material has different dampening properties. Please consult us if you intend to modify the cushion material.
2. Set the steel striker plate on top of the cushion. Keep attention that the contact area of the cushion plate is flat and not bowed, otherwise your cushion material will wear out rapidly!
3. Guide the supplied cable section through the striker plate padeyes and the padeyes of the helmet.
4. Tighten the cables and secure them with a suitable cable clamp!
5. If using a primary helmet set the required pile insert in the receptacle.
6. Slide the helmet or primary helmet in the lead and attach to the diesel hammer like shown.

Typical Helmet assembly:

- 1- striker plate
- 2- 1/2" aluminum cushion
- 3- 1" phenolic cushion
- 4- 1/2" aluminum cushion
- 5- primary helmet
- 6- helmet insert for desired pile type



! WARNING !

All bolted connections must be tight! Loose bolts can cause serious injuries and property damage!

An incorrect attachment of the pile helmet cushion with the steel cable at the pile helmet can cause the striker plate and cushion to fall out! Danger of an accident!

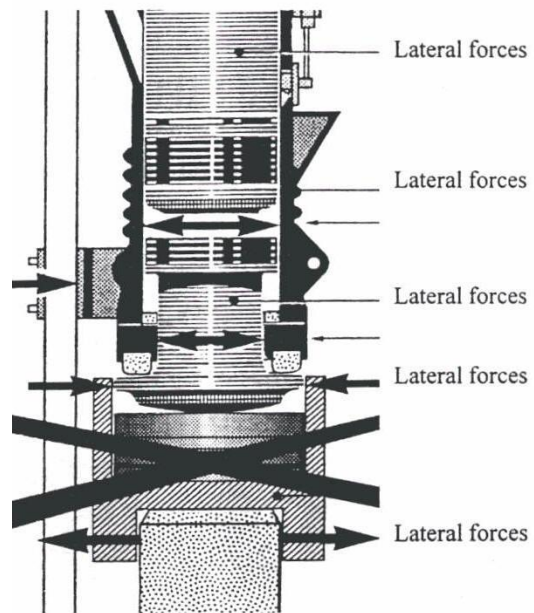
6.3 Guiding for the pile helmet

STARTING THE DIESEL HAMMER

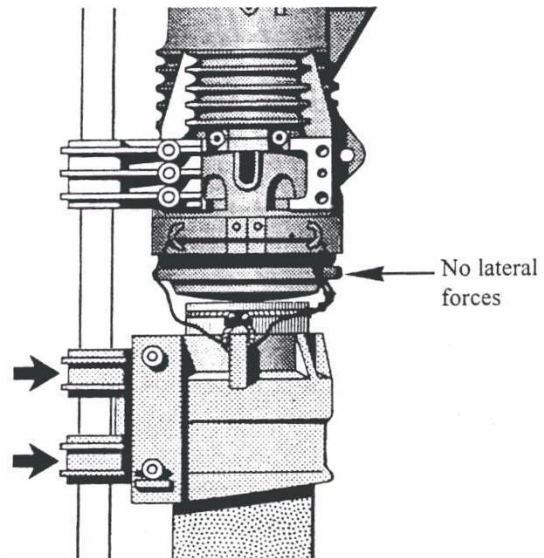


Always guide the pile helmet at the lead and never at the impact block of the Diesel pile hammer!

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



INCORRECT
(Lateral forces cause damage)



CORRECT
(Guided at the lead)

STARTING THE DIESEL HAMMER

6.4 Lifting of piles

! WARNING !



Follow the operating instructions of the carrier equipment!

Use only approved steel cables in accordance with Chapter 4.2 "Transport cables"!

Observe the following information to prevent an overturning of the unit and damage to the lead and material to be driven!

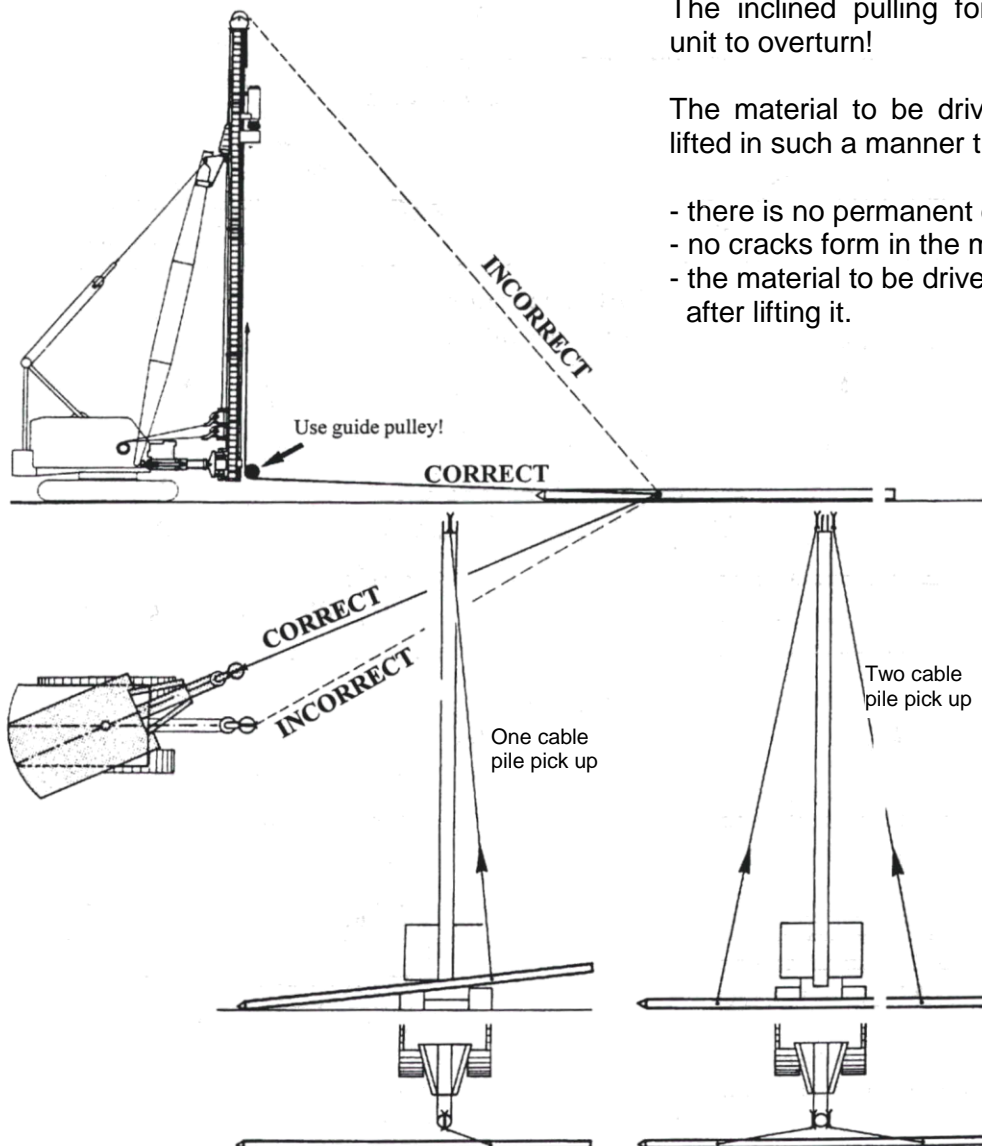
You must always wear a hard hat, safety gloves, safety boots and suitable working clothes! You must wear a life vest when working over water surface!

Never pull the material to be driven from the lead tip! 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 a 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.



STARTING THE DIESEL HAMMER

6.5 Bringing into operating position of diesel pile hammer and pile helmet

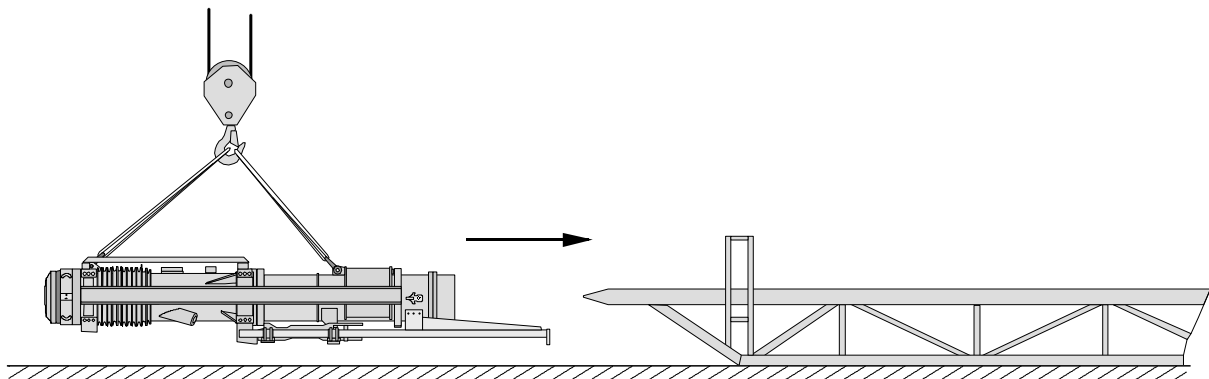
! WARNING !



Observe the operating instructions of the carrier equipment!

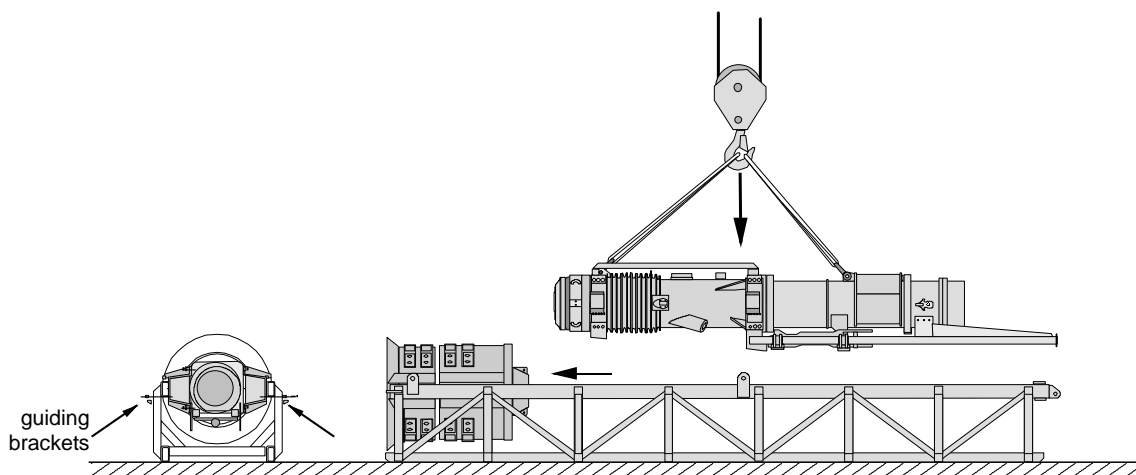
Use only approved steel cables in accordance with Chapter 5.2 “Transport cables”! You must wear a hard hat, safety gloves, safety boots and suitable work clothes! A lifesaving jacket must be worn for work above a water surface!

6.5.1. Placing the dieselhammer in swinging lead – lead laying on the ground



- diesel pile hammers up to the D62 can be equipped with channel guiding
- the hammer must be sled in the lead from one side
- before raising up the lead the starting device and the hammer lifting ears must be connected to the crane winch

6.5.2. Placing the dieselhammer in an offshore lead – lead laying on the ground



STARTING THE DIESEL HAMMER

- by setting the hammer into the lead pay attention to slide the lead guiding carrier and the hammer complete to the guiding bell to prevent uncontrolled sliding when lifting up
- after setting the hammer into the lead the backside guiding brackets must be bolted on

6.5.3. Placing the dieselhammer in fixed lead – lead in vertical position

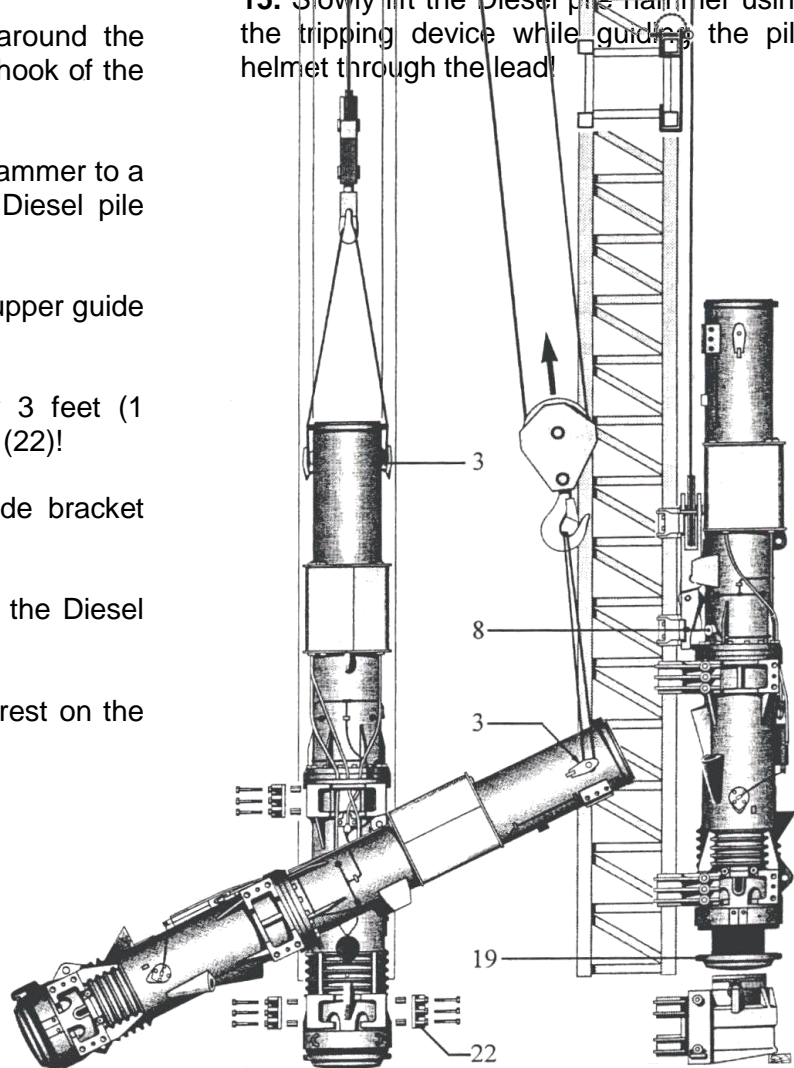
1. Mount the tripping device (see chapter 8.4.6) to the lead if not guided directly at the hammer starter guides attached to the hammer
2. Lift up the tripping device approx. 10ft (3m)
3. Place the Diesel pile hammer in front of the lead (horizontal position, see chapter 4.)!
4. Place the Diesel pile hammer on wooden blocks!
5. Remove the transport cables!
6. Place the steel cable lops around the lifting plates (3) and around the hook of the carrier equipment!
6. Carefully pull the Diesel pile hammer to a vertical position and place the Diesel pile hammer in front of the lead!
7. Install the two lower and one upper guide bracket (22)!
8. Lift the Diesel pile hammer 3 feet (1 meter)! Place the guide brackets (22)!
9. Install the second upper guide bracket (22)!
10. Place the pile helmet below the Diesel pile hammer!
11. Let the Diesel pile hammer rest on the pile helmet.

12. Remove the locking screw(s) (piston) and the impact block clamp (See Chapter 4.1 “Transport safety devices”)!

13. Pull the Diesel pile hammer upward until the impact block (19) is fully extended and hangs approximately 2 inches (5 cm) above the pile helmet cushion!

14. Attach the pile helmet to the lower cylinder lifting pad eyes (5) as shown in the illustration! Use the steel cables and steel cable clamps from the tool box

15. Slowly lift the Diesel pile hammer using the tripping device while guiding the pile helmet through the lead!

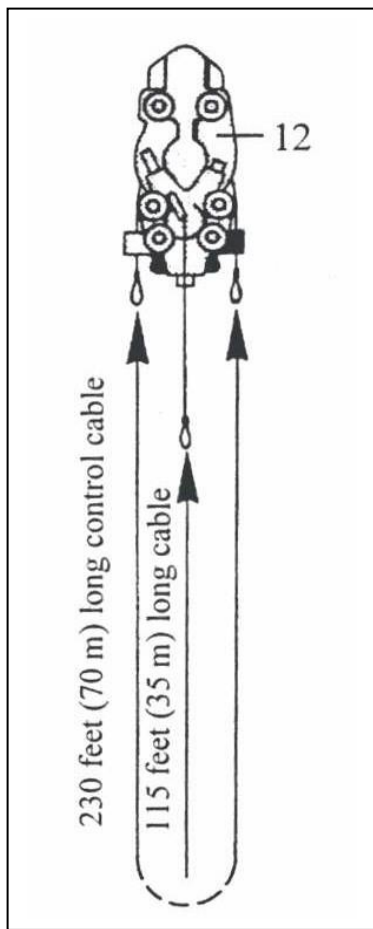


STARTING THE DIESEL HAMMER

16. Remove the steel cable loops from the lifting plates (3) and from the hook of the lifting equipment!

17. Attach both ends of the 230 feet (70 m) long control cable (in the tool box) to the eyelets for the control cable of the fuel pump (12)!

18. Attach the 115 feet (35 m) long rope to the shutoff valve (center eyelet) of the fuel pump (12)!



19. Fill the tank with Diesel fuel (See Appendix A2 “Usable fuels” for alternate fuels). The filling nozzle of the tank indicates “Diesel”.

It is important to use a fuel that is suited for the ambient temperature conditions (See the following table)! If this is

ignored, the unit may be difficult to start and the fuel lines may become clogged!

Mixing ratio Diesel fuel / regular gasoline or engine oil		
outside temperature	Summer Diesel fuel	Winter Diesel fuel
above -10°C 14°F	90% / 10%	100% / 0%
-10°C to -14°C 14°F to 7°F	70% / 30%	100% / 0%
-14°C to -20°C 7°F to -4°F	50% / 50%	80% / 20%
-20°C to -30°C -4°F to -22°F	-	50% / 50%

Note: regular gasoline tends to pre ignition

6.6. Tripping device

The tripping device is an auxiliary means

- to lift the Diesel pile hammer at the lead,
- to lower the Diesel pile hammer at the lead,
- to lift the piston when starting the Diesel pile hammer

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



Check the tripping device for damage prior to its installation! Use only tripping devices that are in good working condition!



Following the operating instructions for the carrier equipment

STARTING THE DIESEL HAMMER

You must wear a hard hat, safety gloves, safety boots and suitable work clothes.

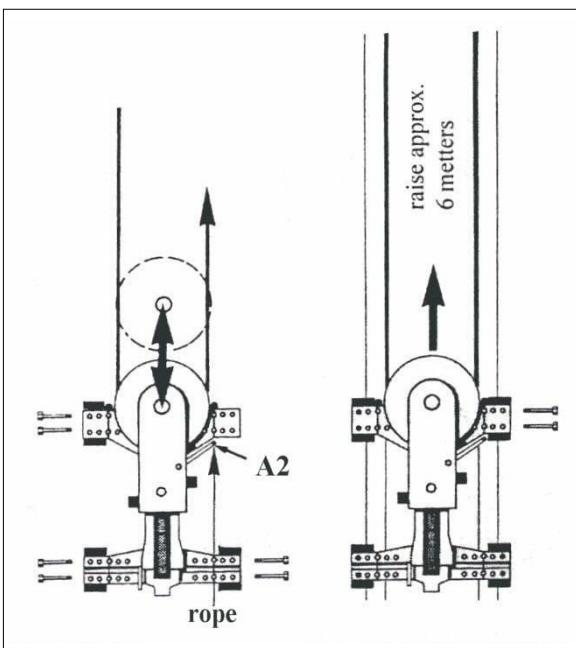
Installation of the tripping device

1. Attach the lower and one upper guide gibs to the tripping device!

In U- type leads the tripping devices is guided directly at starter guides mounted to the diesel pile hammer (see page 1-2)

2. Place the steel cable in the rope sheave or for smaller hammer types connect the cable directly to the sheave pin! To do so, you must remove the sheave pin and install it again when the cable is positioned! Secure the sheave pin with the safety screw or cotter pin.

3. Lift the tripping device upward and make sure it is smoothly sliding



4. Attach the rope (in the toolbox) to the lever (A2)!

Operating mode

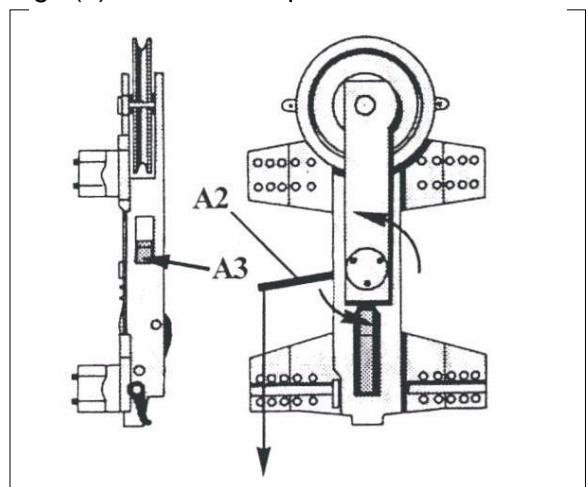
! WARNING !

You must wear a life vest when working over water!

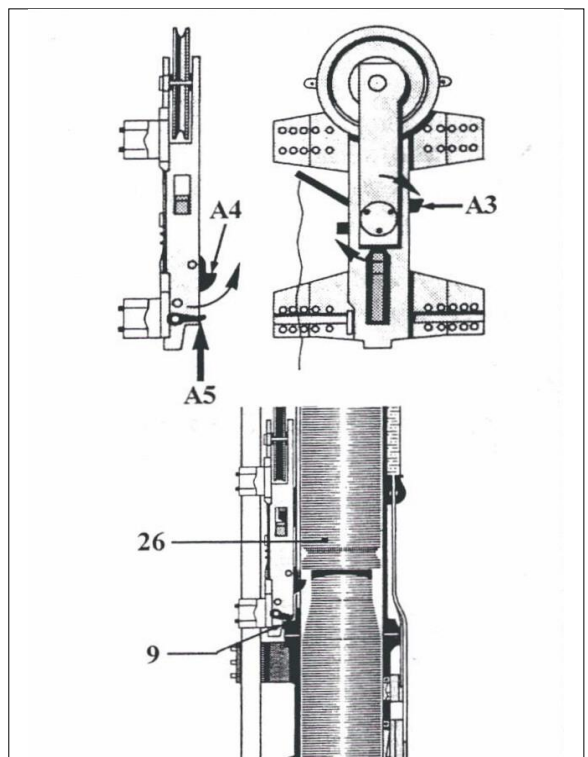
You must keep a distance of at least 13 feet (4 meters) from the Diesel pile hammer!

Lowering the tripping device

1. Pull the lever (A2) down to the stop using the rope and keep it taut! This retracts the driving pin (A3) in a vertical position. The tripping device can move past the lifting dogs (6) of the Diesel pile hammer.



2. Lower the tripping device to the lower stop (9)! The trip cam lever (A5) is pushed upward at the trip cam lever engaging point (9). Pawl (A4) is thus pushed out and into the lifting groove of the piston weight (26).



STARTING THE DIESEL HAMMER

3. Release the cable at the lever (A2)!



The tripping device must always be lowered to the lower stop to ensure that the pawl projects fully and is locked. If this is omitted, the Diesel pile hammer may trip prematurely! Danger to life!

The pulling cable must always hang free! Do not tie the pulling rope to the lead or other places! This may cause the diesel pile hammer to crash down! Danger to life and risk of a damaging tripping device!

Lift / lower Diesel pile hammer

1. Lower the tripping device as described above!
2. Slowly pull the tripping device upward using the cable winch! **Do not** pull on the cable at the lever (A2)! During the lifting stage, the surfaces of the driving pin (A3) grasp below the lifting dogs (6) of the Diesel pile hammer. The Diesel pile hammer now hangs from the tripping device.

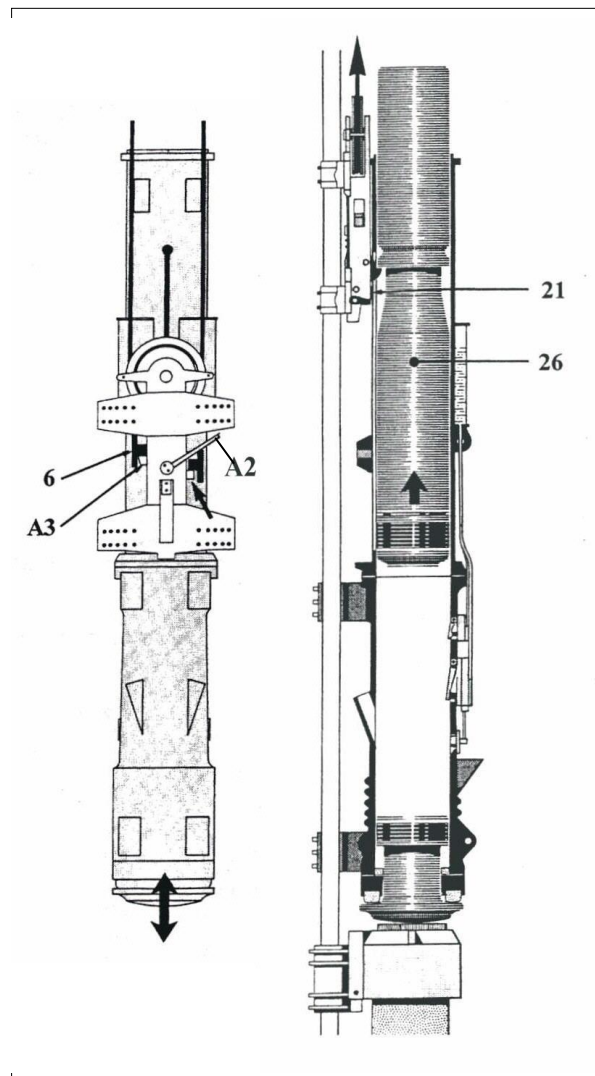


Please be sure the pawl of the starting device is locked under the lifting groove of the piston during lifting of the hammer.

3. Use the cable winch to place the Diesel pile hammer into the proper position.
4. Set the hammer with helmet assembly on top of a pile.

Lifting the piston – start the hammer

1. Lower the tripping device as described above!
2. Pull the lever (A2) down to the stop using the rope and keep the cable tight! This retracts the driving pin (A3) in vertical position to pass the lifting dogs. After the tripping device passing the lifting dogs the lever A2 can be released to its normal position
3. Use the cable winch to slowly pull the tripping device upwards! When pulling it upwards, the piston (26) is also pulled upward and automatically released at the upper stop (21).



STARTING THE DIESEL HAMMER

6.7 Control of fuel supply

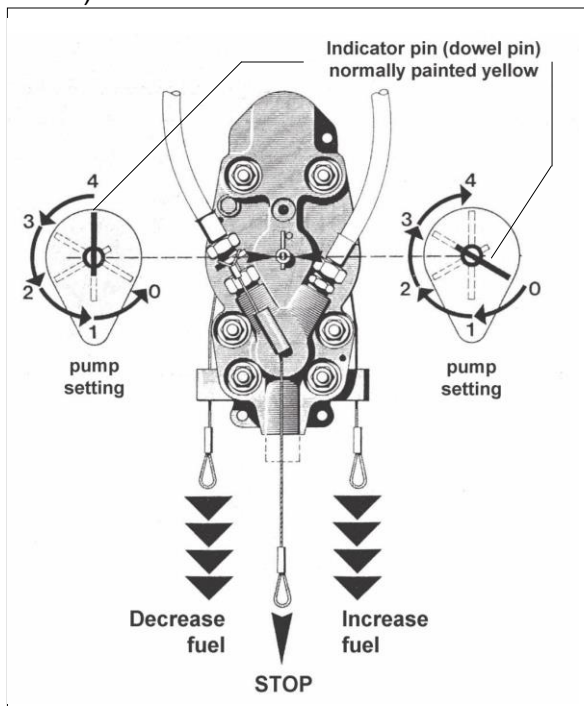
The fuel pump determines the energy per blow and thus the drop height of the piston. The fuel pump has five settings:

	Indicator pin position - fuel supply	
setting I	6 o'clock	49...64%
setting II	8 o'clock	66...77%
setting III	10 o'clock	83...90%
setting IV	12 o'clock	100%
setting 0	4 o'clock	shut off

The settings can be adjusted by three ropes attached to the fuel pump. For easier identify the ropes at night you can mark the ropes with single knots and double knots.

Inspect these ropes carefully as you may need to depend on them to shut down the hammer in the case of an emergency.

The fuel setting can be determined by the position of the dowel pin on the switch shaft of the fuel pump. This dowel pin is normally painted yellow for identification (see chart below)



Mode of operation - Increase fuel supply

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

Decrease fuel supply

Pull on the left 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 maximum setting of "0").

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 pump.

Should this rope break, you can successfully shut down the hammer in two alternate ways:

- adjust the fuel pump to the "0" position
- while in the position "4" (12 o'clock) pull and hold tight the right rope until the impact hammer is at rest. The dowel pin will go to the 2 o'clock. This position is spring loaded. Releasing the rope will cause the fuel pump to return to position "4" (12 o'clock)

Bleed fuel pump and injection valves

The fuel pump and the injection valves must be bled

- prior to the first putting-into-operation
- after repair work
- when the Diesel pile hammer fails to operate due to a lack of fuel

! WARNING !

Let the Diesel pile hammer cool down fully prior to the bleeding in the event the Diesel pile hammer stopped working due

STARTING THE DIESEL HAMMER

to a lack of fuel! Danger of burns and fire!

1. Pull the piston upward until the trip cam lever (A5) of the tripping device is located approximately 8 inches (20 cm) below the release point (21)

The fuel flow to the fuel pump will be blocked, when the piston is too low. The fuel flow is released automatically if the piston is above the pump lever and thus is released.

2. Set the fuel pump to Setting "4" (full load)!

3. Unscrew the swivel joint at the injection valves (Pos. 13, Type D5 through D30: only one injection valve) by approximately 2-3 turns! Do not fully unscrew the swivel joint!

4. Activate the pump with the right control rope (dowel pin position 2 o'clock) until fuel without bubbles exits at all swivel joints

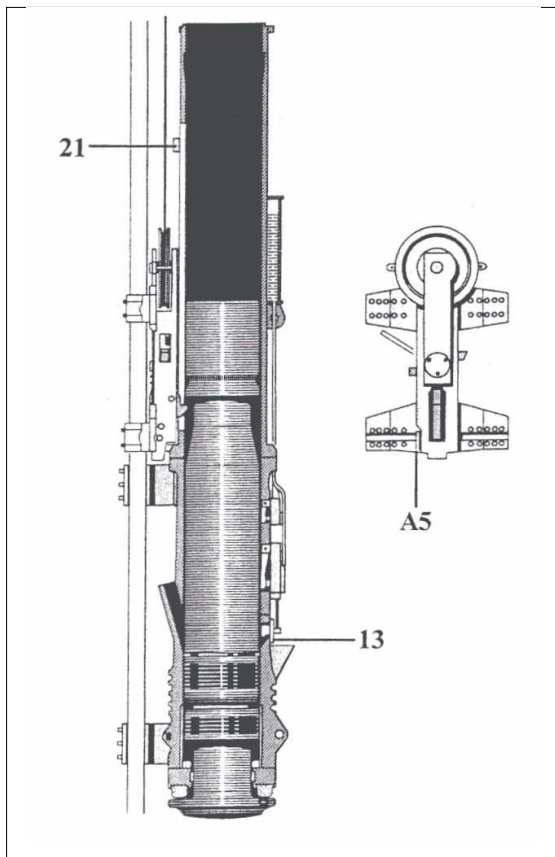
5. Keep the control rope taut and at the same time tighten all swivel joints

6. Release the control rope!

7. Pull on the center rope for approximately 5 seconds! This opens the shutoff valve. Air can escape into the tank by way of the fuel lines.

8. Release the center rope!

9. Repeat steps 3 through 8 three times!



6.8 Cleaning the combustion chamber

The combustion chamber must be cleaned each day **prior** to the first startup of the Diesel pile hammer. When this is omitted, the lubricant that has accumulated in the combustion chamber would also ignite during starting. The impact hammer may bounce to the catch groove (25) and cause damage.

Take the following steps:

! WARNING !

The Diesel pile hammer must rest on a pile or on the ground (with an appropriate support)! It must never rest on a support device. If this is not observed, the support device will be destroyed and the Diesel pile hammer comes crashing down! Maintain a distance of at least 13 feet (4 meters) from the Diesel pile hammer! Never stand in front of the Diesel pile hammer with an open combustion chamber bolt! Fuel, oil, dirt and material residues will be ejected at a great pressure! This could cause injuries to the eyes or skin as well as burns and poisoning.

1. Set the fuel pump to the setting "0"! To do so, pull the left control cable as often as required!

2. Remove the blow out plug (16)! (see page 6-12)

3. Maintain a safe distance from the Diesel pile hammer, since dirt and material residues will be ejected at a high pressure!

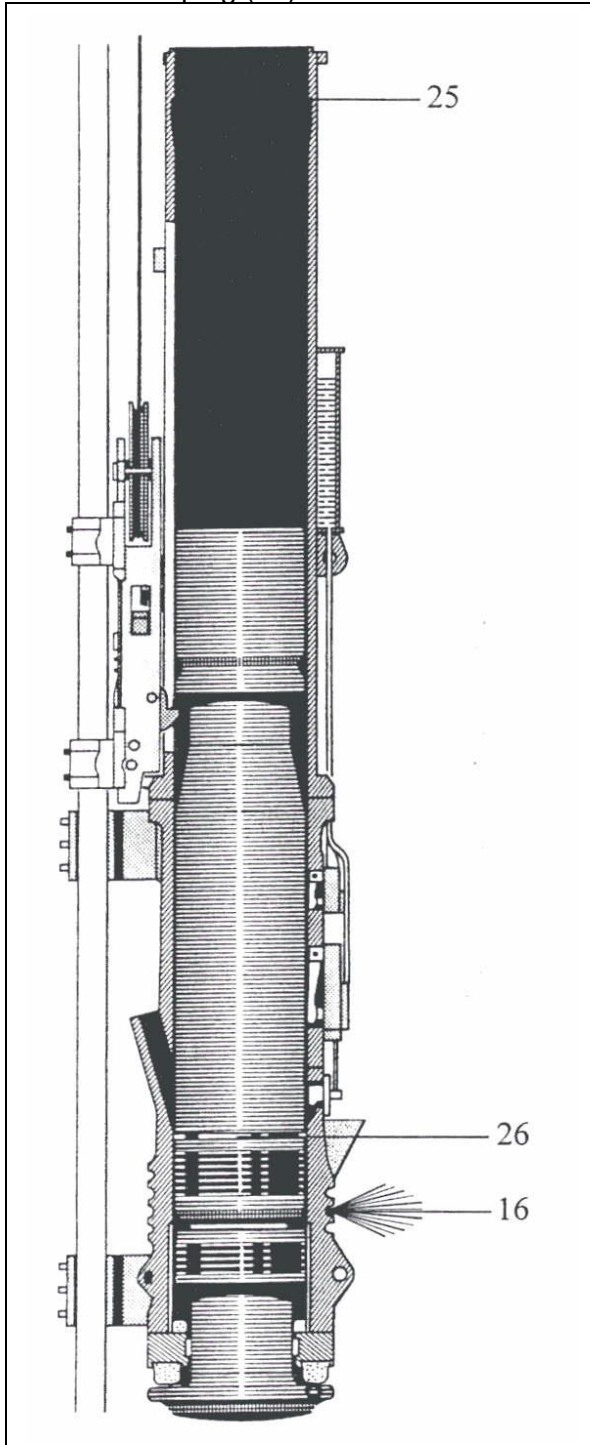


STARTING THE DIESEL HAMMER

Never stand in front of the combustion chamber opening of the Diesel pile

4. Raise the piston five times using the tripping device and let the piston drop from the release point. These cold blows allow oil and dirt to escape from the combustion chamber.

5. Screw the plug (16) back in.



hammer. Always stand to the side of it!

6.9 Start and Control



Thoroughly inspect the whole driving equipment system prior to putting it into operation! Check the unit for loose screws and bolts, cracks, wear, leaks and damage caused by vandals! Check the stability of the unit! Make sure all damages are repaired immediately! Operate the equipment only after all damages have been repaired (See chapter 9 "Maintenance")!

With the exception of the excavator operator, operator and the foreman in charge of the pile driving, make sure no other person stands within a distance of 1.5 times the lead height. Sound a horn to warn others of the impending starting of the unit!



The piston should not bounce into the catch groove (25). The Diesel pile hammer must be shut off immediately in this case! Thereafter, operate the Diesel pile hammer only:

- after checking or replacing the screws used to fasten the upper end ring or upper cylinder extension
- after checking the catch groove
- after checking the catch (piston) ring

You must keep a distance of at least 13 feet (4meters) from the diesel hammer.



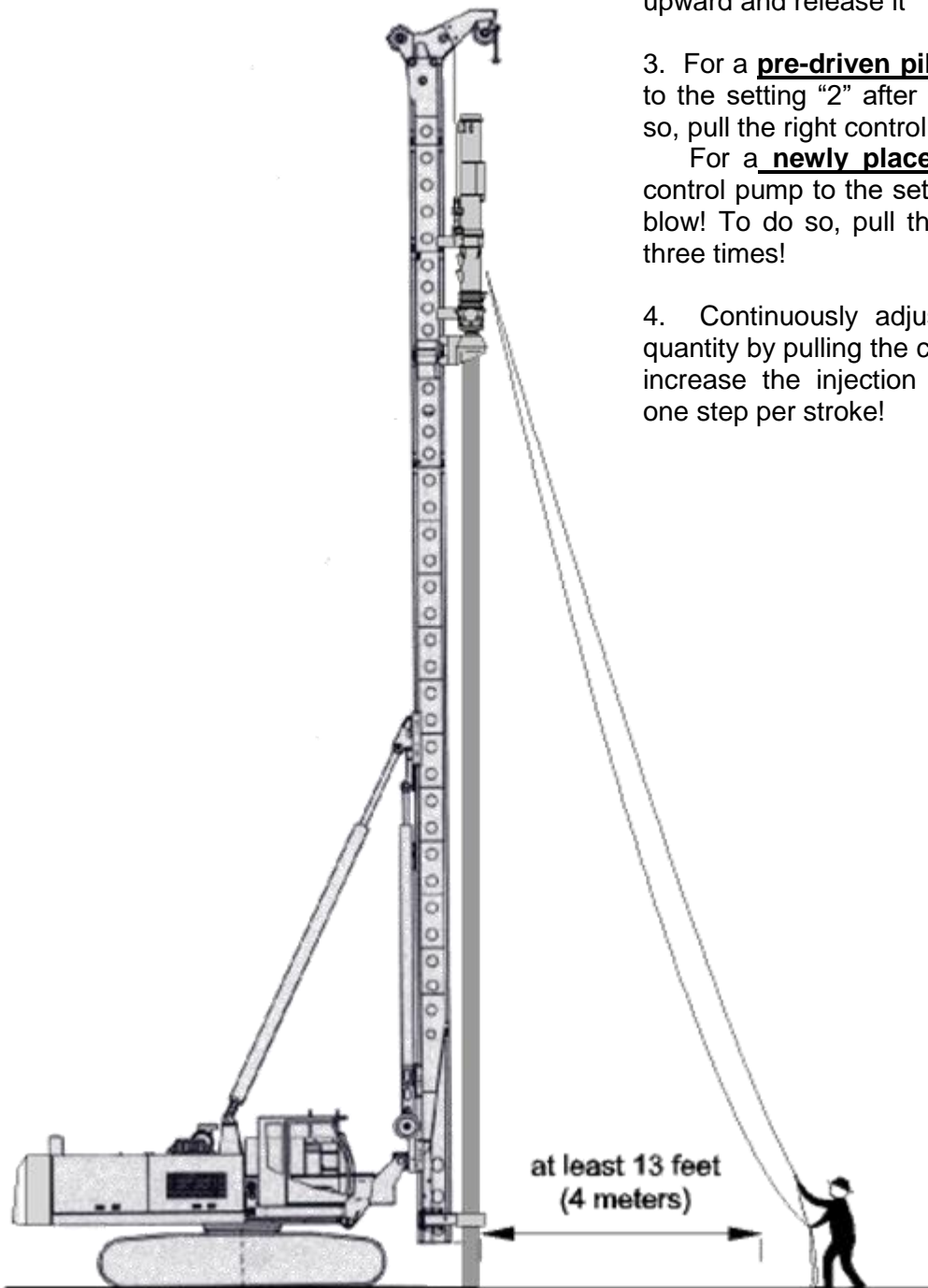
STARTING THE DIESEL HAMMER

Wear hard hat, ear plugs, safety glasses, safety gloves, safety boots and

appropriate work clothes.

Procedure

1. Set the fuel pump to the setting "0"! To do so, pull on the left control rope as often as required
2. Using the tripping device, pull the piston upward and release it
3. For a **pre-driven pile**: Set the fuel pump to the setting "2" after the first blow! To do so, pull 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, pull the right control cable three times!
4. Continuously adjust the fuel injection quantity by pulling the control cables. Do not increase the injection quantity faster than one step per stroke!



OPERATION

7. Operation



7.1 General Information

Follow all safety measures describes in Chapter 3!

Operate the Diesel pile hammer and lead only when they are in a perfect technical condition! Particularly the guiding components and tripping device should show no signs of wear! Danger to life!



You must always wear a hard hat, ear plugs, safety goggles, safety gloves, safety boots and suitable work clothes!

Immediately halt the pile-driving operation when a dangerous situation develops (e.g., when unauthorized persons enter the danger zone or in the event of damage)! Operate the Diesel pile hammer only after the dangerous situation has been taken care of!

Do not carry out any repair or maintenance work on a moving Diesel pile hammer!



1. Never start the Diesel pile hammer unless it is resting on a pile ore a specially prepared test stand.
2. Never start the Diesel pile hammer with the impact block hanging out. The impact of the piston would transmitted directly to the cylinder outer endring resulting in damage of outer endring and lower cylinder. A sticking impact block prevents the cylinder from freely drop on the impact head unit (possibly due to defective damping rings)!
3. Never start a Diesel pile hammer which has been disconnected from the lead or

which is resting on a skid, etc. The support device will be destroyed and the Diesel pile hammer will come crashing down causing an accident

4. Never drive piles eccentrically ! This may cause damage to the cylinder and guide components as well as damage and vibrations to the material to be driven! The center line of the material to be driven must be in line with the center lien of the Diesel pile hammer. This is necessary to avoid jarring blows. Jarring blows could cause
 - cracks in and deformation of the cylinder
 - vibrations in and damage to the material to be driven
 - directional deviation for the material to be driven

Remedy: Use a pile helmet that is guided at the lead and matches the pile profile! Use a pile helmet cushion selected in an optimal manner with respect to the material to be driven and to the blow energy (See Chapter 9.2 "Blow energy stages" and Appendix A3-1 "Reduction factors for different impact head cushions")! When it is impossible to guide the pile helmet at the lead, it will be necessary to hold the material to be driven at the lead with at least one pile guide!

5. increased wear in the guide componentsRebounding impacts, caused by driving eccentrically, very hard driving of relatively elastic piles (H-beams, soiral welded thin wall pipe piles) will lead over long time to damage of the diesel pile hammer especially the rubber rings.
6. Stop the Diesel pile hammer if the penetration rate is higher than 150 blows per foot. Higher blowrates are possible, but it causes higher wear of the diesel pile hammer. We cannot warrant parts if it is obvious that the choosen hammer for the job was too small.
7. The piston shall not bounce into the catch groove! This may damage the catch ring piston, catch groove and attachment screws! The safety of the Diesel pile hammer is thus no longer ensured!
8. The combustion chamber must be cleaned each day prior to the first startup of the

OPERATION

Diesel pile hammer. When this is omitted, the lubricant that has accumulated in the combustion chamber would also ignite during starting. The impact hammer may bounce to the catch groove and cause damage.

9. Make sure the allowable batter is not exceeded when driving batter piles (See Chapter 7.2 “Conversion to drive batter piles”)! Make sure the Diesel pile hammer is maintained regularly and properly
10. When using a bridle, the bridle must be adjusted continuously to the pile driving progress! The bridle will be destroyed otherwise! The safety against a fall is no longer ensure!

the material to be driven can also occur under the best conditions! Accordingly, it will be necessary for the foreman in charge of the pile driving work to continuously monitor the pile driving phase and to have the lead corrected, when required!

Shutting off

Pull the center rope (at the shut off valve) and keep it tight until the piston is completely at rest!

The Diesel pile hammer can also be shut off by setting the fuel control pump to the setting “0”! To do so, jerk the left control rope as often as required

Deviations from the original directions of 7.2 Blow energy

7.2.1. Standard fuel control pump

The blow energy is adjusted to the respective blow conditions by controlling the fuel supply (see Chapter 6.7 “Fuel supply control”). The blow energy of the respective type at different settings can be taken from the table shown below!

Type	Injection Quantity at setting 4 100% ±10%	Injection quantity (%) and blow energy* Nm (ft.lbs)			
		setting 4 100%	setting 3 83...90%	setting 2 66...77%	setting 1 49...64%
D6-32	1.6 cm ³ /stroke	17,040 Nm 12,570 ft.lbs	14,500 Nm 10,700 ft.lbs	12,000 Nm 8,850ft.lbs	7,090 Nm 5,230 ft.lbs
D8-22	1.75 cm ³ /stroke	25,400 Nm 18,760 ft.lbs	21,080 Nm 15,570 ft.lbs	16,890 Nm 10,350ft.lbs	12,853 Nm 9,480 ft.lbs
D12-42	2.10 cm ³ /stroke	40,460 Nm 29,840 ft.lbs	33,580 Nm 24,760 ft.lbs	26,700 Nm 19,690ft.lbs	20,470 Nm 15,100 ft.lbs
D19-42	3.54 cm ³ /stroke	57,600 Nm 42,480 ft.lbs	47,810Nm 35,260 ft.lbs	38,015 Nm 28,035 ft.lbs	29,160 Nm 21,510 ft.lbs
D25-32	3.90 cm ³ /stroke	79,040 Nm 58,300 ft.lbs	71,136Nm 52,470ft.lbs	58,490 Nm 38,830ft.lbs	40,010 Nm 29,510 ft.lbs
D30-32	4.70 cm ³ /stroke	94,890 Nm 69,990 ft.lbs	85,400Nm 62,990ft.lbs	70,220 Nm 51,790 ft.lbs	48,040 Nm 35,435 ft.lbs
D36-32	5.65 cm ³ /stroke	113,820 Nm 83,950 ft.lbs	94,470 Nm 69,680ft.lbs	75,120 Nm 55,410ft.lbs	57,620 Nm 42,500 ft.lbs
D46-32	7.15 cm ³ /stroke	145,450 Nm 107,280 ft.lbs	120,720 Nm 89,040ft.lbs	96,000 Nm 70,805 ft.lbs	73,650 Nm 54,320 ft.lbs
D62-22	8.70 cm ³ /stroke	219,150 Nm 161,640 ft.lbs	181,895 Nm 134,160ft.lbs	145,735 Nm 107490ft.lbs	107,380 Nm 79,200 ft.lbs
D80-23	10.50 cm ³ /stroke	267,300 Nm 197,150 ft.lbs	239,770 Nm 176,840ft.lbs	196,730 Nm 145,100ft.lbs	171,080 Nm 126,180 ft.lbs
D100-13	12.50 cm ³ /stroke	334.060 Nm 246,390 ft.lbs	299,650 Nm 221, 010ft.lbs	257,895Nm 190,210ft.lbs	213,790 Nm 157,685 ft.lbs

* theoretical values based on blows per minute without considering loss of energy by compression and friction values for D-125 and D160 are estimated

OPERATION

Type	Injection Quantity at setting 4 100% ±10%	Injection quantity (%) and blow energy* Nm (ft.lbs)			
		setting 4 100%	setting 3 83...90%	setting 2 66...77%	setting 1 49...64%
D125-32	15.5 cm ³ /stroke	384,860 Nm 283,860 ft.lbs	338,670 Nm 249,800 ft.lbs	288,645 Nm 212,895 ft.lbs	230,910 Nm 170,310 ft.lbs
D138-32	17.0 cm ³ /stroke	460,900 Nm 340,000 ft.lbs	410,300 Nm 302,600ft.lbs	345,900Nm 261,800 ft.lbs	274,800 Nm 217,600 ft.lbs
D160-32	21.0 cm ³ /stroke	502,100 Nm 370,350 ft.lbs	441,850 Nm 325,910 ft.lbs	376,575 Nm 277,760 ft.lbs	301,260 Nm 222,510 ft.lbs
D180-32	24.0 cm ³ /stroke	601,300 Nm 443,500 ft.lbs	535,200Nm 394,700ft.lbs	463,000 Nm 341,500ft.lbs	368,300 Nm 271,640 ft.lbs
D225-32	28.0 cm ³ /stroke	564,930 Nm 416,600 ft.lbs	485,800Nm 358,300ft.lbs	395,000Nm 291,300ft.lbs	292,780 Nm 216,000 ft.lbs
D250-22	31.0 cm ³ /stroke	631,300 Nm 465,600 ft.lbs	536,600 Nm 395,750ft.lbs	430,000 Nm 317,100ft.lbs	331,870 Nm 244,750 ft.lbs
D280-22	34.5 cm ³ /stroke	700,625 Nm 516,710 ft.lbs	588,500 Nm 434,000ft.lbs	476,400 Nm 351,350 ft.lbs	365,060 Nm 269,200 ft.lbs

* theoretical values based on blows per minute without considering loss of energy by compression and friction
values for D-125 and D160 are estimated

You must be aware of the following:

- The given values are measured values. Deviations are possible between Diesel pile hammers of the same type.
- The given blow energy is obtained only for vertical driving work. For batter piles, the blow energy is reduced as a function of the batter (See Chapter 5.5 "Conversion for batter piles").
- The injection quantity is not proportional to the blow energy, because the fuel is burned at different degrees of efficiency. For example: 50% of the injection quantity does not reduce the blow energy by exactly 50%!

7.2.2 Hydraulic controlled fuel pump

The hydraulic controlled fuel pump on the diesel hammer is step less adjustable from zero to maximum injection volume The system consists of :

- hydraulic control cylinder inside the fuel injection pump
- hydraulic hose
- hydraulic hand pump with reservoir, pressure gauge and quick relief valve

Applying hydraulic pressure to the control cylinder inside the fuel pump adjusts the fuel injection volume to a larger amount At a hydraulic hand pump pressure of 275 to 375 psi the maximum hammer performance should be reached .

That depends on:

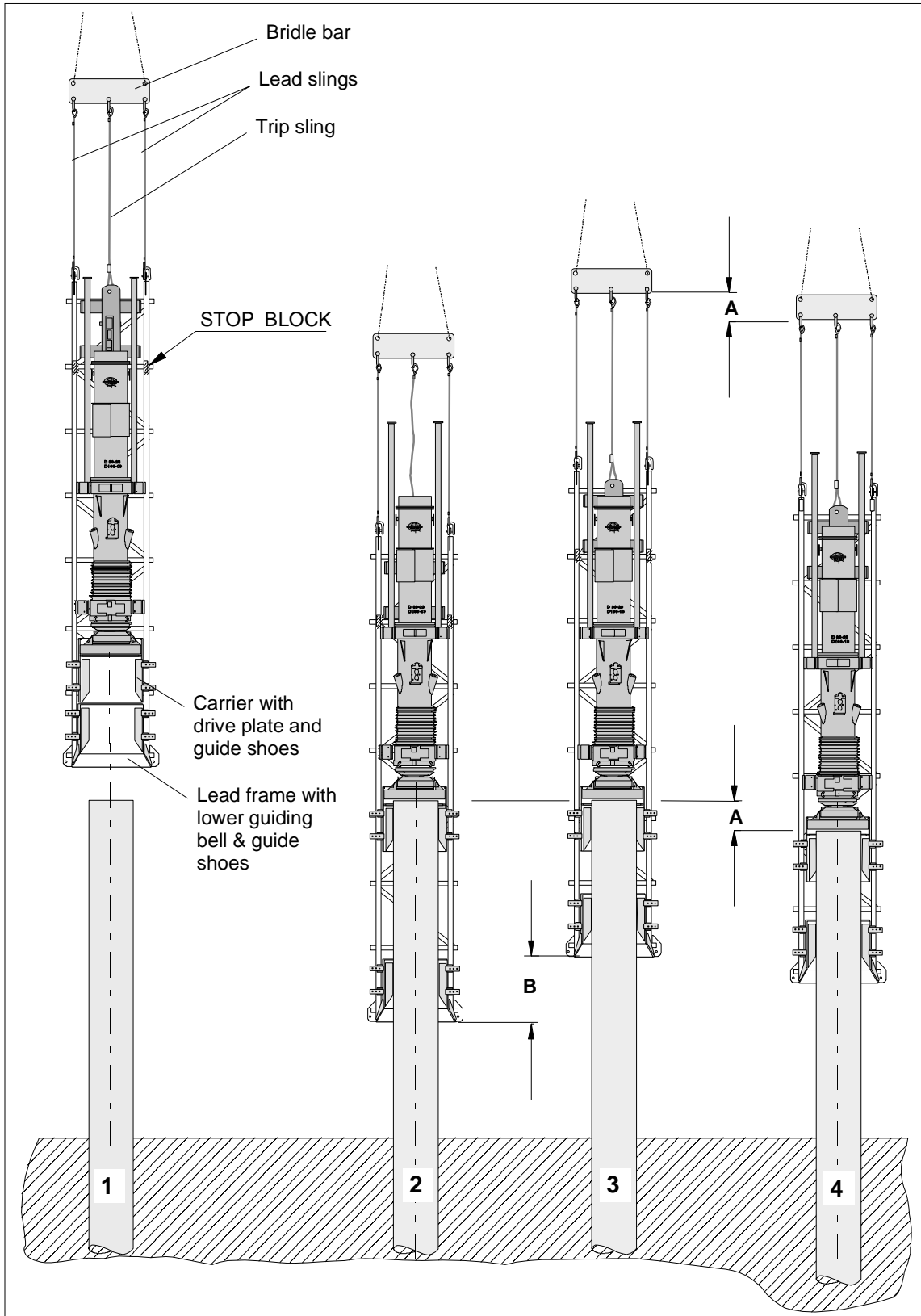
- length and diameter of used hydraulic line
- pile type and ground conditions
- outside temperature and weather conditions

Shutting off the diesel pile hammer can be obtained by:

- Pulling the line of the shutt off valve at the fuel pump
- Opening the quick relief valve of the hydraulic pump

OPERATION

7.3 Offshore lead – Start of Diesel pile hammer



OPERATION

A economic solution for jobs where fixed or swinging leads cannot be used is the our offshore type lead system.

Requirements are:

- Pre driven piles or piles guided in a template or jacket
- The lead size must be chosen to the pile and hammer size, within a range the lead can adapt to the pile size with guide shoes

Procedure for starting the hammer using bridle bar and trip sling:

1. Lifting the lead with hammer over the pile
2. Lowering the lead down until the hammer guides run against the stop block at the lead rails. Lowering the lead further down until the trip is sled down to the lower position at the hammer and the trip lever engages
3. Lift the lead up. The trip will slide up at the trip guiding until it reaches the release point where the piston is released

! WARNING !

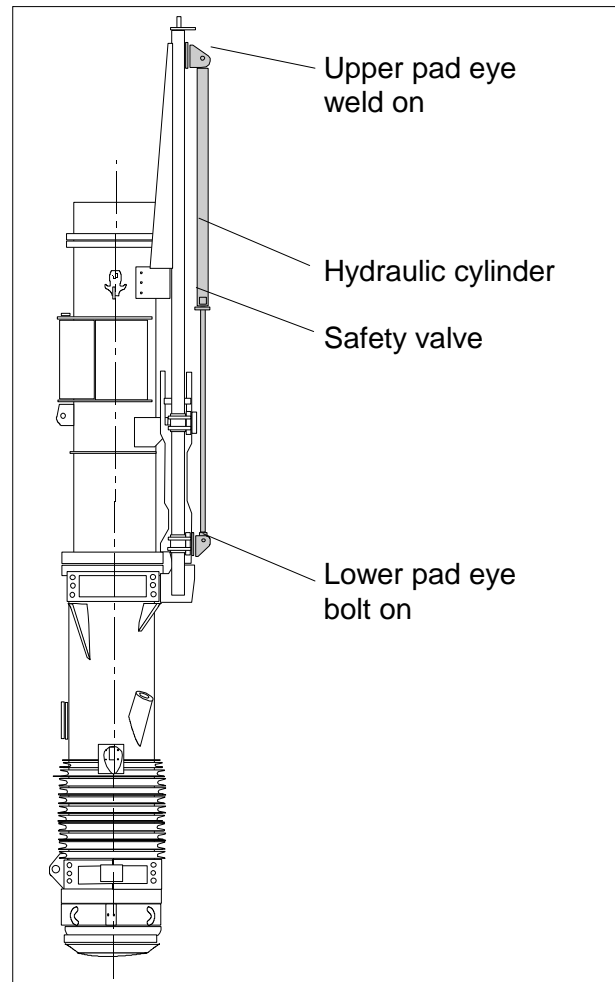
The minimum distance never should be less than 1 ft, otherwise there is a risk of damaging the lead when the diesel pile hammer impact is directly transferred to the lower guiding bell and also to the crane.

The cable length for lead and tripping device are designed in a way that keeping the minimum distance is possible

4. As soon as the diesel pile hammer started the lead must be lowered continuously with the progress of the pile penetration (A) to keep at least the minimum required distance (1ft) between carrier and lower guiding bell.

Procedure for starting the hammer using a hydraulic start cylinder

We offers the solution for a hydraulic starting device of the diesel pile hammer. A hydraulic cylinder is attached to the starter guides and the tripping device (see picture)



The hydraulic start is used most common for the larger size diesel pile hammers (D46 up) with our offshore type leads. After positioning the offshore type lead on the pile (3) the hydraulic cylinder must be extended completely to lower the tripping device completely down and engage. Retracting the hydraulic cylinder will lift the piston of the diesel pile hammer up to the release point. After starting the diesel pile hammer the tripping device should remain in the upper position.

For cases with low head room and for driving batter piles the hydraulic starting device gives the advantage for better controlling of the start procedure. A safety valve ensures the position of the tripping device if ever a hydraulic hose should burst

Information about the required hydraulic power pack you find in chapter 11.1

SHUTTING DOWN & STORAGE

8. Shutting down and storage

8.1 Shutting down and leaving in lead

! WARNING !

The Diesel hammer may be left in the lead for a temporary shutoff. Always - let the Diesel hammer rest on the material to be driven or set to the ground.

Make sure the carrier unit exhibits a sufficient stability! Take into account a change in the weather (rain, storm)! Danger of overturning!

Do not touch the Diesel pile hammer shortly after operation! Danger of burns! Let hot components cool for a sufficient period!

You must wear a hard hat, safety gloves, safety boots and appropriate work clothes. You must wear a life vest when working above a water surface!

Block the danger zone of 1.5 times the lead height! Use warning signs to prevent anyone from entering this zone! Observe local regulations for the blocking of job sites!

10.2 Removal from the lead

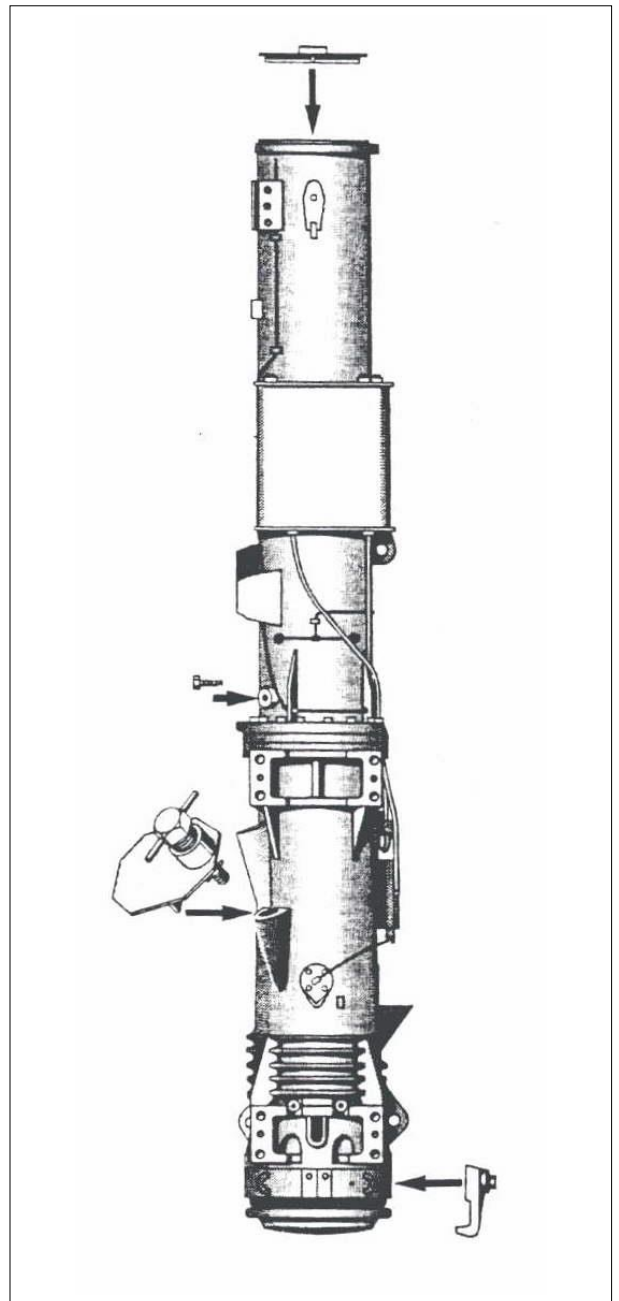
When the Diesel pile hammer will not be operated for several days, it will be necessary to remove it from the lead.

! WARNING !

Follow the operating instructions of the carrier equipment! Do not touch the Diesel pile hammer shortly after operation! Danger of burns! Let hot components cool down for a sufficient period!

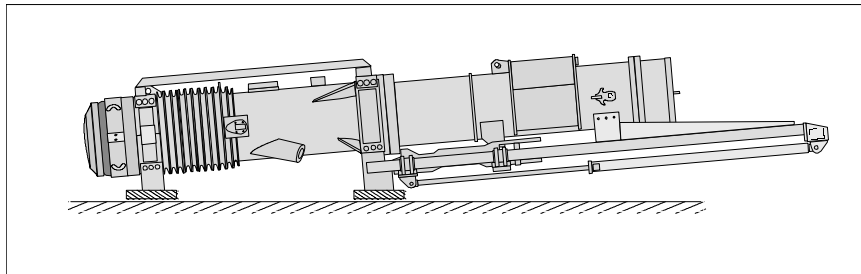
Proceed as indicated below:

1. Let the Diesel pile hammer rest on the material to be driven or on the ground!
2. Let the Diesel pile hammer cool down completely!



SHUTTING DOWN & STORAGE

3. Install the piston locking screws, piston safety, protective hood and exhaust covers (See Chapter 4.1 "Transport safety")!
4. Remove the ropes from the fuel control pump!
5. Taking the hammer out of the lead. Put the hammer a side in reverse procedure like described in chapter 6.5
6. Set the hammer on a stable plain ground, if necessary use 3" thick wood planks.
7. Remove the steel cable loops from the lifting ears (3)
8. Put the carrier equipment out of operation (See operating instructions for the carrier equipment)!
9. Secure the job site in accordance with local regulations for the blocking off of job sites!



10.3 Storage

Let the Diesel pile hammer fully cool down prior to storage! Danger of burns and fire!

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

The following points must be observed when storing the Diesel pile hammer:

1. Check the Diesel pile hammer for damages and wear! Have the necessary repairs carried out immediately! This prevents the work from being forgotten.
2. Check the tanks and lines of the Diesel pile hammer for leaks and a solid fit!
4. Drain the tanks (fuel, oil)!
5. Clean the filters!
6. Close the drain openings of the fuel pump with a rubber plug!
7. Remove and clean the piston, impact block, upper and lower cylinder section. Check all connection elements for a solid fit!
8. Clean and check the tripping device as well as the guide components of the Diesel pile hammer and of the tripping device for damage and wear .

SHUTTING DOWN & STORAGE

9. Clean and check the pile helmet, attachment cables, pile helmet cushion and accessories (bridle, support devices) for damage and wear. Pile helmet cushions made of wood do not store well and are thus not to be stored for a long time!

10. Check the tool box 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 pump for damage and wear (replace, if necessary)!

11. Check the condition and completeness of protection devices and personal safety equipment as

- Protective clothing, hard hat, safety gloves and safety boots
- Safety goggles and ear plugs,
- Lifesaving vest
- Height safety devices

The personal safety equipment must meet local safety regulations!

12. Prepare the Diesel pile hammer for storage (See "Laying-up")!

13. Protect the Diesel pile hammer against the effects of the weather! Cover the Diesel pile hammer and all accessories (Do not use plastic foil or other coated materials)! If possible, storage the Diesel pile hammer in an unheated and dry room exhibiting minimal temperature changes! Do not store the Diesel pile hammer in direct sunlight!

Laying-up – long time storage

The protective effect is very much a function of the thickness and viscosity (ductility) of material used. We recommend the use of Moly Grease 126 EP#2; it is a thick grease that you can apply with a rag or brush.

1. Disassemble the Diesel pile hammer! Observe the installation information indicated in Chapter 10 "Servicing and troubleshooting"!

2. Remove all dirt and rust from all components! Replace worn or damaged parts!

3. Touch up the paint! Let the fresh paint dry!

4. Run a corrosion protection oil through the fuel and lubricant pump!

5. Lubricate the tripping device and subsequently apply a rust protection oil to it by brush.

6. Apply a rust protection oil by brush to the guide parts of the Diesel pile hammer and the tripping device!

7. Spray the tank inside with a rust-inhibiting oil! Then solidly close the tanks!

9. Carefully apply grease such as Moly Grease 126 EP#2 by brush to all unpainted parts (including the holes in the end ring, upper and lower cylinder)

10. Assemble the Diesel pile hammer and all transport safety devices! Follow the assembly information in Chapter 10 "Servicing and troubleshooting" as well as Chapter 4.1 "Transport safety devices"!

11. Apply a rust-inhibiting oil to all metal tools in the tool box!

MAINTENANCE

9. Maintenance

Maintenance work must be carried out by qualified authorized personnel!



Place the Diesel pile hammer out of operation prior to carrying out any maintenance work! Make sure the unit cannot be put into operation by other persons during maintenance work! Danger to life!

9.1 Daily maintenance

As with every equipment / machinery the Diesel pile hammer does require minor daily inspections to ensure that all bolts and nuts are tightened securely. Since the hammer and it's accessories are subject to excessive shock and vibration while in use, it is possible that loosening of certain bolts can occur. Daily inspection procedures are listed below:

1. **Filling of diesel fuel and oil tanks** should be performed after machine is put into upright position. Be sure that only clean filtered diesel (#2) fuel is and a good quality high detergent motor oil are added to the tanks. If contamination from dirt or water is suspected, flush tanks thoroughly and refill. Filling the tanks will reduce the possibility of condensation in the fuel and lubrication oil.
2. **Check the bolts** securing the guide clamps / side guides of the hammer (540 ft.lbs torque)
3. **Check nuts securing the fuel pump & lube pump** at the lower cylinder (210 ft.lbs torque)
4. **Check bolts securing the injection valve** at the lower cylinder (210 ft.lbs torque)

Do not touch the Diesel pile hammer after operation! Danger of burns! Let hot components cool down sufficiently!



You must wear a hard hat, safety gloves, safety boots and suitable work clothes. You must wear a life vest when working above a water surface!

5. **Check bolts securing the upper and lower cylinder** together (210 ft.lbs torque)
6. **Check hollow bolts on lubrication points** of upper and lower cylinder
7. **Check guide gib bolts** at the tripping device (210 ft.lbs torque)
8. **Each grease nipple** at the lower cylinder & ending should be given 10-12 shots of grease every one-half hour of running time This is accomplished by the standard lever gun with a bottom head attachment, as provided in the hammer's tool box. The grease must be a very high temperature grease to hold up under the high heat and friction developed during running. We tested many types of grease and has concluded: -
Bel Ray Molyube- Molyube 126 EP#2
This grease is available in cases containing 12 tubes/case and is therefore easy to store and maintain during non-use.
9. **Check for wear at guiding parts**
10. **Check for wear of rubber ring**
11. **Check all cables** (connected to the hammer, the tripping device, the helmet)
12. **Clean the combustion chamber**

MAINTENANCE

9.2 Weekly maintenance

Weekly inspection of the Diesel pile hammer should include:

- **Remove and inspect the rubber ring** (2 pieces). This ring prevents the impact block from striking the outer endring / lower cylinder of the hammer while running. This ring also is instrumental in regulating the amount of air volume the machine scavenges, therefore affecting the compression. If damaged, please advise us.
- **Bolts securing the outer endring** to the lower cylinder. The procedure is described in chapter 11.xx. The tightness of this bolts should always be uniform. Running the diesel pile hammer with loose or stretched bolts will result in damage to the other bolts, the endring and the lower cylinder
- **Catch groove and catch piston ring.** When the pile meets strong resistance, piston travel can increase so much that the catch ring may be hit the catch groove in the upper cylinder. If this occurs, immediately reduce fuel injection by lowering the fuel pump setting. Thus shutting off the hammer. Catch groove and catch piston ring must always be in perfect condition, otherwise there is a risk of accident. The catch groove edge can be re machined by taking off the upper endring.

- **Testing the compression**



Only test the compression if the hammer rests on a driven pile, otherwise there is a danger of accident!

Fuel pump is set on “off” (dowel pin at 4 o'clock position)



Raise the piston and trip up to the release point and release the piston. There is sufficient compression if the piston after it hitting the impact block is thrown upwards through the compression and falls back onto the impact block after three (3) additional up and down movements on the air cushion. If there is less compression the piston rings need to be checked

If a diesel pile hammer is continuously used with worn out piston rings the piston face will be damaged and there is a high risk of piston cracks, because the piston will hit the impact block harder with higher velocity than designed to do so.

9.3 Monthly maintenance

- Empty fuel and lube oil tanks
Remove fuel and lube oil lines
Remove and clean filter nozzles!

SERVICING & TROUBLESHOOTING

10. Servicing and troubleshooting

10.1 General



Maintenance and repair work must be carried out by qualified and authorized personnel!

Place the Diesel pile hammer out of operation prior to carrying out any maintenance and repair work! Make sure the unit cannot be put into operation by other persons during maintenance and repair work! Danger to life!



Do not touch the Diesel pile hammer after operation! Danger of burns! Let hot components cool down sufficiently!

You must wear a hard hat, safety gloves, safety boots and suitable work clothes. You must wear a life vest when working over a water



10.2 Trouble shooting

Problem	Possible cause	Symptoms	Fault / Remedy
Diesel pile hammer does not start	Compression too low	Impact block drops quickly when lifting the diesel pile hammer	Defective or stuck piston rings Insufficient lubrication at impact head or piston (maintain lubrication intervals as indicated in chapter 9)
		Strong blowing effect at impact block	
		After dropping and without a fuel supply, piston does bounce only one or two times and then sink slowly	
		Wear grooves in lower cylinder below the exhaust openings	
	Damaged cylinder sleeves		
	Lower cylinder is out of round		
	Low soil resistance	Soft soil, light or pointed or narrow material to be driven, Pile runs	Drop piston several times (cold blows) until there is a sufficient penetration resistance
	Oil grease or water in combustion chamber	Dull sound, when piston impacts the impact block	Clean combustion chamber , and flush fuel tank
		Black smoke (oil or grease in the combustion chamber)	
White smoke (water in the fuel)			

SERVICING & TROUBLESHOOTING

Problem	Possible cause	Symptoms	Fault / Remedy
Diesel pile hammer does not start	Fuel problems	Dull sound, when piston hits the impact block	Leaking relief valve (replace relief valve, clean combustion chamber)
		Black smoke (->too much fuel)	Air in fuel pump Selected setting of fuel control pump is too high Fuel pump is not working properly Pump element wrong installed in reverse position, supply opening must be at the top position
		No smoke or little gray smoke (-> too little fuel)	Sticking pump element, pump lever or guide sleeve or setting value of the pump lever has been changed Defective pump element in fuel pump Clogged ventilation in diesel tank plug screw Defective check valve, suction valve, injection valves or shut off valve (replace) Damaged or clogged fuel lines (replace or clean) Dirty fuel tank (clean) Dirty fuel filter
		White or black smoke (-> water or dirt in fuel)	Water in fuel (clean fuel tank, fuel filter and fuel lines, clean combustion chamber)
	Lack of lubrication	Impact block gets stuck in cylinder or end ring	Too little or incorrect lubricant type
	Mechanical	Damage to impact areas of piston or impact block	Machine impact areas
		Stuck or broken piston rings	Replace defective or worn piston rings

SERVICING & TROUBLESHOOTING

Problem	Possible cause	Symptoms	Fault / Remedy
Diesel pile hammer runs irregularly	Mechanical damage	Damaged or deformed upper cylinder / upper cylinder extension	Replace defective parts or have a repair shop authorized by us carry out the necessary repair
		Worn cylinder (out of round) or piston is not round	
	Changing soil conditions	Material to be driven penetrates at different rates	Make adjustments during the pile driving by regulating the fuel control pump
	Diesel hammer become too hot (above 600°F /300°C)	Pre ignition, lower stroke	Check the blow rate (If the blow rate is higher than 150 blows per foot penetration a larger pile hammer must be considered) Choose the right hammer size Check compression Check injection valve and fuel pump (leaking elements or valves can cause insufficient fuel burn)
Diesel pile hammer stops running after a short time	Fuel problems	Clogged fuel filter	
	Diesel hammer becomes too hot - Insufficient combustion	Damaged piston rings Damaged injection valve Pump element jams	
Tripping device does not lift the piston	Piston is not latched	Broken dowel pins at trip cam lever	Replace defective or worn parts
		Bent trip cam lever	
		Damaged bearings of trip cam axis	
	Piston is not lifted	Rounded edges at piston lifting groove or pawl	
		Bent or broken leaf spring at tripping device	
		Loose leaf spring bolts	
	Worn guide strips or guide sleeves	Immediately replace worn guide parts	
Tripping device does not lift the diesel hammer	Cam of the tripping device does not grasp below the lifting dogs at the diesel pile hammer	Lack of lubrication at the latch of the tripping device	Lubricate (lubrication intervals maintenance chapter 9)
		Broken torsion spring on the driving pin of the tripping device	Replace broken or worn out part

SERVICING & TROUBLESHOOTING

10.3 Screwed / bolted connections

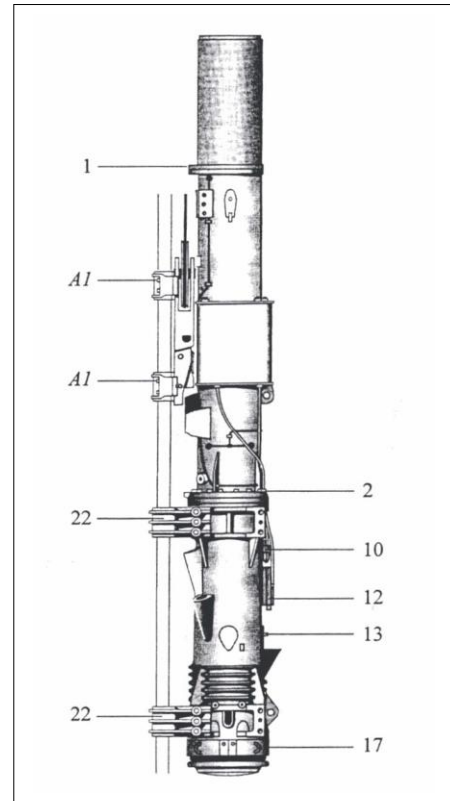
Tighten all screwed or bolted connections prior to the pile-driving work at the :

- (1) Upper end ring (cylinder extension)
- (2) Upper cylinder
- (10) Lubrication pump
- (12) Fuel control pump
- (13) Injection valve cover
- (17) Cylinder end ring
- (22) Hammer guides
- (A1) Guide gibs

The fasteners used for the diesel hammer are **metric dimensioned**, but some guiding parts are mounted with **inch-dimensioned fasteners**.

! WARNING !

Immediately replace stretched bolts with the new ones of the same strength! The Diesel pile hammer cannot be operated safely with loose or stretched bolts!



		D6/D8	D12	D19	D25 / D30	D36 / D46	D62	D80 / D100	D125/D 138	D160/D 180	D225/D 250/D2 80
1	Upper end ring (cylinder extension)	-	M16	M24	M24	M24	M24	M24	M24	M24	M24
2	Upper - lower cylinder	M24	M24	M24	M24	M24	M36	M36	M36	M36	M36
10	Lubrication pump	M16									
12	Fuel control pump										
13	Injection valve										
17	Outer end ring	M24	M24	M24	M24	M24	M36	M36	M36	M36	M36
22	Hammer guides	M24	M24	M24	M24	M24	M30	M36	M36	M36	M36
A1	Guide gibs for tripping device	7/8"-9	1"-8	1"-8	1"-8	7/8"-9	7/8"-9	1"-8	1"-8	1"-8	1"-8

Thread size	Torque* - Grade 10.9	Thread size	Torque* - Grade 5
M6	12 ± 3 Nm (9 ± 2 ft lb)	1/4"-20	12 ± 3 Nm (9 ± 2 ft lb)
M8	28 ± 7 Nm (21 ± 5 ft lb)	5/16"-18	25 ± 6 Nm (18 ± 4 ft lb)
M10	55 ± 10 Nm (41 ± 7 ft lb)	3/8"-16	47 ± 9 Nm (35 ± 7 ft lb)
M12	100 ± 20 Nm (75 ± 15 ft lb)	1/2"-13	105 ± 20 Nm (75 ± 15 ft lb)
M14	160 ± 30 Nm (120 ± 22 ft lb)	9/16"-12	160 ± 30 Nm (120 ± 22 ft lb)
M16	240 ± 40 Nm (175 ± 30 ft lb)	5/8"-11	215 ± 40 Nm (160 ± 30 ft lb)
M20	460 ± 60 Nm (340 ± 44 ft lb)	3/4"-10	370 ± 50 Nm (275 ± 37 ft lb)
M22	650 ± 80 Nm (480 ± 60 ft lb)	7/8"-9	620 ± 80 Nm (460 ± 60 ft lb)
M24	800 ± 100 Nm (590 ± 75 ft lb)	1"-8	900 ± 100 Nm (660 ± 75 ft lb)
M30	1600 ± 200 Nm (1180 ± 150 ft lb)	1-1/4"-7	1800 ± 200 Nm (1320 ± 150 ft lb)
M36	2700 ± 300 Nm (2000 ± 220 ft lb)	1-1/2"-6	3100 ± 350 Nm (2280 ± 260 ft lb)

SERVICING & TROUBLESHOOTING

* fasteners should not be lubricated, except for rust preventive with Mos₂

10.4 Guides

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

- guides of the Diesel hammer
- guide gibs of the tripping device
- guides of the pile helmet
- wear strips along the whole lead length!

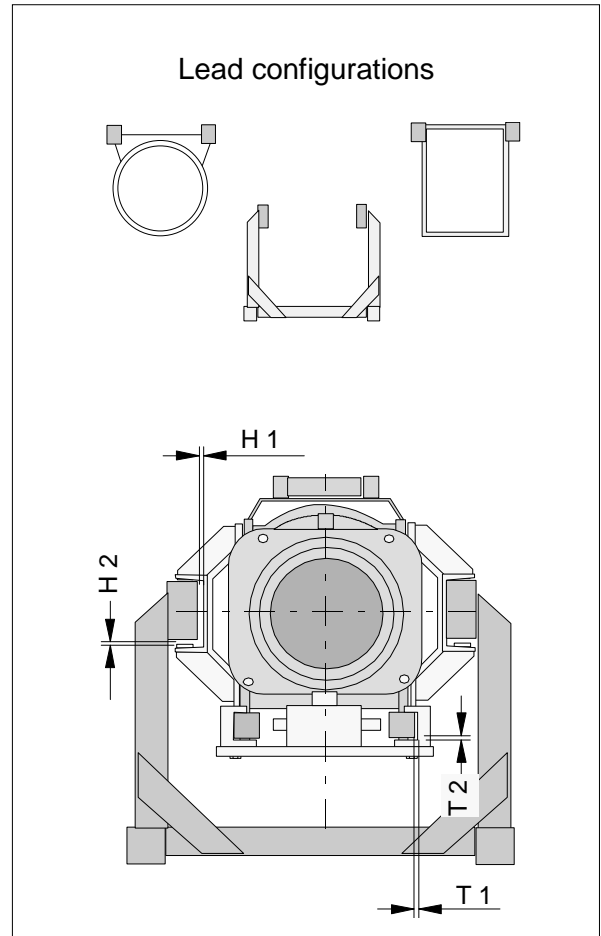
Lubricating the guide rails of the lead and the starter guides with a MoS₂-containing multipurpose grease extends the lifetime of your equipment.

! WARNING !

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 pile hammer, the helmet or the tripping device may fall out of the leads! Danger of accident!

Not only because from a safety standpoint it is important to have a good guided hammer and pile helmet: The driving efficiency also depends on how the diesel hammer is in line with the pile. Our Diesel hammers have the longest possible channel-guiding. This accomplishes a good hammer guiding with a relatively large guiding clearance (which is sometimes necessary if slightly bent or worn out leads are used)

Short distance hammer guiding needs a tighter fit to the lead (less guiding clearance)



Total guiding clearance		
Hammer channel guiding	H1	1/2"
	H2	1/4"
Hammer short guiding	H1	1/4"
	H2	1/4"
Starter guides	T1	1/4"
	T2	1/4"

10.5 Tripping device

The following items must be checked daily prior to the driving of the piles and when problems are suspected:

- The proper functioning of the trip cam and the lifting mechanism of the tripping device
- The guiding clearance in the guides of the tripping device

Lubricate the tripping device weekly with Molyube 126 EP#2 (5 strokes with a grease gun per grease nipple)!



Do not operate the Diesel pile hammer, when the tripping device does not function properly or the overlapping distance between the Diesel pile hammer and the tripping device is too small! Danger of accident!

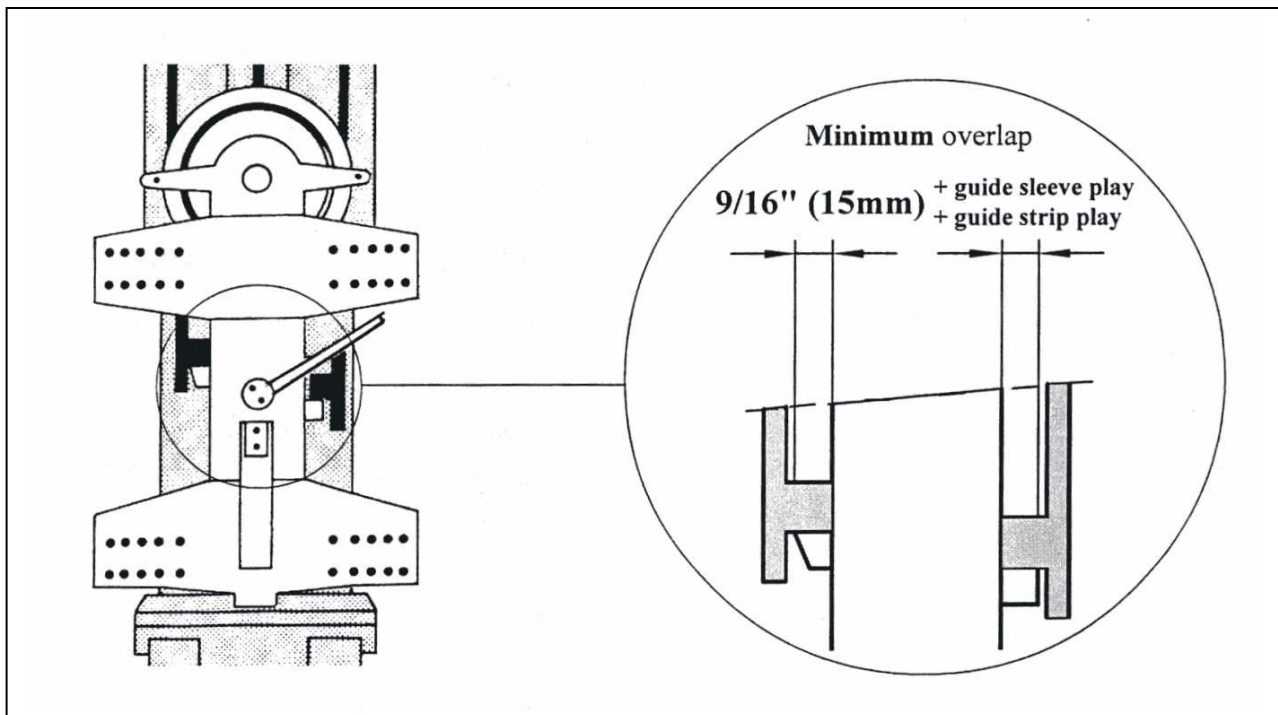
! WARNING !

Worn guide strips must be replaced immediately! When this is not done, the tripping device may jump out of the guide! Danger of accident!

Use only spare parts supplied by us! We cannot guarantee a proper functioning of the tripping device when other spare parts are used!

Along the whole lead length, the overlap of the latches between the Diesel pile hammer and the tripping device must be at least 9/16" (15 mm) greater than the play of the guide strips

The play of the guide strips must be less than 1/4" or 9/32" (6 mm or 7 mm). If this is not the case, the guide strips must be replaced immediately!

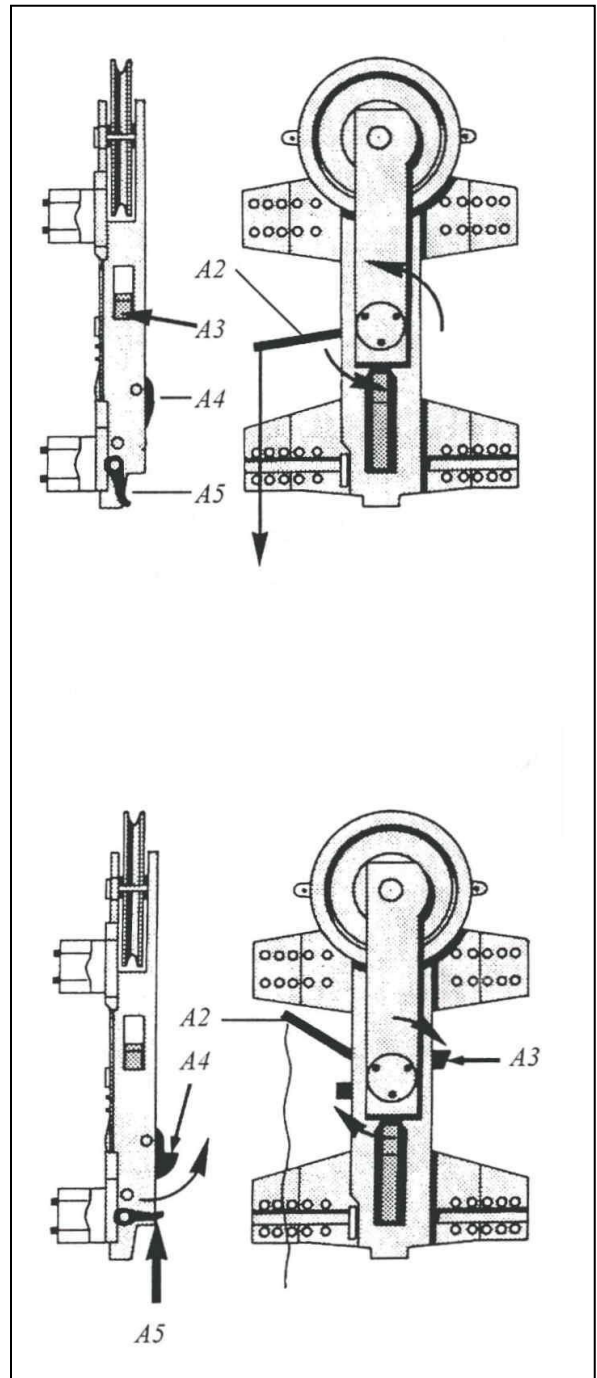


SERVICING & TROUBLESHOOTING

Testing the proper operation

The tripping device is considered inoperative, when one of the following criteria is not met:

1. Lower the tripping device
2. Make sure the trip cam lever (A5) is pushed up when the tripping device impacts the lower support device (9)! At the same time, pawl (A4) must swing out fully and must lock!
3. Check the tension and the screw connection of the plate spring!
4. Pull down on the cable at lever (A2)! The driving pin (A3) must fully reach its vertical position!
5. Release the cable at lever (A2)! The driving pin (A3) must return to fully horizontal position!
6. Check the proper functioning of the rope sheave (if used)!
7. Check the tripping device for wear! Particularly the pawl (A4) with lugs and joint bolts as well as the driving pin (A3) and the pawl (A4) should not be rounded or exhibit visible wear!



10.6 Pumps

! WARNING !

Problems with the fuel or lubricant system must be remedied immediately! Such problems pose an increased fire risk and may cause the destruction of the Diesel pile hammer.

Use only spare parts supplied by us! We cannot guarantee proper functioning of the pumps when other spare parts are used!. Following the safety instructions indicated at the beginning of chapter 10 "Servicing and troubleshooting

Disassembly and cleaning of pumps

The fuel control pump and lubrication pump shall be disassembled and cleaned when necessary (See spare parts list)! Remove all paraffin and dirt residues! Make sure all moving parts move easily! Replace worn and defective parts! The following steps are needed to install the sealing surfaces:

1. Carefully remove any grease from the sealing surfaces as well as from the support surface between the fuel pump and the lower cylinder section! Use a suitable grease remover! Let the grease remover evaporate fully!
2. Use a high performance sealant (Hylomar) or similar (provided in the tool box) for sealing the pumps to the lower cylinder
3. Install the pump!
4. Check for leaks!

Depending on the sealant the sealing surfaces can be separated several times without applying new sealing mass. No foreign material should be left on the sealing surface

Lubricant pump

After each 30 minutes of pile driving work, check that the upper cylinder section is properly supplied with the lubricant! The piston and the upper cylinder section must be covered with a uniform thin lubricant film! The following should be checked as well:

- Is the lubricant tank empty!
- Are the lubricant lines clogged or defective? Is the pump lever worn?
- Is the lubricant pump contaminated or defective.

Operate the Diesel pile hammer only after the problems have been remedied!

Use a motor oil for the appropriate motor temperature range

Fuel control pump

The control dimension at the fuel control pump is significant for the fuel quantity supplied with each stroke. A dimension that is too long causes an excessive fuel supply to the Diesel pile hammer. Accordingly, there is the risk of the piston jumping into the catch groove. When the control dimension is too small (e.g. due to wear at the pump lever or guide sleeve), the fuel supply will be too low. The diesel pile hammer is thus unable to reach the maximum blow energy. Check the control dimension of the fuel control pump as required. Reset the control dimension when it deviates from the nominal dimension!

1. Set the fuel control pump to setting "4" (full load)! To do so, pull on the right control ropes often as required!
2. Measure the control dimension (see pict.)
3. Compare the measured control dimension with the nominal dimension (see table below)!

SERVICING & TROUBLESHOOTING

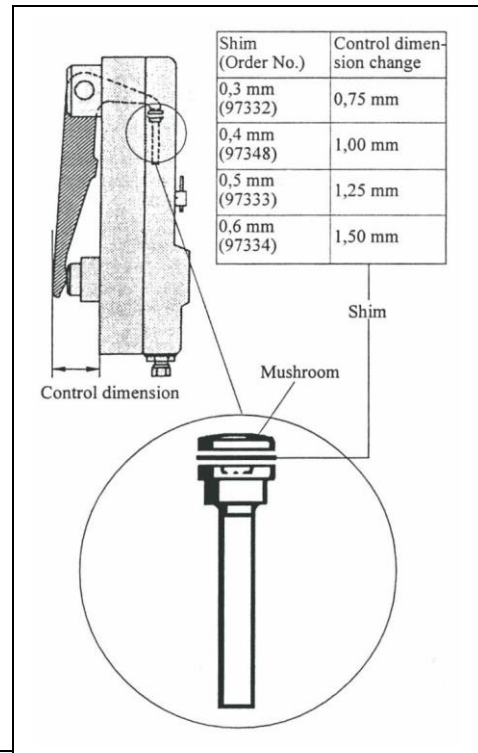
4. The control dimension must be reset, when the measured control dimension is not within the tolerance. This is achieved by changing the number and thickness of the shims between the pressure section and the mushroom! It is generally sufficient to remove one shim or to use a thinner shim. The pump lever is worn, when it is no longer possible to remove shims. In that

5. Check the injection valve! The pistons in the injection valves must move smoothly and close well. Replace the injection valves when this is not the case

case, replace the pump lever and reset the control dimension!



Never grind the pressure piece or mushroom! The supplied fuel quantity can be measured directly with the test unit for fuel pumps (see A1-1)



Type	Control dimension (mm)	Supply quantity at full stroke (cm ³ /stroke)	Fuel control pump order number	Injection valve		Pump element		
				quantity	Order No.	Diameter (mm)	Order No.	
D6-32	53.5 ^{+0.3}	1.6	41865	1	104675	14	22903	
D8-22	53.5 ^{+0.3}	1.75	41865			14	22903	
D12-42	54.0 ^{+0.3}	2.10	122469			15	122470	
D19-42	54.6 ^{+0.3}	2.40	170244			16	44015	
D25-32	54.5 ^{+0.3}	3.90	108780			20	66522	
D30-32		4.70	105172			22	66528	
D36-32	54.0 ^{+0.3}	5.65	105731	2	63841	24	64804	
D46-32	54.5 ^{+0.3}	7.15	105202			27	64813	
D62-22	53.5 ^{+0.3}	8.70	100259	2	104675	31	67218	
D80-23	55.0 ^{+0.3}	10.50	66948	4		32	67207	
D100-13		12.50	103964	4		35	14655	
D125-32		15.5	DH125.04.01	4		39	125.04.01.03	
D138-32		17.0	DH138.04.01	4		41	138.04.01.03	
D160-32		21.0	DH160.04.01	4		DH160.04.07	45	160.04.01.03
D180-32		24.0	DH180.04.01	4			48	180.04.01.03
D225-22		53.8 ^{+0.3}	28.0	DH125.04.01		4	DH225.04.07	39
D250-22		55.0 ^{+0.3}	31.0	DH125.04.01	4	39		125.04.01.03
D280-22	55.0 ^{+0.3}	34.5	DH138.04.01	4	41	138.04.01.03		

SERVICING & TROUBLESHOOTING

10.7 Filter

! WARNING !

Follow the safety instructions indicated at the beginning of this chapter !

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

1. Drain the fuel tank!
2. Pull the fuel line from the filter nozzle!
3. Unscrew the filter nozzle!
4. Clean the filter insert!
5. Screw the filter nozzle back in!
6. Push the fuel line again on the filter nozzle and mount the hose clamp!
7. Fill the fuel tank!
8. Check the filter nozzle for leaks!
9. Clean the filter of the lubricant tank in the same manner!

10.8 Grease Nipple

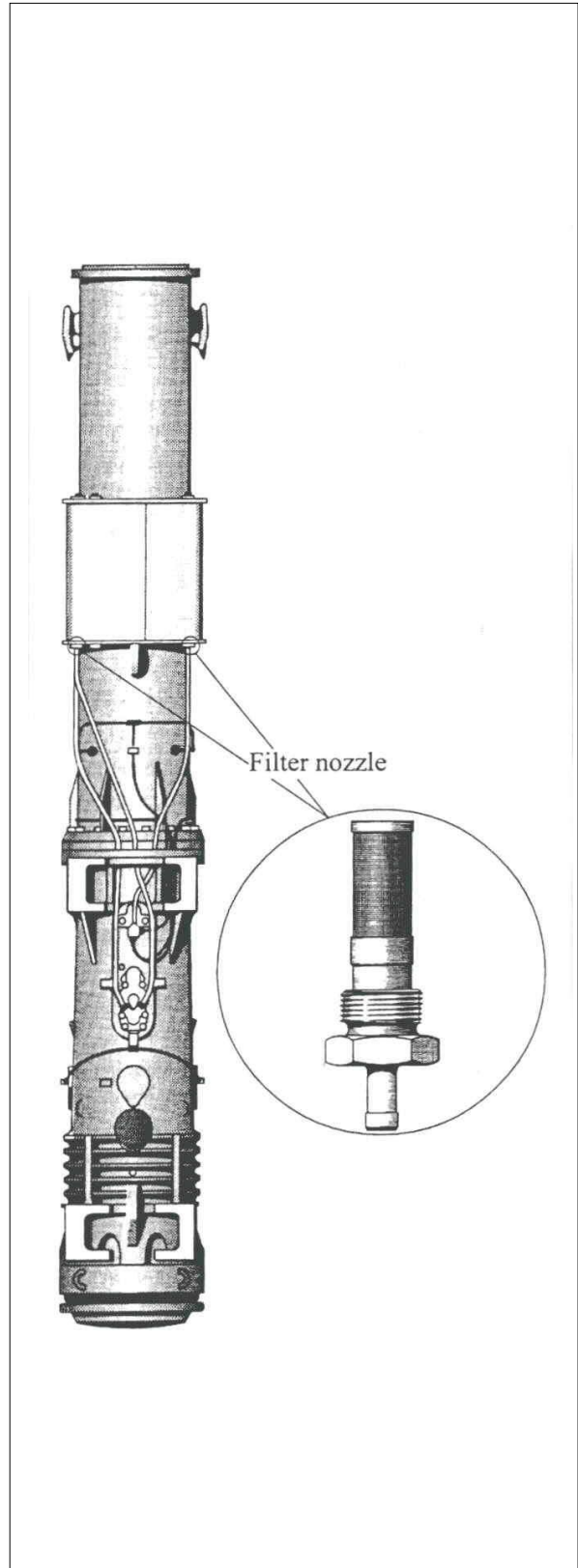


Be careful when working on a hot Diesel pile hammer! Do not touch hot components! Danger of burns!



The grease nipples and lubrication openings must be free of dirt and carbonization and must allow a free flow for the lubricant. Clogged grease nipples must be replaced!

Pump fresh grease again in the grease nipples of the impact block, cylinder end ring and upper cylinder section after shutting off the Diesel pile hammer! This prevents a carbonization of the grease located in the hot grease nipple!

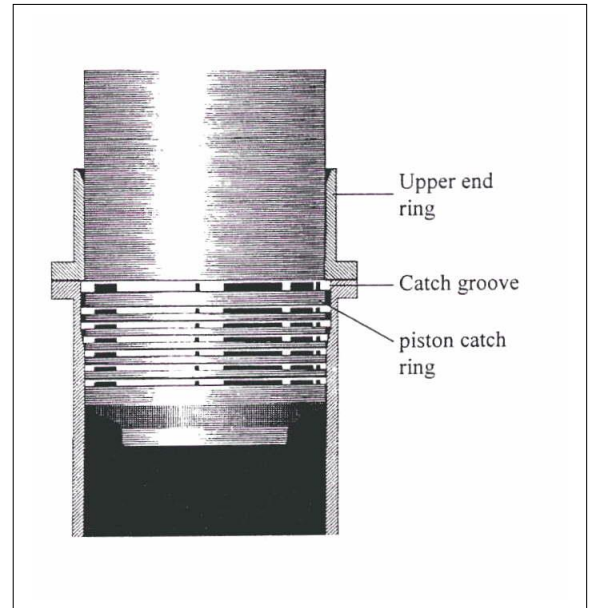


SERVICING & TROUBLESHOOTING

10.9 Catch groove and piston catch ring

The material to be driven penetrates slowly in particularly solid soil or in the case of a very blunt pile. In such a case, the drop height of the impact hammer may continue to increase. You must, in a timely manner, reduce the fuel supply to prevent the piston catch ring from bouncing into the catch groove of the upper cylinder section

The operation of the Diesel pile hammer must be discontinued immediately, when the catch piston ring has bounced into the catch groove of the upper cylinder section! Check the catch groove and the piston catch ring! Both must always be in perfect condition. Machine a damaged catch groove! Replace damaged catch piston rings!



10.10 Rubber rings

Rubber rings are components subject to wear. The service life of damping rings (operating hours to wear) can vary tremendously. The service life of the damping rings is a function of

- the type of pile-driving work,
- the number of strokes per minute,
- the quality of the maintenance work,
- outside effects (weather, dirt...)

Worn or damaged damping rings shall be replaced as described below:

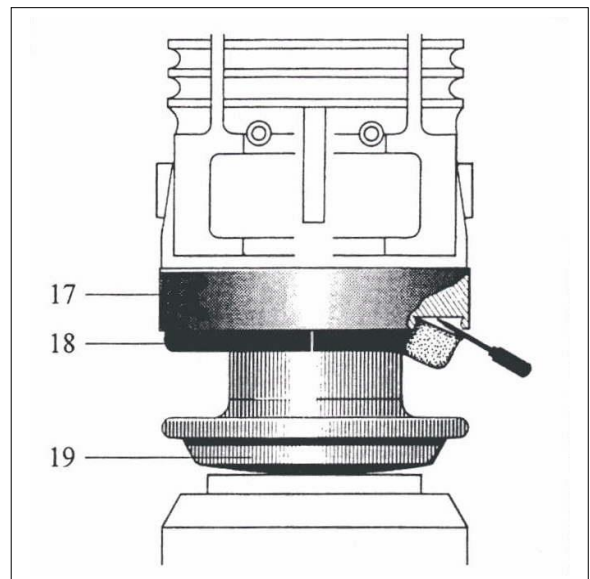


Follow the safety instructions indicated at the beginning of this chapter!

1. Let the Diesel pile hammer rest on the impact (19)!
2. Remove the impact block safety device, if present!

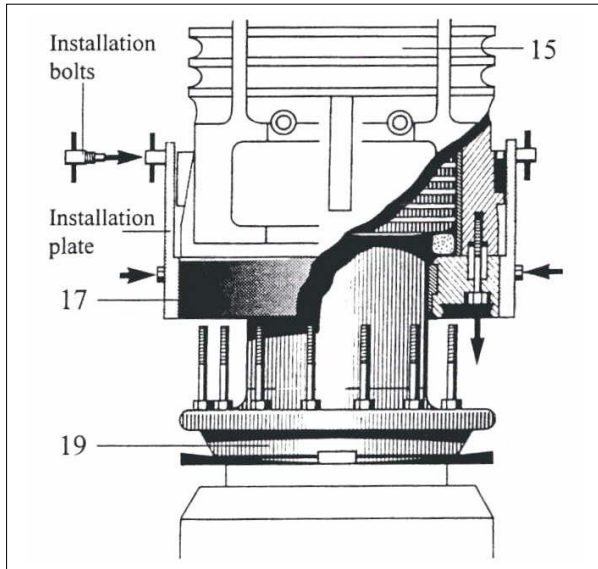
3. Lift the Diesel pile hammer until the impact block (19) is fully extended!

Secure the Diesel pile hammer against a falling down !

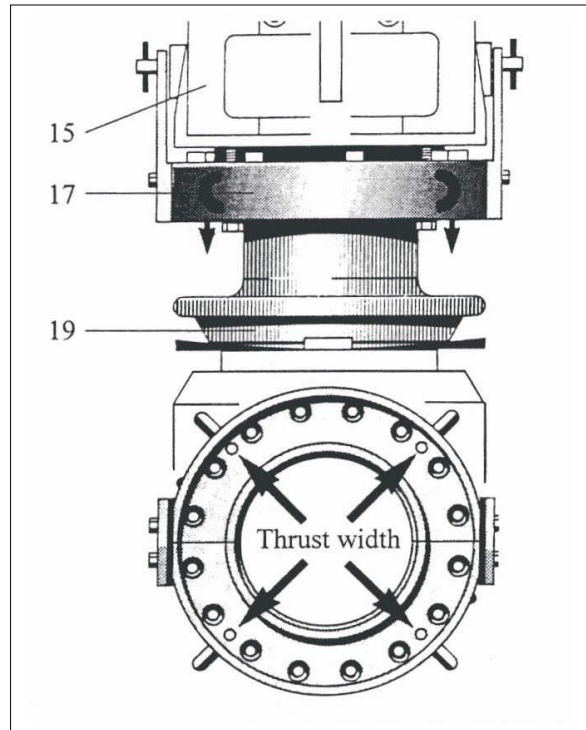


SERVICING & TROUBLESHOOTING

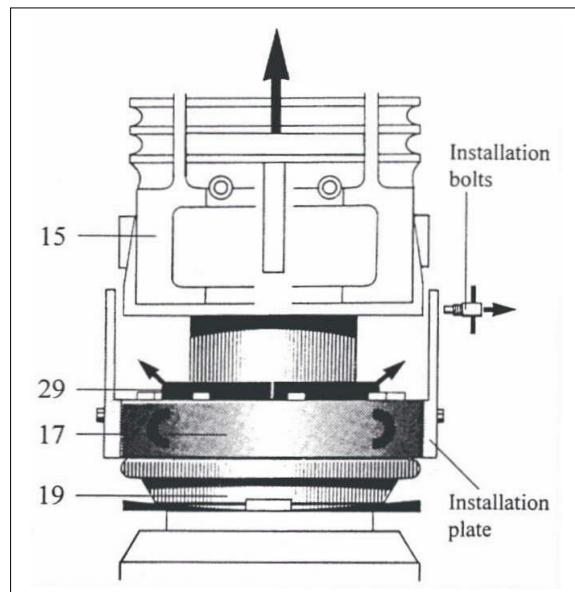
4. Using a screw driver, push the two-piece outer damping ring (18) out of the groove! Keep the loose metal guard for the later installation! Work steps 5 through 19 can be ignored, when it is necessary to replace only the two-piece rubber ring (19).
5. Secure the impact block (19) with wedges against a tilting toward the pile helmet!
6. Attach the supplied installation plates to the two-piece cylinder end ring (17)!
7. Screw the installation bolts in the lower cylinder section (15)!
8. Unscrew all expansion screws of the cylinder end ring (17)! Keep the expansion screws at a safe place!



9. Remove the cylinder end ring (17)! To do so, screw four expansion screws in the respective threads (See illustration)! The width is restricted by the installation bolts.
10. Let the Diesel pile hammer rest on the impact block flange!
11. Unscrew the installation bolts from the lower cylinder section (15)!
12. Pull the Diesel pile hammer upward until the inner damping ring (29) is easy to replace! **Secure the Diesel pile hammer from falling down!**



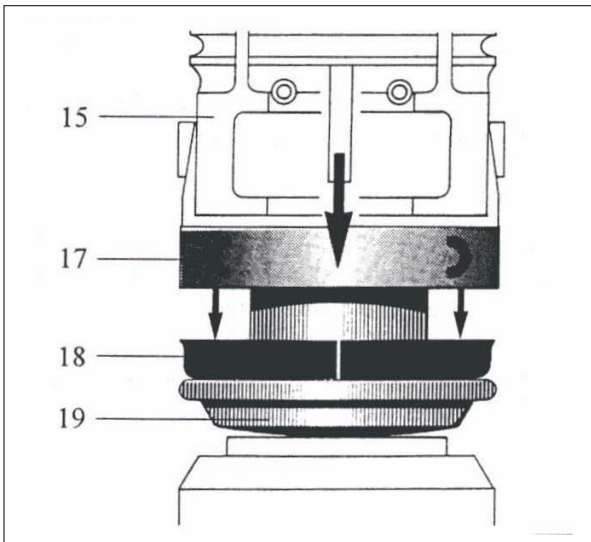
13. Replace the inner damping ring (29)!
14. Let the Diesel pile hammer rest on the impact block flange (15)!
15. Screw the installation bolts in the lower cylinder section (15)!
16. Lift the Diesel pile hammer until the impact block (19) is fully extended!



SERVICING & TROUBLESHOOTING

The piston rings remain in the cylinder!
Secure the Diesel pile hammer from falling down !

17. Remove the four thrust screws!
18. Screw all expansion screws back in the cylinder end ring (17)! Follow the torque data
19. Remove the installation plates!
20. Place a new two-piece rubber ring (18) of the impact block flange!
21. Place the metal guards indicated in work step 4 on the two-piece rubber ring (18)!



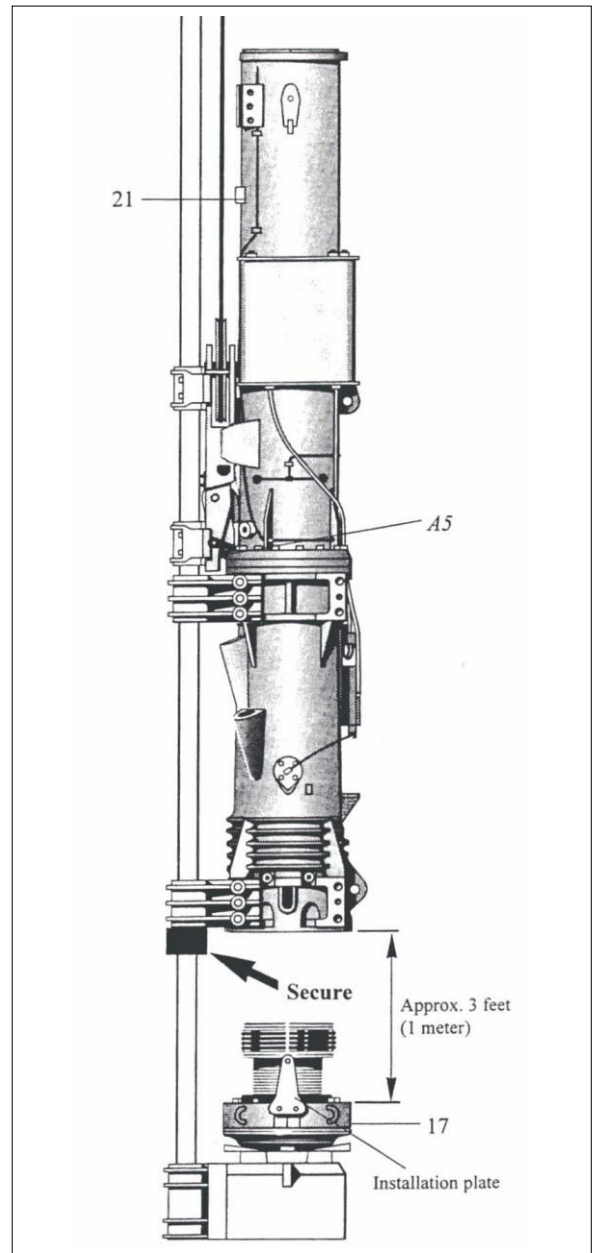
22. Lower the Diesel pile hammer! With its self-weight, the Diesel pile hammer presses the two-piece rubber ring (18) into groove.

10.11 Piston and impact block rings

! WARNING !

Worn or damaged piston or impact block rings must be replaced as indicated below.

Follow the safety instructions indicated at the beginning of this chapter!



SERVICING & TROUBLESHOOTING

With the Diesel hammers of the types D12 through D100, it will be possible to pull the piston upward and out after disassembling the upper end ring. Work steps 18. and 23. Change accordingly!

1. proceed the steps 1 through 11, described above

12. Lift the Diesel pile hammer approximately 3 feet (1 meter)! The cylinder end ring (17) is kept together with the installation plates and remains on the impact head flange. Secure the Diesel pile hammer from falling!

13. Pull the piston (26) upward with the help of the tripping device and stop just prior to reaching the upper stop (21)

! WARNING !

The catch lever (A5) must not touch the upper stop (21)! This may cause a release of the piston (26) and it may thus come crashing down! Danger of an accident!

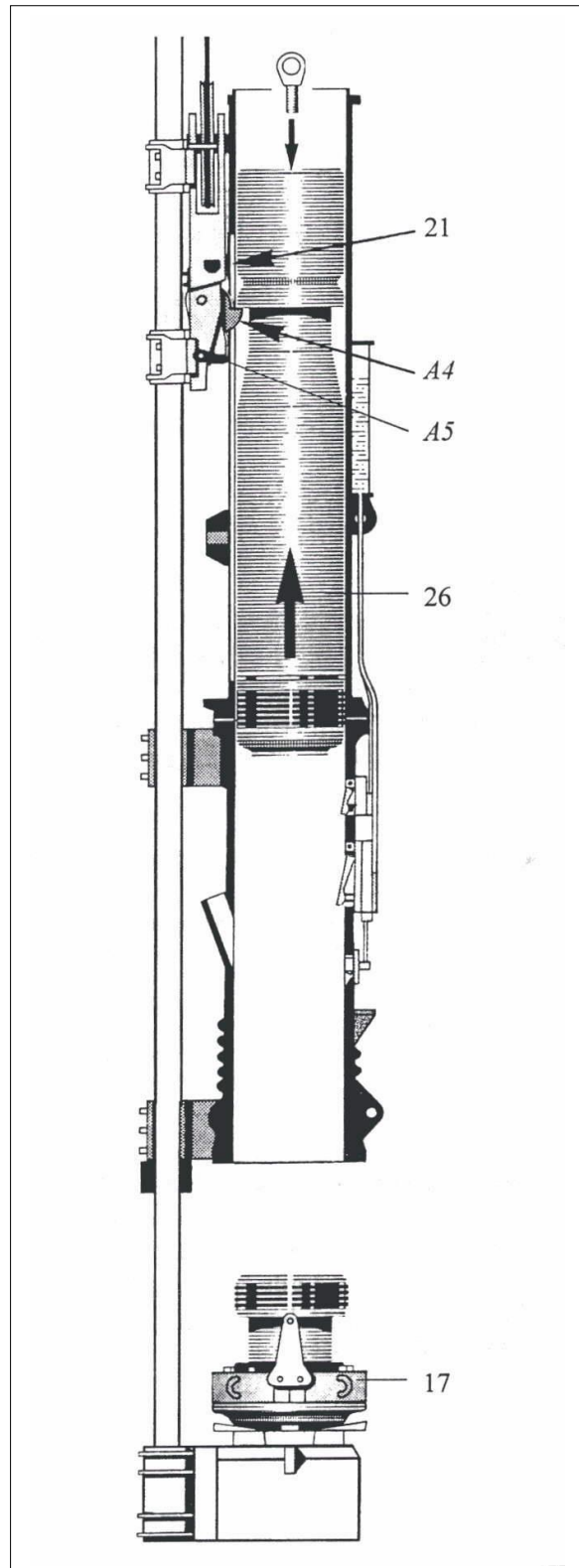
14. Screw the supplied ring screw into the piston (26)!

15. Attach a suitable steel cable to the ring screw and the lifting equipment!

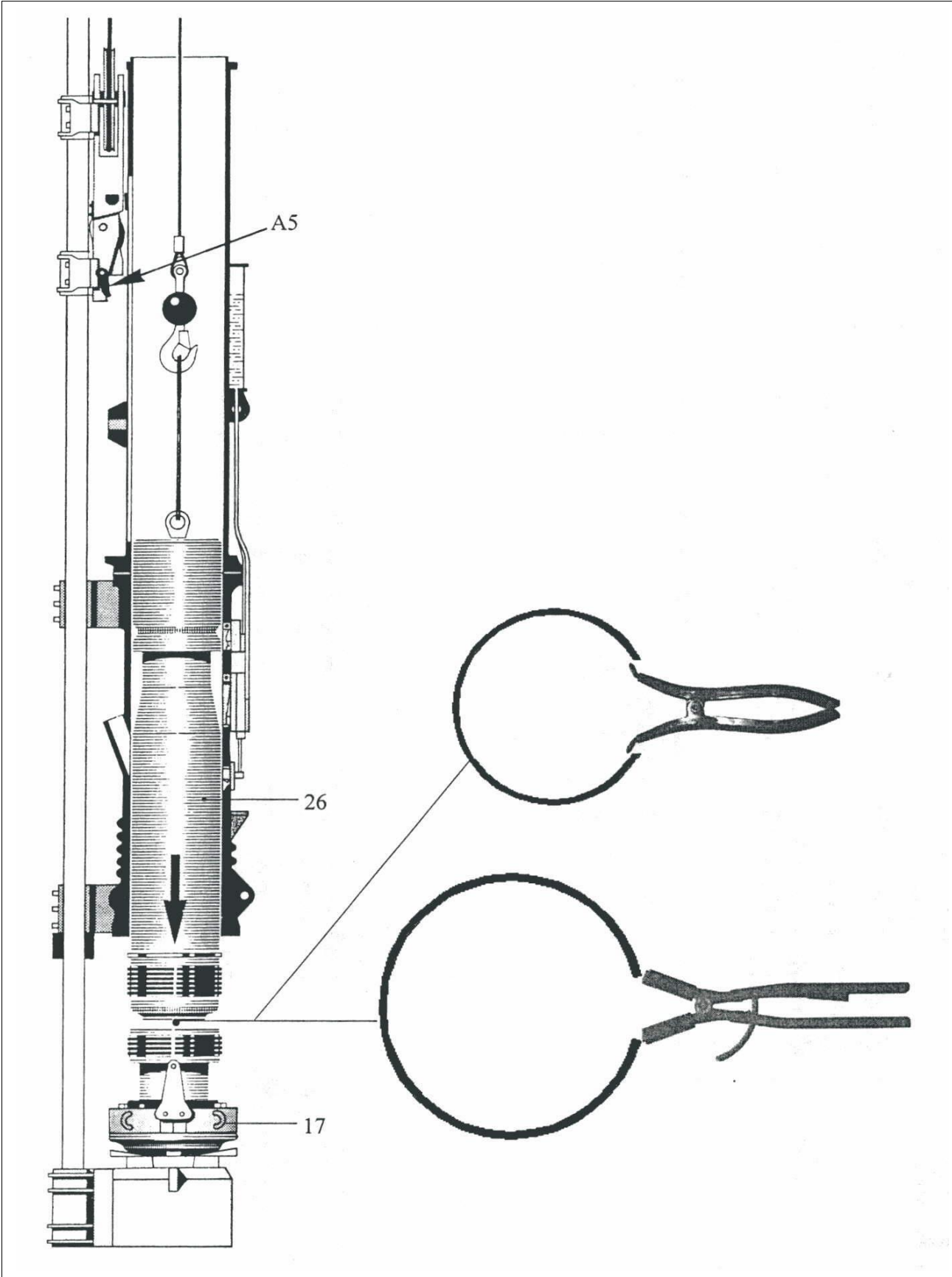
16. Lift the piston approximately 2 inches (5 cm)!

17. Push the catch lever (A5) down using a pry bar

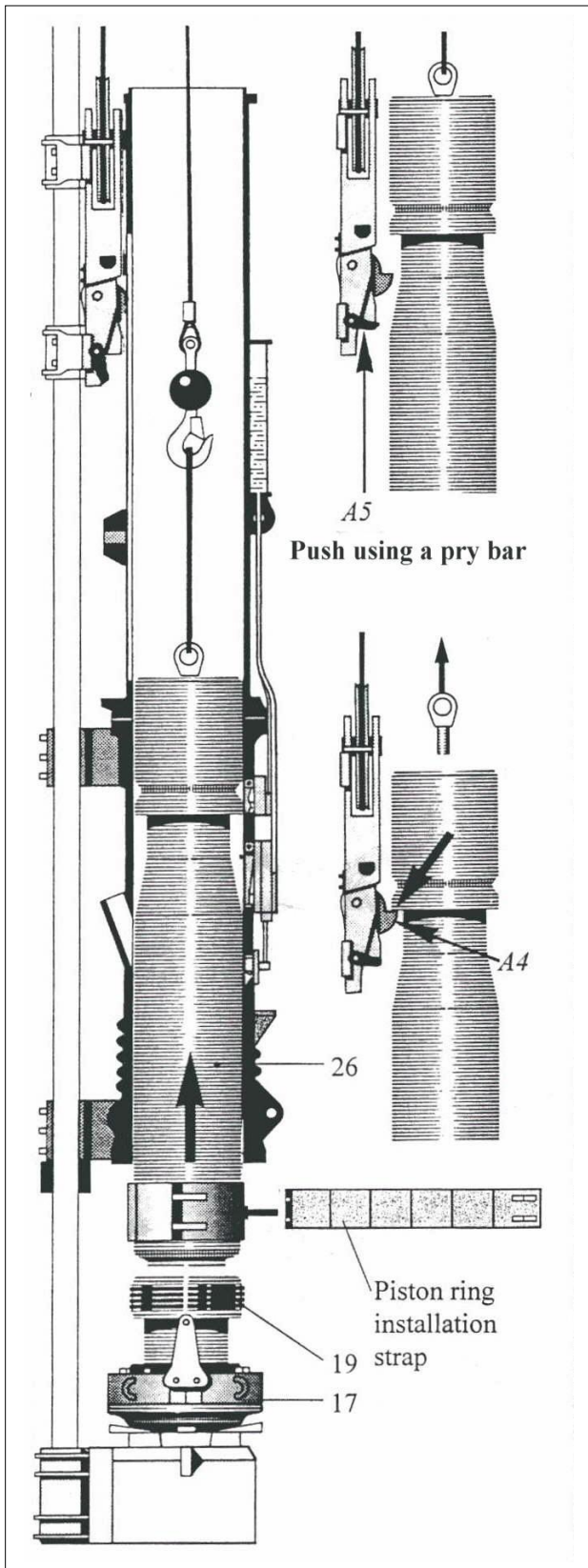
18. Lower the piston until all piston rings are easily accessible!



SERVICING & TROUBLESHOUTING



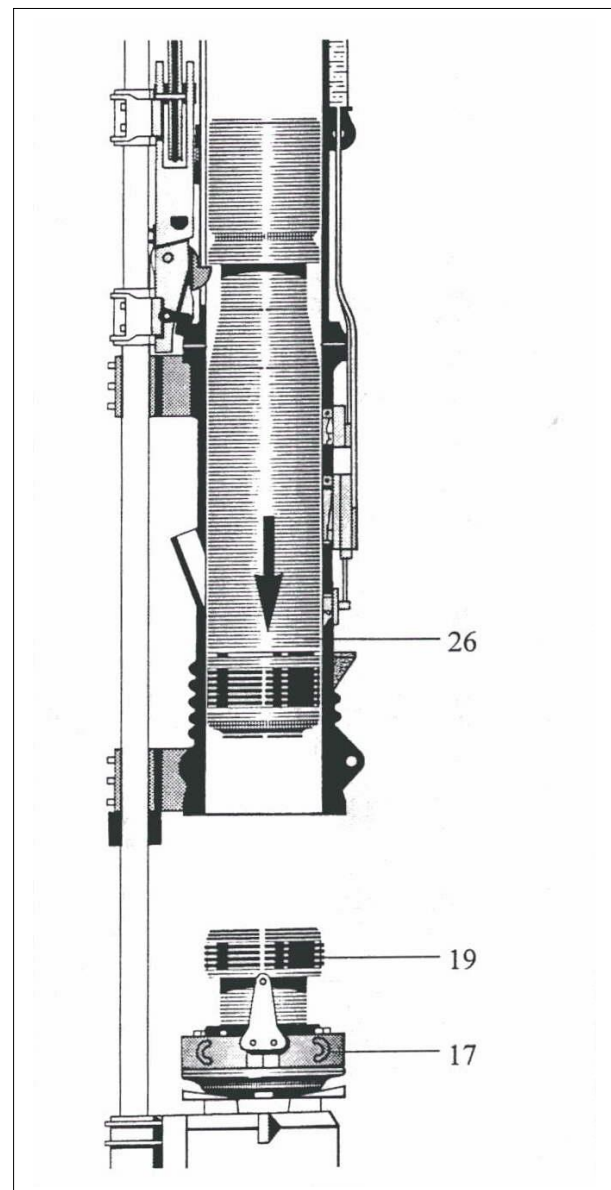
SERVICING & TROUBLESHOOTING



19. Remove the piston and impact block rings using special piston ring installation pliers (included with the tool chest)!

20. Carefully clean the piston and impact block ring grooves and apply the special grease!

21. Install the new piston and impact block rings using the special piston ring installation pliers (included in the tool box)!



SERVICING & TROUBLESHOOTING

22. Place the supplied piston ring installation band around the piston rings!

23. Carefully pull the piston upward until you are able to push the pawl (A4) into the groove of the piston (26) by pressing the catch lever (A5) upward by hand.

Make sure the piston ring installation strap does not get stuck, when the piston (26) is lifted into the cylinder!

24. Let the piston (26) rest on the pawl (A4)!

25. Remove the cable and ring screw from the piston (26)!

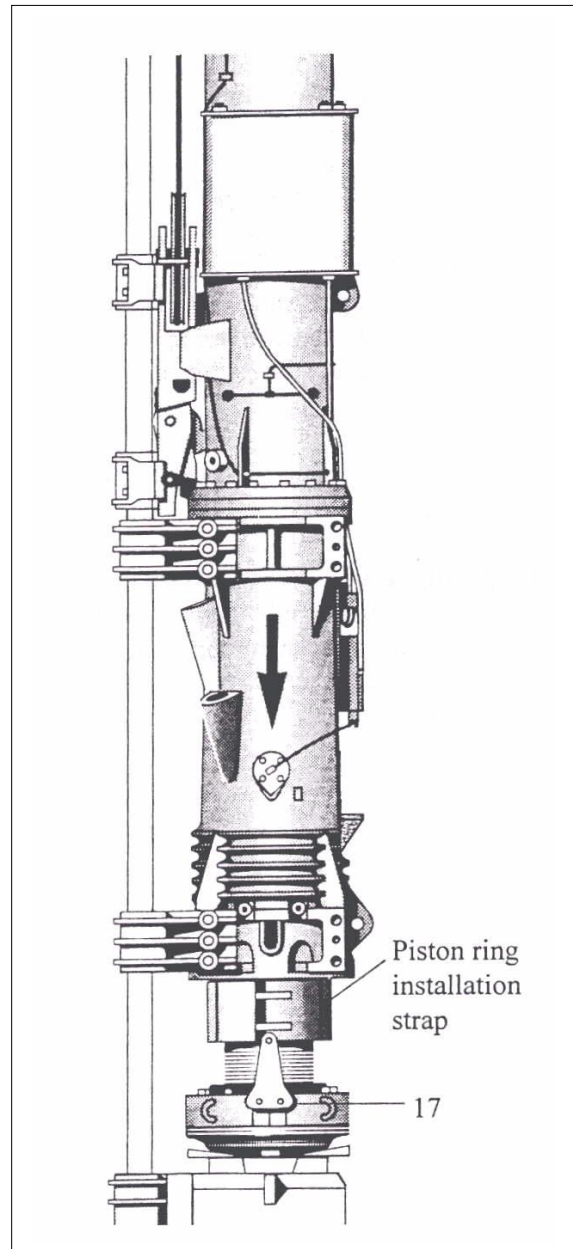
26. Lower the piston (26) to the lower stop using the tripping device

27. Place the piston ring installation strap around the impact block (19)!

28. Slightly raise the Diesel pile hammer to unlatch the tripping device! Then lower the Diesel pile hammer! Guide the impact block (19) during said phase! Make sure the piston installation strap is not compressed on the cylinder end ring (17) (Stop the downward movement at the appropriate time)!

29. Remove the piston ring installation band.

30. Install the inner dampening ring and rubber ring



! WARNING !

The Diesel pile hammers of the types D12 through D100 may be operated only with the upper end ring or the extension of the upper cylinder section in place! Danger of an accident!

SERVICING & TROUBLESHOOTING

10.12 Compression

Starting difficulties may be caused by a compression that is too low. A major decrease in the compression during the pile-driving work will cause the piston to reach lower and lower heights. The Diesel pile hammer will stop in the extreme case.

The compression can be checked as described below:



You must wear a hard hat, ear plugs, safety goggles, safety gloves, safety boots and suitable work clothes!

1. Place the Diesel pile hammer on a hard pile or a test stand!
2. Set the fuel control pump to setting "0"! To do so, pull the left control rope as often as required
3. Pull the piston upward until it trips!
4. Watch the piston! Compression is sufficient when the piston bounces after impacting the impact block and comes to rest after at least another three upward and downward movements.

Causes for compression that is too low:

- defective or stuck piston rings
- Insufficient lubrication of impact block or piston
- Grooves in the lower cylinder section below the exhaust openings
- damaged inner (bearing) ring
- inside diameter of the lower cylinder is out of round or has grooves (worn out)
- the pile "runs" (soft soil, light, pointed and narrow material to be driven).

Replace the defective components!
Lubricate the impact block and piston in accordance with the maintenance schedule

The following steps are helpful in case of a "running" pile:

Starting difficulties: Let the piston drop several times with the fuel supply shutoff (Setting "0") (cold blows) until the penetration resistance is sufficient for the starting.