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ERL MAINTENANCE SUPPORT SDN BHD

(Company No. 498574-T)

E-MAS

Effective Railway Operations; Reliable System Maintenance

ROLLING STOCK DEPARTMENT

IN-HOUSE TECHNICAL INSTRUCTION

RESCUE & RE-RAILING EQUIPMENT TRAINING MANUAL

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Amendments or additions to this procedure must be indicated with a vertical black line in the adjacent left margin.

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1 Purpose

This document is a training material and guideline to the RST Rescue & Re-railing Team (RRT) to operate the Rescue & Re-railing equipments in the event of exercise or Incident. This to ensure RRT is capable to carry out the rescue and re-railing of train or vehicles when required in safe and professional manner.

The instructions below are applicable as examples for the re-railing process. This document is by no means an exhaustive list of all possible derailing circumstances. Should a situation come across you that not detailed here, act responsibly at your own discretion. The general instructions must be adhered under all circumstances!

2 Scope

This document is applicable to all RST personal and could be viewed and retrieved via EDMS and RST Portal [http://express50/ E-MAS_Portal/RST.html]. The hardcopy of this procedure is available in RST foreman room for reference. The full access for editing this document is only granted to RST MGT.

In this document also describes the function and its characteristics in the system.

- Procedure
- Technical Description of Re-railing Equipments

3 Hydraulic Power Systems and Control Units

• Pump set with 4-stroke engine (oil filling type)
The Pump Set generates the hydraulic pressure required for the re-railing equipment. The Pump Set comprises of main components the oil tank, the combustion engine and the high-pressure axial piston pump. The engine and pump are assembled together on a common base plate, which is mounted on the oil tank using elastic elements. Pressure and return flow connections are equipped with screw couplings.

• Control Desk for Pump Set Control
The Control unit is the central point from which all the operations of the re-railing system can be controlled and monitored. It is equipped for the connection of four hydraulic consumers. The control unit comprises a sturdy portable frame, a four-way control block, oil-circulation, integral pressure relief valves, high-pressure filter, and pressure gauge for pressure monitoring, color-coded hose connections

3.1 Drive and Control System

The motor-pump unit serves as a source of power for flow rate and operating pressure. The ***motor*** (1) is used to drive a ***radial pump*** (2) that generates the pressure.
A distinction is made between the:

- low pressure circuit (up to 16 Mpa) = LP, and
- high pressure circuit (up to 50 Mpa) = HP

The changeover from low pressure to high pressure takes place automatically. In high-pressure mode, the ***pressure shut-off valve*** (4) of the LP circuit is automatically switched to pressure less circulation. The unit is a compact device and has been installed so that the control unit is arranged above the drive section with motor and pump. This section consists of a valve block, by means of which the movements of the hydraulic cylinders are controlled. A pressure relief valve (5) protects the system against excess pressure.
The cylinder piston moves inwards on the annular side of the cylinder with a reduced pressure of 10 Mpa.
The pressure restriction needed for this to ensure the valve at pos.13. The setting of this valve must not be altered.

*Numbers in brackets relate to the corresponding position in Figure 1 and 2

The actual movement is controlled by means of the following valves:

- ***Pre-selection valve*** (6)
  This is used to pre-select the direction of movement of the lifting cylinder.
  Lever horizontal: ***zero position***, pressure fluid circulation
  Lever moved ***upwards*: for *jacking***, piston extends forward
  Lever moved ***downwards:* for *lowering***, piston retracts

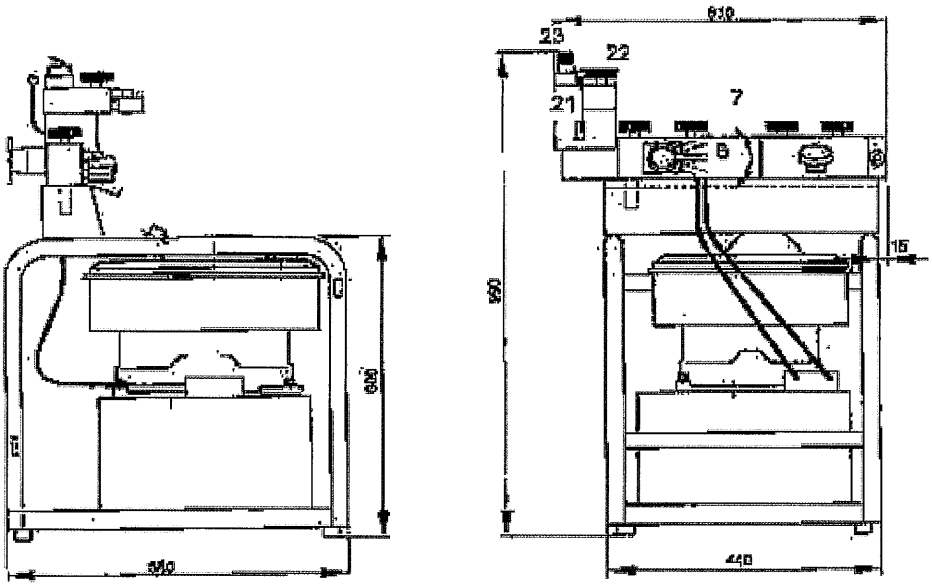
- ***Stop valve*** (7)
  This is used to control the movement and the speed.
  Valve ***closed***, turned clockwise: **no *piston movement***
  Valve **open**, turned anti-clockwise: ***piston movement***
  In accordance with the setting of the pre-selection valve (6)

3.1.1 Speed of movement

By turning hand-wheel slowly (anti-clockwise) the valve is opened, the pre-selected movement is initiated. If the wheel is turned further in an anti-clockwise direction, the piston movement is accelerated. If the wheel is turned in a clockwise direction, the movement slows down. If 2 cylinders are connected, the second hand- wheel can be used to control a uniform movement or a following movement of the pistons with precision. If the wheel is turned clockwise as far as the stop, the movement is stopped.

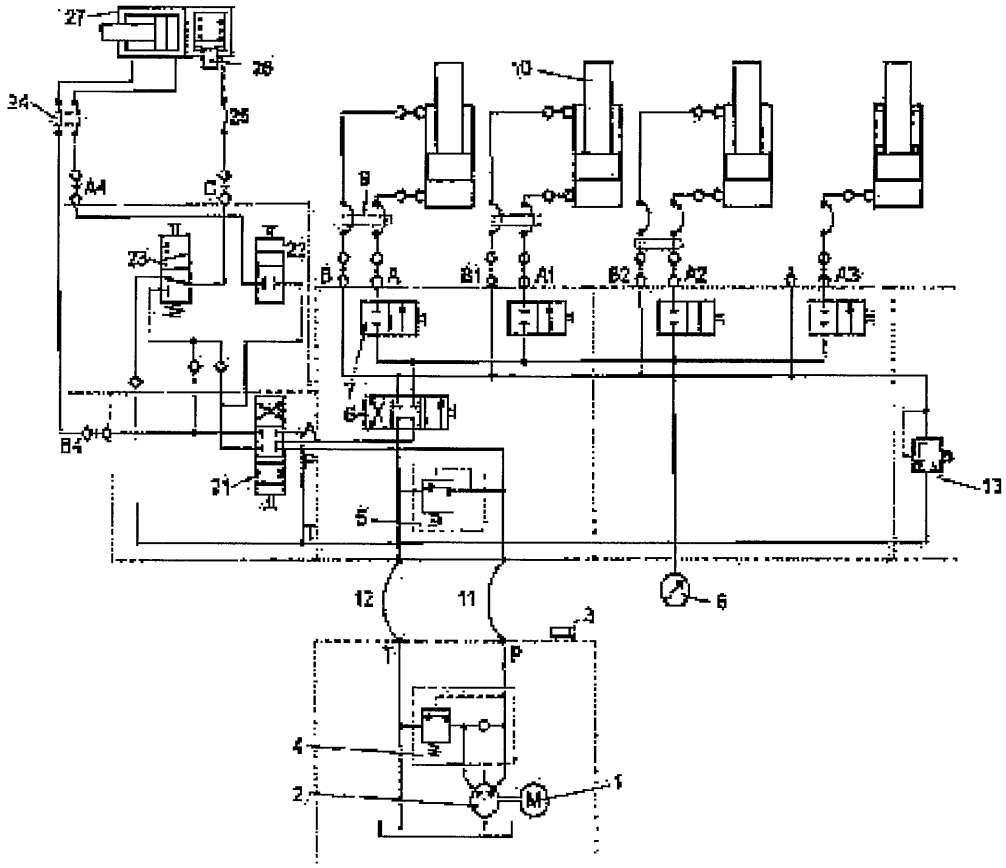
3.1.2 Lowering the load

The lowering movement must only be carried out when the pump is operating, otherwise a forward piston stroke under load will create a vacuum, which may cause air to enter the system.



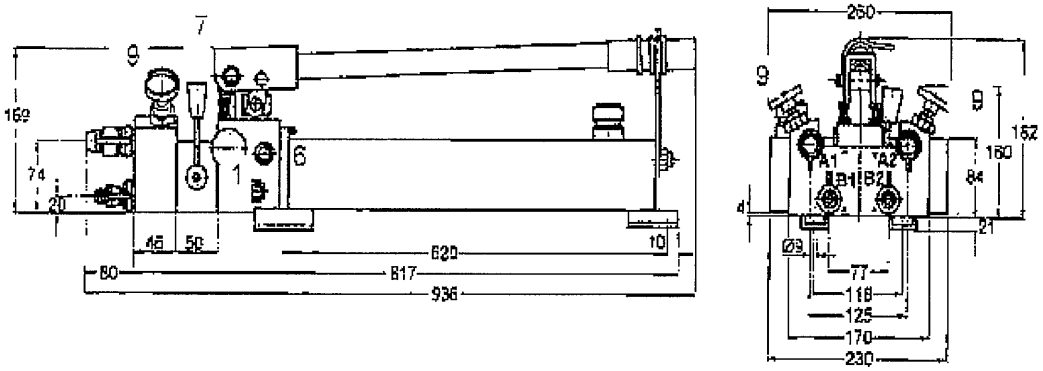
Lukas Compact Power Unit		GC-6-4DC
Order No.		84072/9243A
Operating pressure	Mpa	50
Motor		Gasoline engine
Motor power	Kw	2.6 at 3200 rpm
Oil delivery low pressure (16 MPa)	l/min	4.7
Oil delivery low pressure (16 MPa)	l/min	1.45
Oil capacity	l	24
Usable oil capacity, max.	l	19
Weight without oil	Kg	58.5

Figure 1: Lukas Compact Power Unit GC- 6 –4 DV



Operating pressure	Mpa	50
Oil delivery low pressure (up to 18 Mpa) per stroke	cm^3	10.8
Oil delivery high pressure (over to 18 Mpa) per stroke	cm^3	4.2
Oil capacity	l	10.5
Usable oil capacity	l	8
Weight without oil	kg	11.8
Weight with oil	kg	20
Delivered with oil		HLP 22

Figure 2: Hydraulic Diagram



A1 and A2 = Pressure port M 14 x 1.5 (quick-connect socket StMu 61-O)
B1 and B2 = Pressure port M 14 x 1.5 (quick-connect plug StNi 61)

Figure 3: Lukas Hand Pump for double-acting cylinders ZPH 3 / 8 – 2D

4 ZPH 3 Hand Pump

The hand pump of the ZPH series is a two-stage pump and is used as a substitute if the motor-pump unit fails or for operating additional single jacks. In the lower pressure range (1st stage), the lifting cylinder is extended quickly up to the load point. When load is applied, the pump automatically switches over to high pressure (2nd stage). The jacking speed decreases in the high-pressure range. The pressure relief valve (6) is set to a maximum pressure of 50 Mpa and must not be set to a higher value.
Refer to Picture 5.

4.1 Lifting a load

- Turn (clockwise) hand-wheel of the discharge valve (1) up to the stop.
- Turn both hand-wheels on the 2D block (9) up to stop.
- Move lever of 4/2 way-valve (7) to position B (away from pump handle).
- Move the pump handle with short lifting movements. (Stand to one side of the pump).
- Turn hand-wheels (9) in accordance with the desired lifting movement (anti-clockwise).

4.2 Lowering a load

- Open the fluid-filler cover (4) by turning it several times.
- Open the discharge valve (1) by turning anti-clockwise.
- Turn hand-wheels (9) in accordance with the desired lowering movement.
- Move the lever of the 4/2-way valve (7) in order to retract the lifting of the pump handle (position A).

Note: Numbers in brackets relate to the corresponding position in Figure 3.

4.3 Lifting Cylinder with hydraulic piston retraction

The jacks are made of a light-metal alloy and have a working pressure of 50 Mpa. The use of high pressure and light-alloy construction allows a jack to be made which is small and light in weight compared to the force it exerts. The jacks are powered by the motor-driven pump or hand pump. They are operated by means of the control unit above the motor pump. The connection between the pump and the jack is in the form of two hoses (red/blue). Each jack is fitted with quick stop valve. This prevents unintentional lowering of the load if a hose leak occurs. Thanks to the blocking effect of the valve, a faulty hose can be replaced even if the jack is still under load.

When setting up the jack, make sure that it rests on a solid wooden base. To do this, place two equally sized wooden planks lengthways on plastic sheeting or similar placed on the ground and then put another two planks on top of them at right angles to the planks underneath. Then, lay down more planks, again at right angles to those underneath. With narrow wedges (1:10 slant), you can ensure that the jacks are mounted absolutely vertically. The wedges should be driven in as near to the bottom as possible (between the 1st and 2nd layer of wood or between the 2nd and the 3rd). Depending on requirements, make at least two double layers, preferably three and then continue the stack with single.

4.4 Auxiliary extension

Using a set of auxiliary fittings can increase the stroke of the piston. This set consists of auxiliary piston extensions and slip-on cylinder rings. After having placed a support base underneath the jack, proceed as follow:

- Replace the piston protection plate of the cylinder with a protection plate with centering borehole in the middle.
- Raise the load until a slip-on ring can be pushed onto the cylinder. The borehole should be facing you.
- Lower the load onto the slip-on ring; retract the piston.
- Insert the auxiliary piston extension into the center hole of the protection plate.
- Extend the piston with auxiliary extension against the load.
- Push on slip-on cylinder ring 2 and lower load onto it.
- Retract the piston; fit auxiliary piston extension 2.
- Raise load again and repeat as necessary.

A maximum of 3 auxiliary piston extensions can be placed on top of each other. Make sure that the auxiliary piston extensions and slip –on rings are inserted so that they fit into the machined recesses, the reason being that the forces exerted deviate from the ideal centerline in relation to the mounting height and piston-extension height. Use of a suitable base plate is therefore absolutely necessary in order to ensure sufficient stability.

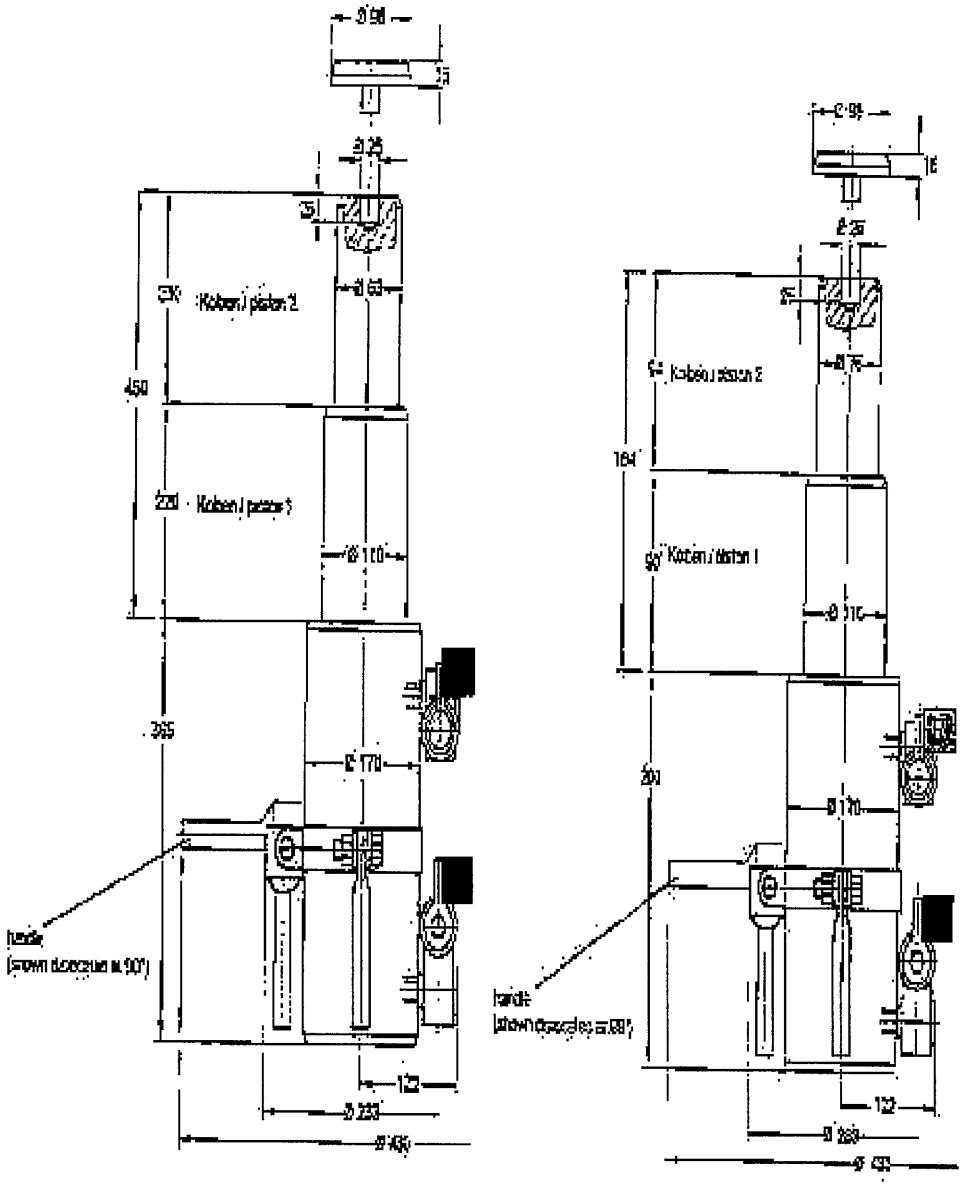
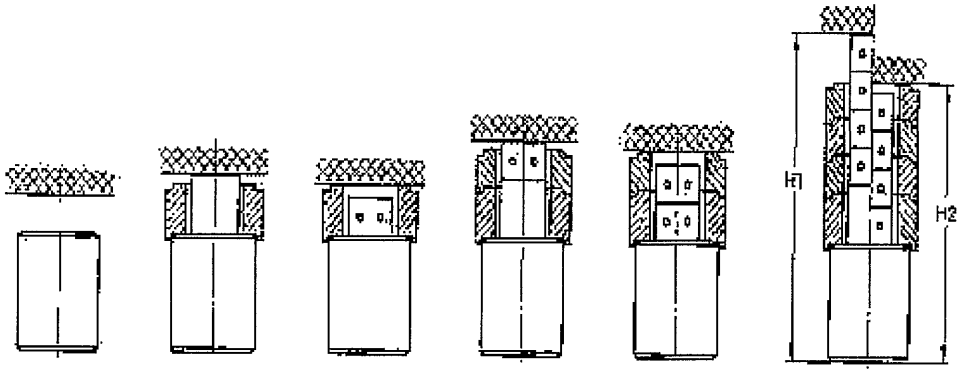


Figure 4: Lukas Telescopic Cylinder



Order No.	Weight kg	Cylinder Type	Lifting height H1 max.	Support height H2 max.	Stepwise (X) x (mm)
84072/7963	7	HP 16/60	363	310	1 x 51, 3 x 43
84072/8063	4.3	HP 12/T160 (R)	483	328	1 x 100, 1 x 50
84072/8163	8.4	HP 10/T280 (R)	670	400	4 x50
		HP 25/T185 (R)	577	400	
		HP 25/T450 (R)	1005	565	
84072/7863	16.5	HP 50/T165 (R)	535	440	1 x 90, 3 x 50
84072/8263	22.2	HP 50/T400 (R)	1072	680	2 x 150
84072/8463	41	HP 65/T400 (R)	1170	780	3 x 133, 4

Figure 5: Stacking set

4.5 Hose lines and their connection

The two hoses, one red and one blue connect the valve block of the drive unit and the lifting cylinder. The hoses are fitted with a sleeve coupler or a nipple and are identified by their colour so that there can be no mistakes in connecting them to the correct valve input or output. In order to prevent any problems arising in the hydraulic system, first connect the blue hose (R = Return stroke, retracted) and then the red hose (A = Forward stroke, extended).
When doing this, proceed as follows:

- Remove protective cap.
- Unlock the sleeve coupler with the rotating ring by turning it.
- Pull back the sleeve and connect nipple and sleeve together.
- Release sleeve and lock with the rotating ring.

A red marking then becomes visible, thus indicating that the connection is secure. Before starting up for the first time or if the equipment has not been used for a long time, it may be necessary to ***bleed the hose and lifting cylinder:***

- Extend the piston approximately half way out and place the cylinder on its head.
- Make sure that, in this position, the highest point of the cylinder is below the motor pump connections.
- The air is forced out of the cylinder and hose by extending and retracting the piston several times.

The *components are always dismantled* in the reverse sequence:

- Retract lifting cylinder until 10 mm before the end of the stroke.
- Shut down drive unit.
- "Lower" the pre-selection valve (Figure 1, Position 6) for a short time by and the back to middle position
- Uncouple the hoses from which the pressure has thus been moved; first red, then blue.

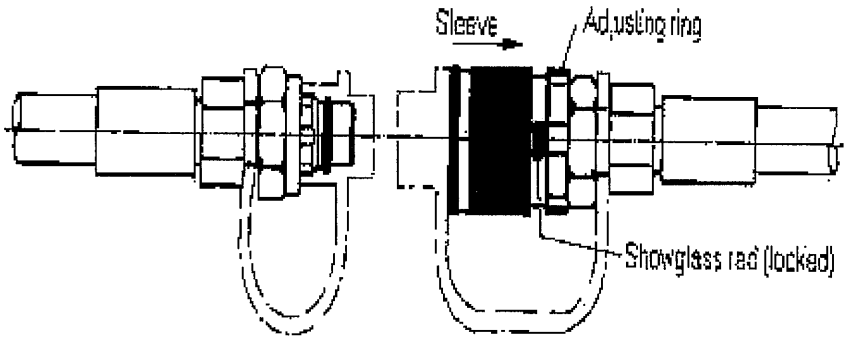


Figure 6: Hose Coupling

5 Traversing Devices

The traversing device consists of re-railing bridge, the rolling carriage and the traversing cylinder and also the control module.

The ***control module*** contains the following valves:

• **Traversing valve** (21):

This is used to pre-select the direction of movement of the traversing cylinder.
Before operating, make sure that the pre-selection valve (6) is in the middle position!
Lever in middle position: neutral, pressure less fluid circulation
Lever pointing towards you: piston extends

Lever pointing away from you: piston retracts
The traversing cylinder must always be in the middle position when the lifting cylinder is operated!

- **Stop valve** (22):

This is used to control the movement and speed of the traversing movement.
Valve **closed**, anti-clockwise rotation: **no piston movement**
Valve **open**, anti-clockwise rotation: **piston movement** in accordance with setting of traversing valve (21)

- **Retention valve** (23):

This valve is used to operate the anchor cylinder. The anchor is spring-loaded and acts as a buttress
When the traversing device moves.

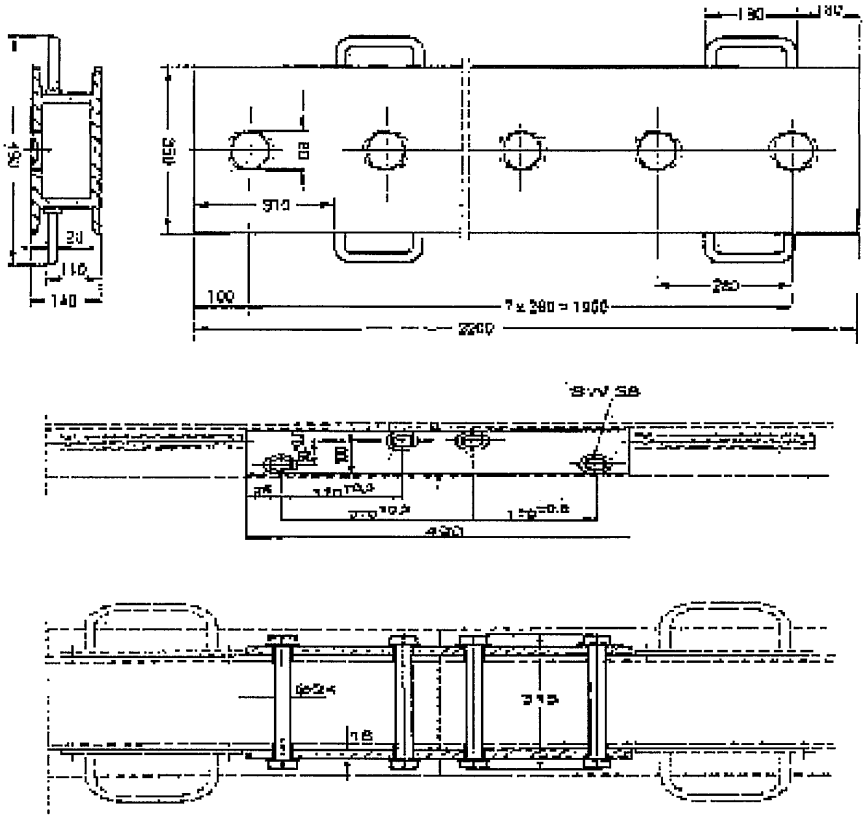
Pushbutton pressed: **Anchor released**
Pushbutton released: **Anchor is retained**

*Numbers in brackets relate to the corresponding position in Figure 1 and 2

5.1 Re-railing bridge and roller carriage

The re-railing bridge is made of light-metal alloy and, in conjunction with the roller carriage, is for carrying the load during horizontal traversing of a raised rail train/vehicle. The bridge is placed on the rails at right angles to the rails with suitable wooden planks underneath. The inclination of the bridge should not exceed 120 mm when the supporting width is 1.43 m. Make sure that the re-railing bridge is not subjected to more than the maximum load indicated in Figure 7.

If the bridge is not long enough, a second bridge can be connected with the help of connecting elements. When setting up the traversing system, make sure that the roller carriage are placed on the bridge as directly as possible beneath the intended lowering point/lifting point of the vehicle. If necessary, a spacer / pair of spaces should be placed under the roller carriages. Make sure that the two spaces are adjusted to the same length and the sliding surfaces between the roller carriage and the mounted sliding plate are kept clean.
Refer to picture on page 24.



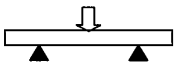
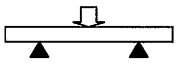
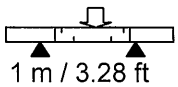
	Height		
	184 mm 7.24 inch	140 mm 5.51 inch	85 mm 3.35 inch
 1 m / 3.28 ft	1000 kN/ 220000 lbs	500 kN/ 110000 lbs	80 kN 17600 lbs
 1.43 m / 4.69 ft	800 kN 176000 lbs	400 kN 88000 lbs	60 kN 13200 lbs
	1300kN 286650 lbs	700 kN 154000 lbs	80 kN 17600 lbs
 1 m / 3.28 ft	300 kN 66000 lbs	200 kN 44000 lbs	20 kN 4400 lbs

Figure 7: Re-railing bridge, Joining elements, Table of allowable load

5.2 Traversing cylinder

Horizontal movements are achieved by means of a traversing cylinder. Before the load is lowered onto the roller carriage on the bridge, fit the traversing cylinder as follows:

- Insert the cylinder with anchor end into hole in the bridge.
- Push guide plates on the left-hand sides onto the bridge.
- Mount the cylinder in the guide plates on both sides. To do this, pull up the slide, pushing in
- The guide plates until they locked in place by pressing down the slide again.
- Insert the cylinder head into the mounting point on the rolling truck and connect the hydraulic equipment.

The control module is connected to the traversing cylinder by two hoses, one yellow and one blue, and also by the black hose, which is for operating the anchor cylinder. All hose connections have fast-acting couplers and are identified by their colors to prevent incorrect connection. The plug-in coupling nipples of the yellow and blue hoses are fitted with a pressure-relief valve so that the hoses can be connected under pressure as well. Refer picture on page 24.

5.2.1 Traversing

Let us consider the case where the anchor cylinder has ***not*** engaged in the cutout of the bridge but the cylinder head has been inserted in the roller carriage. In order to initiate traversing, proceed as follows:

- Close stop valve (22) (turn clockwise).
- Move traversing valve (21) in the desired traversing direction.
- Do not operate the retention valve (23)!
- Carefully open the stop valve (22) (turn anti-clockwise).

The piston of the traversing cylinder extends or retracts depending on the pre-selected setting of the valve (21) so that the free anchor end slides over the bridge. As soon as the latter reaches the bridge cutout, the spring –loaded bolt of the anchor cylinder latches into the cutout. The traversing cylinder is now firmly buttressed and moves the traversing device as long as the stop valve remains open. If the traversing cylinder reaches its end position and the train/vehicle is still not yet over the rails, the procedure is repeated:

- Close stop valve (22).
- Press retaining valve (23) and leave pressed down.
- Move the traversing valve (21) to the opposite position>
- Carefully open the stop valve (22); traversing cylinder moves in the opposite direction.
- Release the retaining valve (23) after a short movement of the traversing cylinder.

If the anchor pin sticks, move the traversing cylinder a little towards the envisaged direction of movement and operate the retaining valve again.

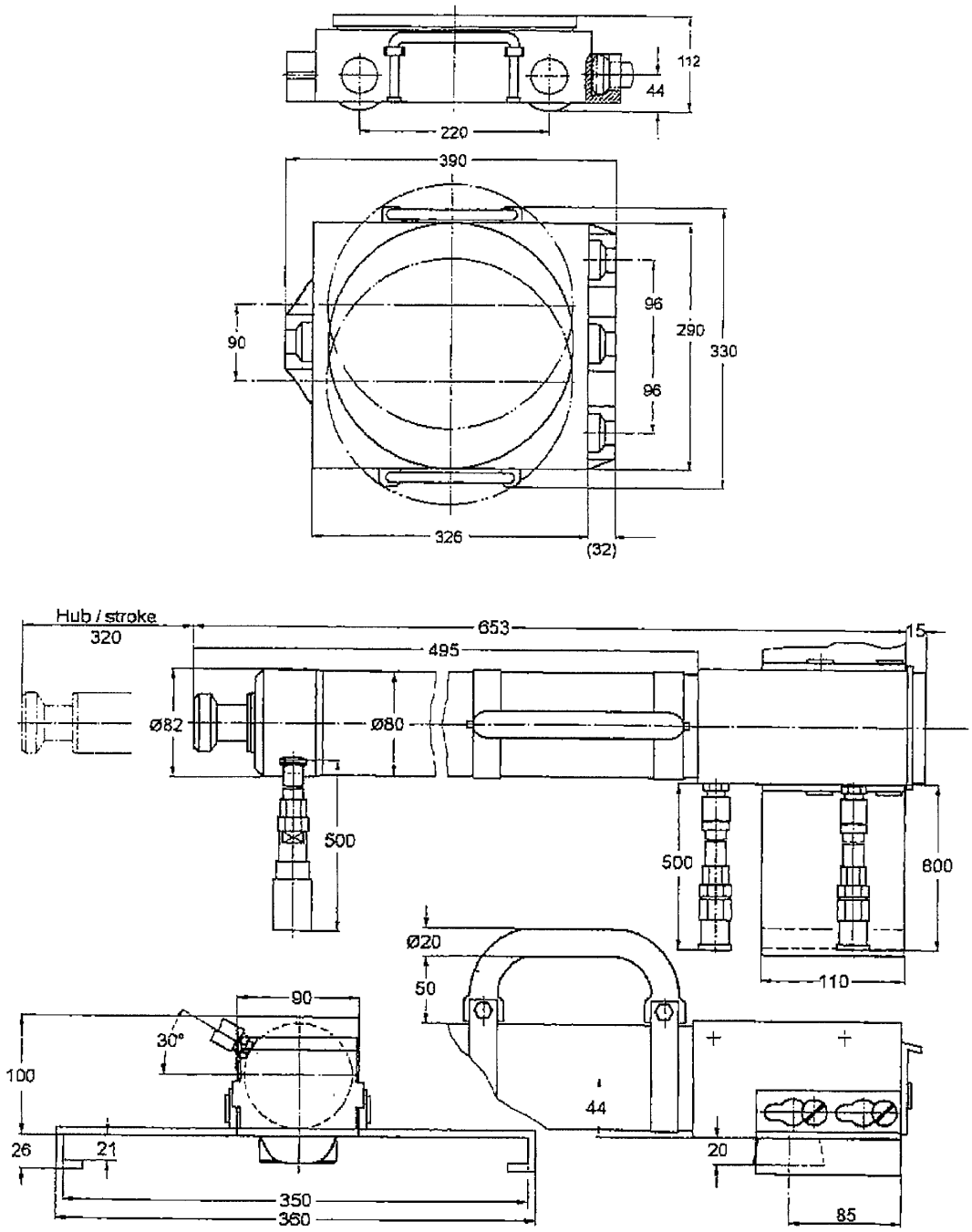


Figure 8: Traversing Cylinder and Roller Carriage

5.3 Lifting Points for Re-railing of Rail Vehicles/Trains

On the load-bearing parts, there are points where the jack can be applied. The marking in the page below indicates these points. The markings indicate reinforced points on the frame and the limits of the maximum bearing distance (unsupported load-bearing length, without risk of permanent

deformation).
In exceptional cases, it may be necessary to lift a vehicle at a point which is not marked or which is not described on the respective re-railing instruction. In such cases, permanent deformation can be expected in the case of vehicle that is subjected to more 85 % of the permissible loading weight.

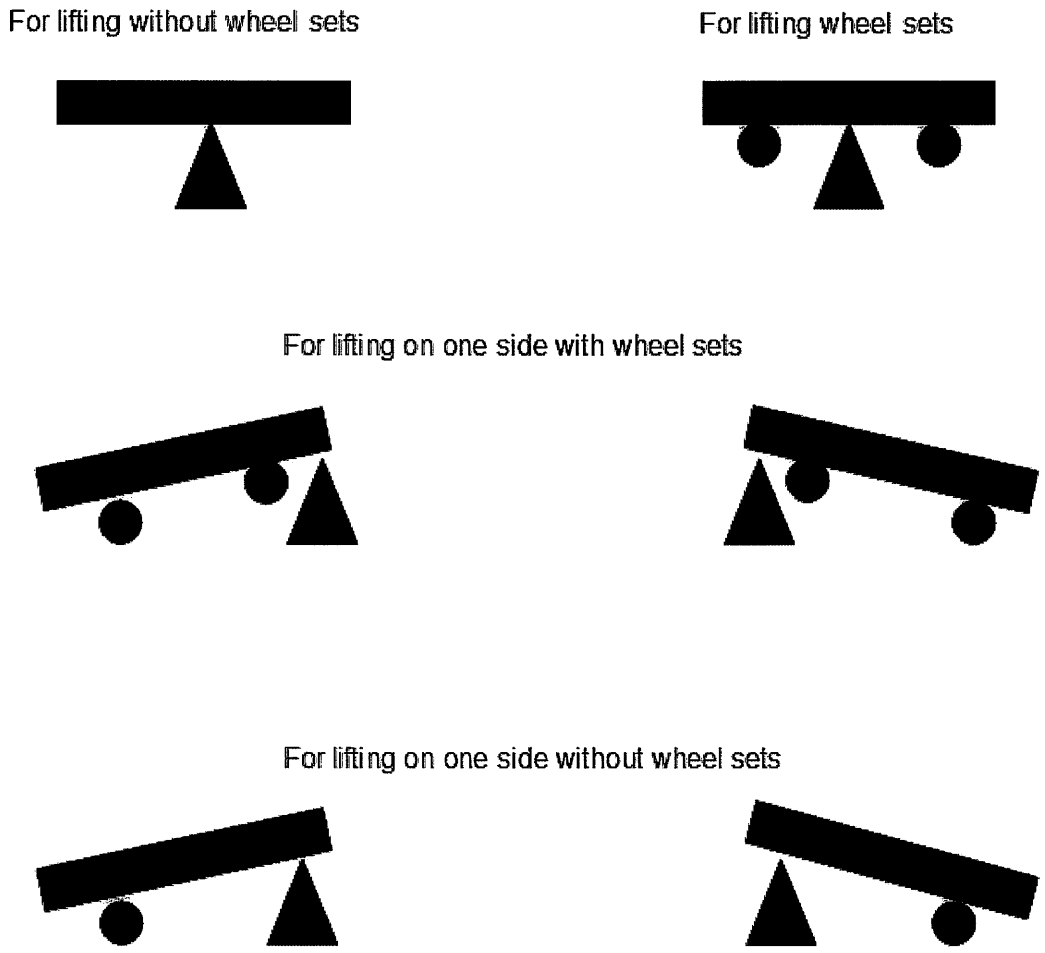


Figure 9: Marking of the lifting and support points on the vehicles / trains

Note: "Lifting without wheel sets" does not mean that the wheel sets stay where it is. It indicates of the wheel set or bogie suspension is not secured.
The marking is an indication of the statically unsecured state of the wheel set and bogie suspension.

5.4 Lifting Points

The lifting points can be found on the side sills of the center car and end car in each case;

- at the leading bogie of the end car
- at the ends of the car over the Jacobs bogie

- in the coupler mouth

The lifting points are shown in Figure 9.All dimensions are in millimeters (mm) unless specified otherwise.

5.5 Preparatory work before lifting

a) Before starting the re-railing procedure, you need to carry out the following preparatory work;

- Open vehicle / train doors
- Secure the wheel set, which has not been derailed to prevent it from rolling away.
- Release the brakes for the whole train
- Switch off the battery
- Switch off wheel set suspension or restrict vertical play
- Take into account the load bearing capacity of the ground surface
- Stack wooden beams crossway underneath
- Secure resting point or lifting point to make sure vehicle does not slip

b) The entry doors are opened from the outside in stripped down condition by unlocking at track level. You can then pull the door out and push it up using the gap in the underside.

c) Before releasing the brake, the relevant brake cylinder must be locked and bled. The manual release pull can then be activated.

d) Grounding the train. The aim of grounding the train is to ensure that the work required and for setting up the towing unit is only carried out on a vehicle which is properly grounded.

e) Disconnecting of the battery. To disconnect of the battery supply remove the battery box cover of Car A2 on side 1 and Car B2 on side 2 then disconnect the battery connections.

f) Venting the air springs. Before lifting, the air springs need to be vented. The locking mechanisms can be found underneath the vehicle a small isolating cock in red beside each bogie.

g) Lifting. Before positioning the jacks, the Yaw dampers must be removed. When the under frame is lifted at the same time, and no further components need to be removed. The train does not need to be separated for re-railing or towing. When lifting the Jacobs bogie, the construction of the train only allows the jacks to be positioned at one end of the car. Both ends of the car are lifted by means of the connecting linkage between the car and the bogie.

5.6 Equipment Required

a) Lukas
b) Oil Pump driven by internal-combustion engine or electric motor
c) Control Table
d) HP 10 or HP 60 Telescopic Cylinder
e) Sliding Roller Carriage
f) Roller Carriage
g) Re-railing Bridge
h) Hose Connections
i) Support Planks, Square Timbers, Wooden Chocks, Steel Pieces, Adjusting tool

5.7 Re-railing Basic Procedure

5.7.1 Lifting

With 2 jacks on the longitudinal sill, one on the left and one on the right, until the wheel set is above the top of the rail (top of rail) help of the re-railing bridge with traversing device in the middle below the bogie

5.7.2 Traversing

The traversing device in the middle below the bogie and the re-railing bridge. If this is not possible, re-railing bridge with traversing device in front of the 1st axle (seen from the front end), e.g. under the end sill, until the wheel set is above the rails.

5.7.3 Lowering

If it is necessary to free the re-railing bridge with traversing device, lift vehicle/train by longitudinal sill again. Remove bridge and traversing device then lower vehicle/train. When a vehicle/train is re-railed in curve or points, it is not always possible to place all the wheels on the rails. In such case, use the axle to press-in device, moving the wheel set horizontally in the direction of the axle.

5.8 Re-railing Procedure

5.8.1 Re-railing the Leading Bogie

Place the jacks under the lifting points on either side in the coupler mouth. The bogie is lifted up until the re-railing bridge can be pushed under the bogie perpendicular to the axis of the track and the roller / sliding roller carriage fit between the longitudinal member of the bogie and the re-railing bridge with appropriate supports. The support planks are measured and arranged such that, when the bogie frame is lowered onto the roller carriage, ensure no train parts are resting on top it. Once it has been set down, move the train towards the center of track. When it is in center of track, it is lifted again in order to remove the re-railing bridge with roller carriage and support planks and then lower the bogie down onto the track.

If the centering pin of the air spring has been pulled out of the cross member as a result of lifting, care should be taken when lowering the bogie down onto the track that the pin is not jammed, but can move freely when it is inserted.

5.8.2 Re-railing the Jacobs Bogie

In order to re-rail a Jacobs bogie (powered bogie or trailing bogie) place the jacks on either side at one of the marked lifting points on the bogie longitudinal member. The design of the train is such that the jacks can only be positioned at one end of the car. Both ends of the car are lifted by means of the connecting linkage between the car and the bogie. However, please note that the jacks are ***not*** *to* be positioned ***diagonally***, as the connecting linkage cannot support the resulting force.
When lifting, take care to ensure that no cables or other components are crushed or knocked in the intercar gangway. The bogie is lifted until the re-railing bridge can be pushed under the center of bogie perpendicular to the axis of the track and the roller carriage / sliding roller carriage fits between the longitudinal frame of the bogie and the re-railing bridge with appropriate wooden support planks.
The wooden supports are measured and arranged such that, when bogie frame is placed on the roller carriage, there are no parts of train on top. Once it has been set down, move the train

towards the center of track. When it is in center of track, it is lifted again in order to remove the re-railing bridge with roller carriage and support planks and then lower the bogie down onto the track.

5.9 Towing

5.9.1 General

If the running gear is blocked or damaged, the Auxiliary Truck towing unit is used. Depending on the requirements, the unit can be fitted under the damaged wheel set or the whole bogie can be placed on the Auxiliary Truck. In the latter case, lay the 2.20-meter re-railing bridge perpendicular across the longitudinal struts of the Auxiliary truck. Wedge the bridge to support the rollers, which should be set to the smallest distance. Then set the longitudinal members of bogie down onto the bridge, using appropriate wooden support planks. The planks must be measured and arranged such that no other parts are on top or crushed. If necessary, remove parts to ensure free access.

If the Auxiliary Truck is only to be fitted under the damaged wheel set, the bogie is positioned diagonally, and the support roller distance should therefore be set such that there is sufficient clearance to the train components under the car body on the relevant side. In addition, any protruding parts of the bogie must be removed if they threaten to collide with or rub against the towing unit.

5.9.2 Towing the Leading Bogie

The train is lifted on the lifting points near the bogie until the pre-assembled towing unit can be moved underneath the damaged wheel set or centered underneath the defective bogie.

5.9.3 Towing the Jacobs Bogie

If the towing unit needs to be fitted underneath the Jacobs bogie, the jacks are positioned at the lifting points detailed in 4.6(3). The towing unit must be completely assembled underneath the car and the bogie is lifted until the towing unit can be moved under the center of bogie. Then, lay the re-railing bridge (2.20 m) perpendicularly across the longitudinal struts of the towing unit and lower the longitudinal member of the bogie down onto the bridge, using appropriate support planks. At the intercar gangways,

Ensure that no cables are crushed or parts resting on top or can bump against other object.

5.9.4 Transport

The unit can be transported away under the power of a towing unit fitted underneath as described above. In the case of powered bogie, the relevant drive unit must be switched off in advance. The car can tow away by means of a locomotive or with another train. Before coupling, close the stopcock on the ***Scharfenberg Coupler*** to avoid buffing of electric coupling. The towing speed must be in accordance with Operations Manual.

5.10 Lifting Rail Vehicles

On the load bearing parts, there are points where the jacks can be applied. These points are indicated by the markings on 4.0 marking of lifting points. The markings indicate reinforce points on

the frame and mark the limits of the maximum bearing distance (unsupported load-bearing length, without risk of permanent deformation).

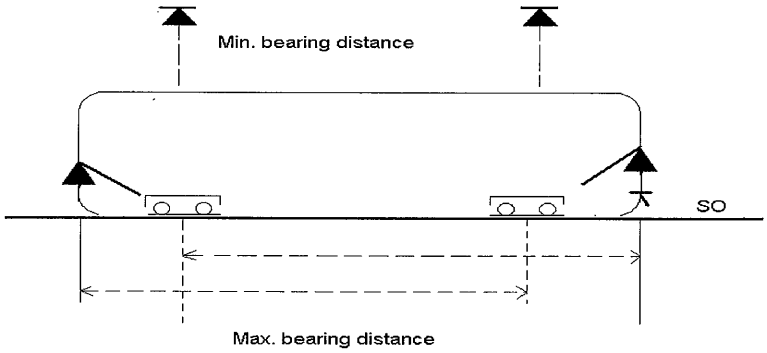


Figure 10: Bearing distance

In exceptional cases, it may be necessary to lift a vehicle / train at a point which is not marked or described on the respective re-railing instruction sheet. In such cases, permanent deformation can be expected in the case of vehicles / trains which are subjected to more than 85% of the permissible loading weight (powered vehicle = 100% load).

In this case, the vehicle / train is inspected using a special measuring procedure.

Note: In the event of an actual incident please refer to Re-railing of Vehicle Procedure, GOO.OMR.M15880.NG.0001.*.

6 Technical Description of Rescue Equipment

6.1 Equipment for Lateral Displacement

- 2 Re-railing bridges, 2 m long /10 cm high
- 2 Re-railing bridges, 1 m long /10 cm high
- 2 Set bridge couplings for a.m re-railing bridges
- 4 Roller carriage 150 KN with plate and 2 pockets
- 2 Distance bars 1000 to 1900 mm
- 2 Displacing jack 120/60 KN, Height 500mm/stroke 350mm
- 2 Single counter support

6.2 Auxiliary Truck

The auxiliary truck or skate is used to move rail-bound vehicles on which major traveling gear parts are defective. The individual components of the auxiliary truck can be assembled on side, the trucks can be used to haul the damaged vehicle to the workshop to repair. Refer to Picture 4.

- Carrying capacity = 160 KN
- Weigh = 110kg

6.3 Electrical Abrasive Cutting – off machine

- Idle Running Speed 6600 rpm
- Motor Power Rate 1950 W
- Motor Power Output 1500 W
- Abrasive Disc Diameter 230 mm
- Weight-without cable 6.2 kg

6.4 Motor Chain Saw

- Cutting Length 45cm
- Air –Cooled Two Stroke Engine 3.1 kW
- Cylinder Capacity 60 cm^3
- Automatic Chain Lubrication

6.5 Gas Cutting Device

- 1 Oxygen Bottle 200 bar capacity 5 liters
- 1 Acetylene Bottle capacity 5 liters
- Pressure Regulator
- 1 Set Hoses length 5 meters
- 2 Cutting Nozzles

6.6 Portable Generator

- Nominal performance 3.7kVA
- Motor Power 6.5 kW
- Nominal Voltage/Frequency 240V, 50 Hz
- Protection Type IP 23
- Dimensions 39 kg
- Weight (L/W/H) 590/455/415 mm
- Refer to Picture 6 on page

6.7 Spreader

A hydraulic operated spreader and cutter will form the basic of the rescue device. Consequently this device wills especially enable the rescue staff to force one's way into the train. The double-acting devices are powered directly from the re-railing system through a pressure intensifier. This pressure intensifier makes other power generating units and hand pumps unnecessary.

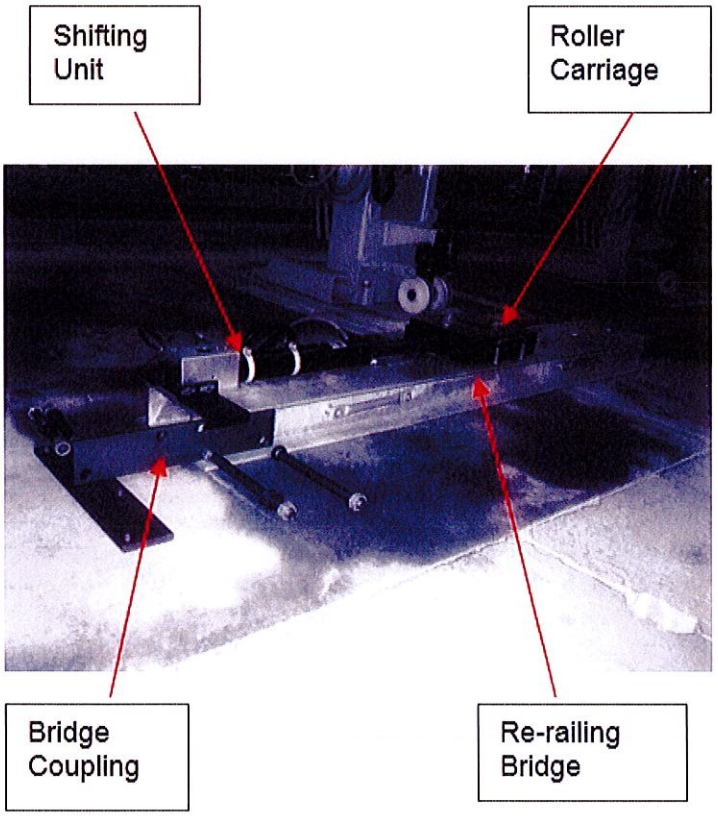
Double-acting hydraulic spreader with two spreading arm fitted with exchangeable tips. Corrugated surfaces on the tips ensure safe squeezing and spreading. There are also two holes in the arms for attachment of two pulling chains. Carrying handle and non-mistakable dirt protected quick connecting coupling for trouble-free handling. Refer to Picture 10.

Accessories:

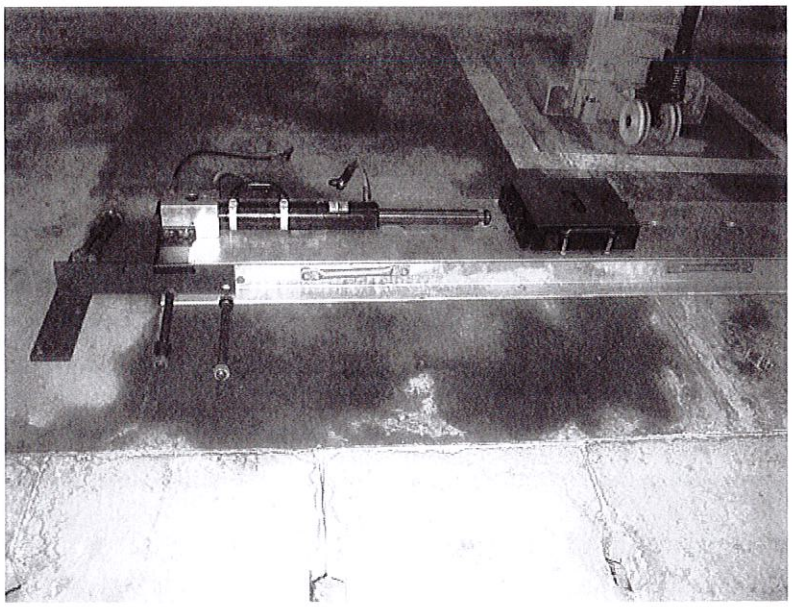
- Two Pulling Chains with hook and shackles for attachment to spreading arms.
- One pair spare tips for the spreading arms.
- One pair peeling tips for the spreading arms.

6.8 Cutter

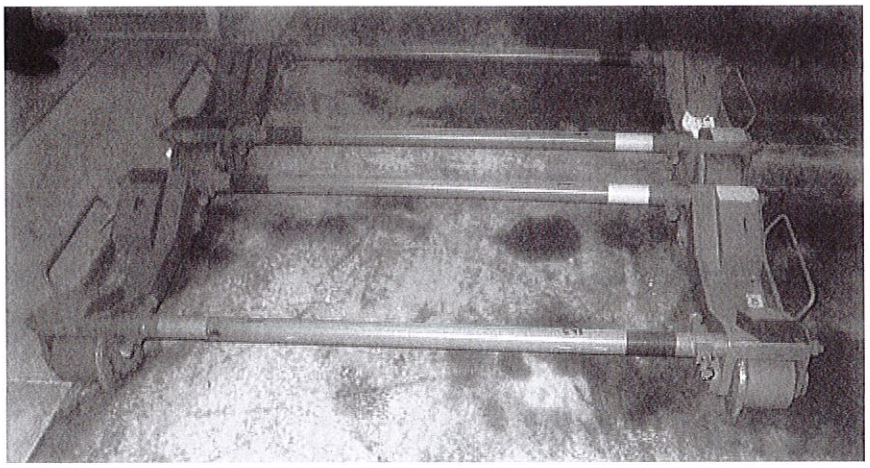
Double-acting hydraulic cutter fitted with two replaceable and re-grind able blades of special heat-treated die steel. Operation and control is secured by means of an integral safety valve. Carrying handle and non-mistakable dirt protected quick connecting couplings for trouble-free handling. Refer to Picture 10 on page 28.



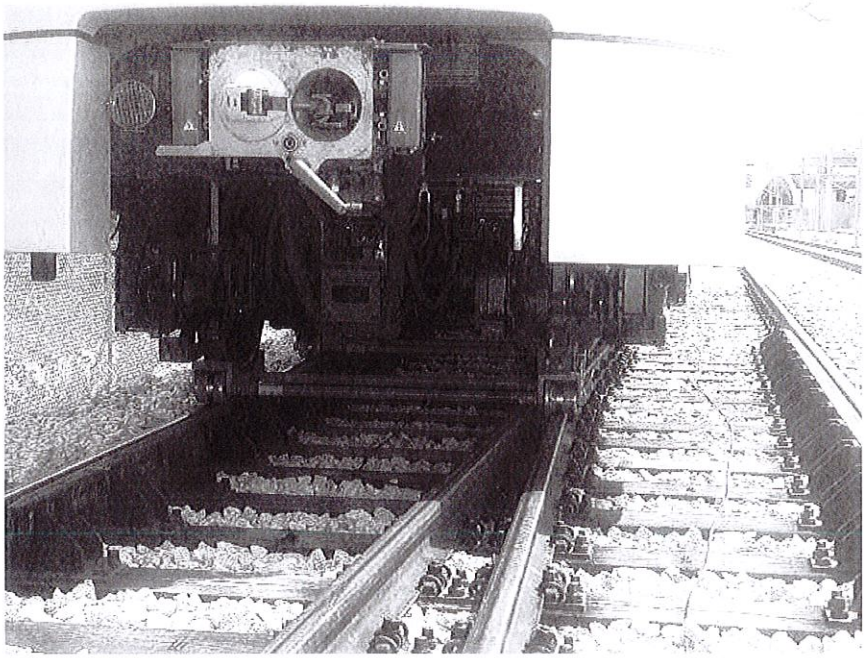
Picture 1: Re-railing Bridge with Roller Carriage and Shifting Unit



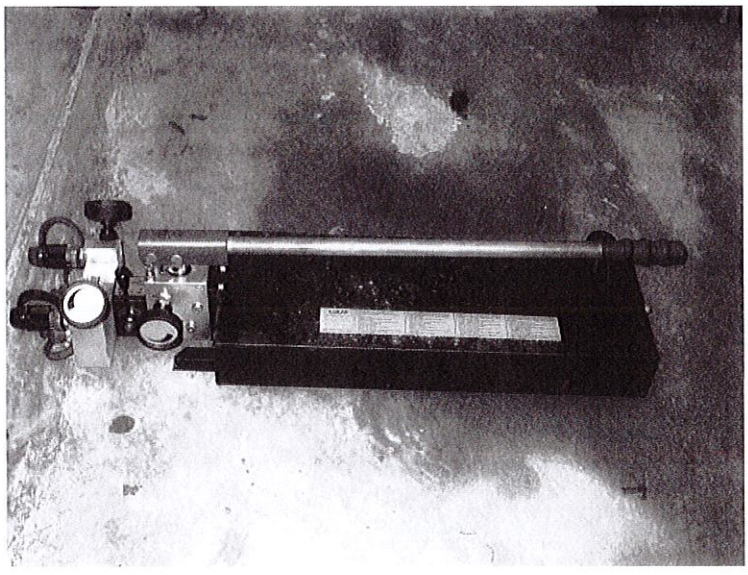
Picture 2: Re-railing Bridge with Bridge Coupling and accessories



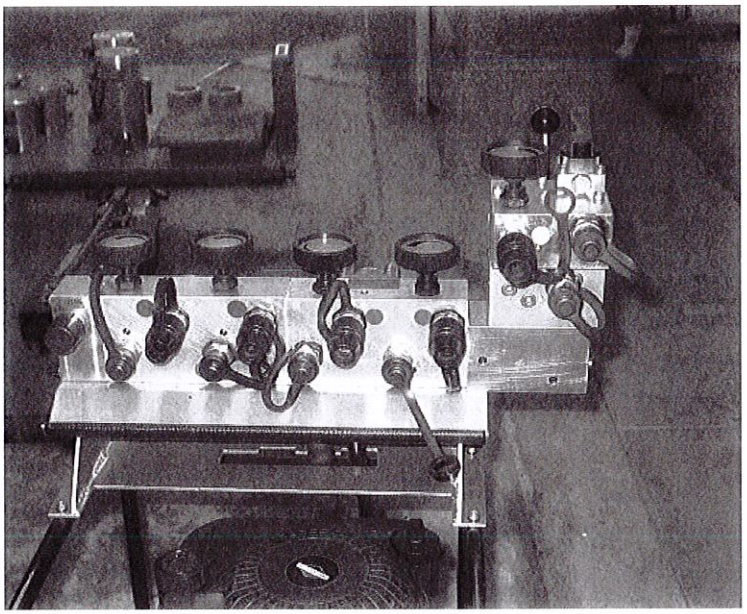
Picture 3: Auxiliary Truck (Skate)



Picture 4: Bogies on Auxiliary Truck

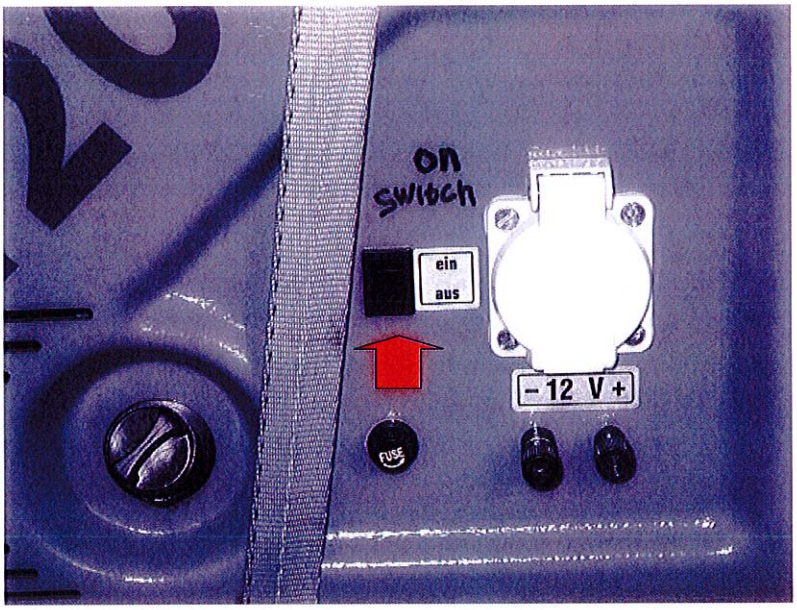


Picture 5: Lukas Hand Pump

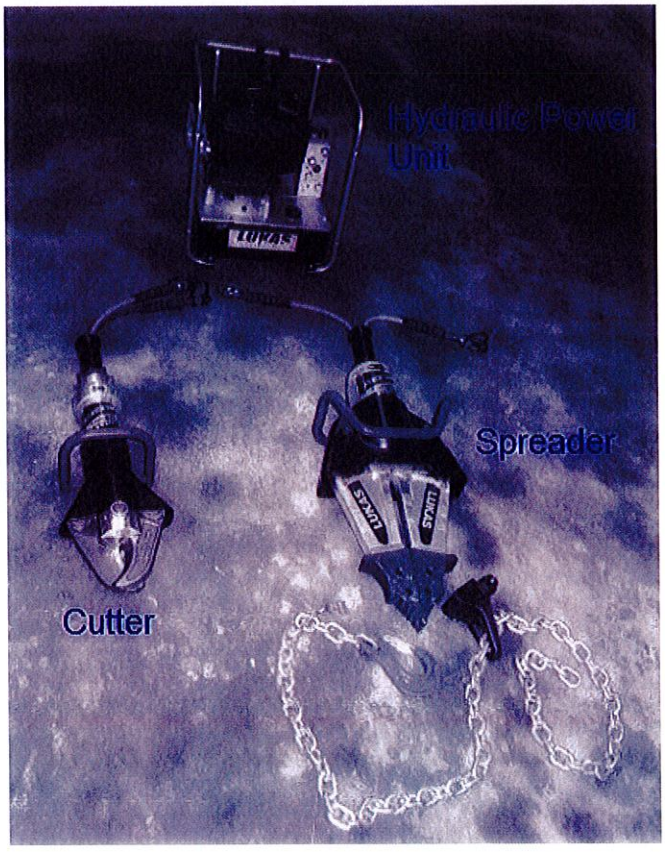


Picture 6: Power Unit with Control Desk

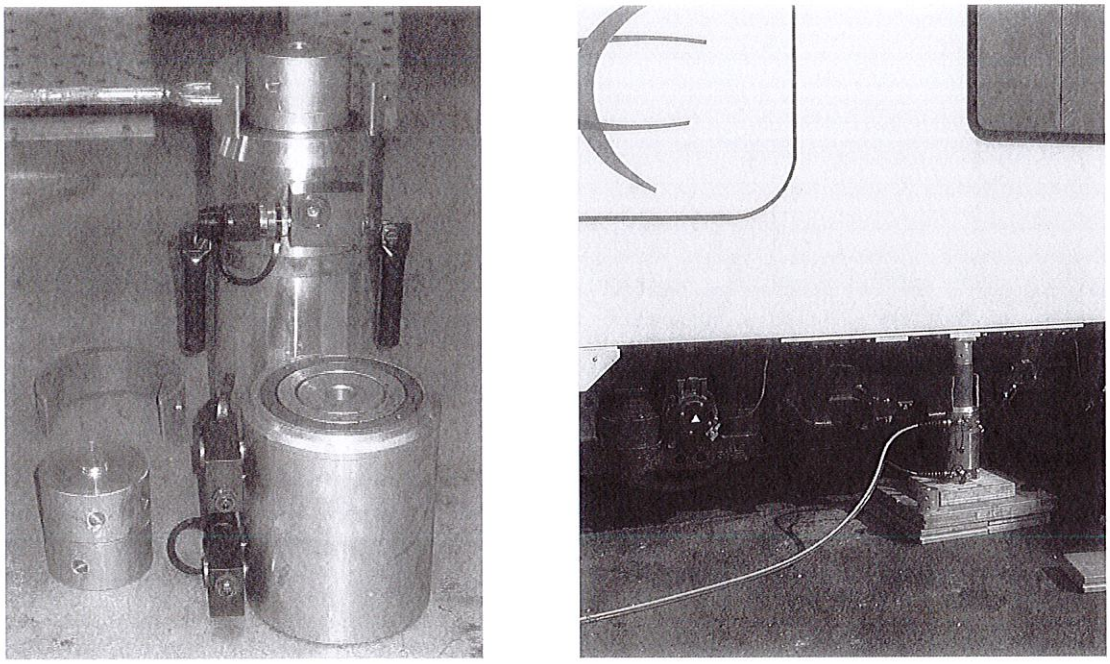
Picture 7: Portable Generator Set



Picture 8: Switch to turn "ON" Gen-set



Picture 9: Spreader and Cutter



Picture 10: Lukas Telescopic Cylinder

Attachment

Attachment 1 – Rescue & Re-railing Checklist Before Lifting, D00.OMR.M88200.DQ.1001.A.

Rolling Stock Department

Rescue & Re-railing Checklist Before Lifting

GEN E-MAS
Effective Railway Operations; Reliable System Maintenance

Procedures: 1) Re-railing of Vehicle Procedure, G00.OMR.M15880.NG.0001.*
2) Rescue & Re-railing Equipment Training Manual, R00.OMR.M88200.SH.1001.*

A Date and Start time

1 Notified time: _____Hrs. 2 Date: _____

3 Time depart from workshop: _____ 4 Time arrived at site: _____

B Recovery Team Members

1 Recovery Supervisor: _____ 2 Assistance Recovery Supervisor: _____

3 Team Members:

1) _____ 6) _____
2) _____ 7) _____
3) _____ 8) _____
4) _____ 9) _____
5) _____ 10) _____

C Incident Information

1 Train Number: _____ 2 Effected car / bogie: _____ /_____

3 Incident Manager at site: _____ 4 Incident Place: _____

DURING LOADING COMPLETENESS OF EQUIPMENT CHECK

A During setting up before lifting (Please tick (√) once completed)

1 ☐ Open all Vehicle / Train doors.
2 ☐ Switch off main switch.
3 ☐ Ensure pantograph lowered.
4 ☐ Incident Manager to request for Picop.
5 ☐ Secure the non-derailed wheels with wheel chocks.
6 ☐ Release the brakes for the whole train.
7 ☐ Switch off battery main off train.
8 ☐ Disconnect the battery terminals in the battery box of Car A2 side 1 and Car B2 side 2.
9 ☐ Switch of wheel set air suspension.
10 ☐ Remove the Yaw dampers on the affected bogie.
11 ☐ Place the wood on ballast under the bogie perpendicular to air suspension on 4 sides.
12 ☐ Place the 4 short lifting cylinders under the bogie perpendicular to air suspension on both sides.
13 ☐ Connect the red & blue hoses to all 4 lifting cylinders and Hydraulic Power Unit.

B During Lifting (Please tick (√) once completed)

1 ☐ Start up the Power Unit and raise the lifting cylinders to contact with the bogie.
2 ☐ Check around the bogie to ensure no cables or components that could damage during lifting.
3 ☐ Lift the train with the bogie up until the re-railing bridge and the roller carriage can be pushed under the bogie.
4 ☐ Set the re-railing bridge under the lifting point of the bogie with wood support underneath.

C During Traversing (Please tick (√) once completed)

1 ☐ Place the roller carriage and the traversing cylinder with guide plates on the re-railing bridge.
2 ☐ Connect the blue & yellow hoses to the traversing cylinder and Hydraulic Power Unit.

D During Lowering (Please tick (√) once completed)

1 ☐ Lower the bogie frame onto the roller carriage with support wood.
2 ☐ Remove the lifting cylinders from the bogie and put at aside.
3 ☐ Move the train towards the center of track.
4 ☐ Place lifting cylinders under the bogie and raise to remove the re-railing bridge and the traversing cylinder.
5 ☐ Lower the bogie on the track.

E During Packing Up (Please tick (√) once completed)

☐ **Check Completeness of Equipment**

1 Time Depart from incident site: _____
2 Time arrive at main workshop: _____

Recovery Supervisor Name:	Date	Stamp: