SE400 Sidelifter

Operation, Maintenance & Service Manual

V2.0

STEELBRO

Container Handling Solutions

Warranty Summary

This warranty statement is a summary of the full product warranty and does not constitute a full statement of the warranty terms and conditions.

The following warranty is given in lieu of and to the exclusion of any other guarantee, condition or warranty, either expressed or implied by statute or otherwise and whether regarding goods manufactured by ourselves or others. Provided the terms of payment are promptly complied with by you, we undertake to remedy with reasonable despatch, any original defects arising from faulty workmanship, in any goods manufactured by us, which under proper and normal conditions of use, are revealed within twelve (12) calendar months or one thousand (1000) hours of operation, whichever occurs soonest from the date of delivery, provided the defective item is returned to our Works, freight paid both ways, or in the case of the item not being returnable, then provided the expenses of travelling, transport, plant hire and accommodation are to your account.

Any goods supplied or work done in remedying such defects shall not extend our liability under this clause beyond the time stipulated above. At the expiration of such time, all further liability on our part shall cease. In the case of goods or material not of our manufacture, we shall endeavour to secure for you, the benefit of any guarantee given to us in respect thereof. In no case, shall we be liable for the cost of replacing and fitting of defective goods, and goods replaced shall become our property. No responsibility will be accepted for any defect, unless we first receive a written complaint, and we have been given first priority and ample opportunity to rectify the defect.

Liability for consequential damage or loss arising from defects, faulty materials, omissions, or negligence of workmanship, in any goods supplied by us is excluded.

Labour charges for work carried out under the terms of this warranty are to the purchaser's account.

Variations to the above are subject to STEELBRO New Zealand Limited Management approval.

Claims under warranty will only be accepted if all conditions of warranty are satisfied.

Contents

Foreword

This Operators Manual deals with your new STEELBRO Sidelifter. Take the time to read it through - it will be time well spent. The manual contains a short description of the Sidelifter together with instructions on its operation and maintenance. Generally this manual is provided along with other documentation including manuals provided by third party manufacturers, parts lists, technical drawings and schematics and compliance certification, either in bound print format, in a folder, or on a data CD.

If you wish to ensure a long life for your Sidelifter, you should carefully carry out all the maintenance instructions. However, all servicing, apart from lubrication and minor repairs should wherever possible be entrusted to factory trained service facilities.

We reserve the right to introduce, without notice, changes in data and equipment and amendments to the instructions for maintenance and other servicing work.

In this document:

This symbol means that the instruction in the shaded area is essential to the safe operation of your Sidelifter and failure to follow the instruction is likely to lead to injury or damage to property

This symbol means that the instruction in the shaded area relates to safe or recommended practice and failure to follow the instruction could lead to damage or accident.

This symbol means that the information in the shaded area is useful and/or is something we wish to emphasise.

Owner and Operator Responsibilities

Regulation Compliance

It is the responsibility of the OWNER to ensure that use of the Sidelifter fully complies with all Local Authority, State and Government Regulations covering lifting equipment, road use, health and safety in the country where the Sidelifter is being used.

Health & Safety Compliance

The OWNER must provide and maintain work environments, systems of work, and his equipment that is, as far as practicable, safe and without risks to health.

The OWNER must ensure that only properly trained and approved operators use the Sidelifter. In some locations, the law requires an operator's Certificate of Competency. The OWNER must ensure that he complies in full with such requirements.

Operators must consistently demonstrate:

1. Healthy and safe work practices.
2. Medical and mental fitness for the task.
3. A sound knowledge of emergency procedures.
4. A sound knowledge of the contents and requirements of the STEELBRO Manuals.

If there is a hazard to health or safety that cannot be eliminated, the OWNER must immediately cease using the Sidelifter and contact STEELBRO for advice.

Maintenance and Servicing

The OWNER should realise that the reliability, safety, and longevity of the Sidelifter, depends greatly on the standard of maintenance and servicing that it receives during its working life. The Maintenance and Servicing Schedules set out in the STEELBRO Manuals must be met, and ONLY suitably qualified technicians should carry out this work.

Design and Modifications

Where STEELBRO notify that a modification is required, it is the responsibility of the OWNER to ensure that the modification is carried out in accordance with the instructions from STEELBRO and if requested, to withdraw the machine from service until the modification has been carried out.

The OWNER should withdraw the Sidelifter from use where any deficiencies are identified during inspection of the Sidelifter, which may affect its safe operation, until the design or operational deficiency is rectified.

The OWNER should ensure that neither the Sidelifter nor any of its components are used beyond their design capacity. For crane design capacity refer to the Safe Working Load decal and for the chassis design capacity (when applicable) refer to the Chassis plate decal. Print copies of both of these are included in the Manual.

Particular care should be taken to ensure that the emergency stop controls are always operational.

Safety Instructions

It is the responsibility of the Owner to ensure that a STEELBRO Sidelifter is only operated by an operator:

Who is well trained, mentally alert and physically prepared

Who is working under safe conditions in a comfortable environment

Utilising a properly maintained and inspected machine in a safe manner.

Has knowledge of operational and safety measures before operating the sidelifter.

Operator Safety

Do not wear radio or music headphones while operating the Sidelifter.

In case the operator becomes unable to continue crane operation due to injury or illness, the Sidelifter must be stopped immediately and the fact must be reported to a responsible person. All operations must be disabled until it has been established whether the Sidelifter caused the injury or illness and the Sidelifter has been assessed as suitable for service.

Back care is important. Take all reasonable precautions wherever bending down or manual lifting is required. This includes changing tyres.

All Sidelifter operations may be carried out at ground level. DO NOT climb onto the crane structure. For maintenance or other operations that require ‘working at height’ refer to appropriate regulations.

Shift Safety Practices

For the first lift of a working shift and the first lift of each shift where the load is greater than 50% of the rated capacity, the load must be raised a short distance to test the system before continuing the operation.

At the end of a working shift the Sidelifter should be left in a safe condition in a designated parking area and reasonable precautions taken against unauthorized operation. "Safe Condition" is defined as power supply turned off and if unladen with cranes fully stowed. If laden, the container/s should be properly loaded onto the twistlocks, not suspended in any way.

Tractor Unit Safety

A Sidelifter should not be operated unless a tractor unit is coupled to it for stability purposes.

Always apply the vehicle park brake before operating the Sidelifter.

Never overload axles.

Regularly check tyre pressure. Improper pressure decreases road hold and increases tyre wear.

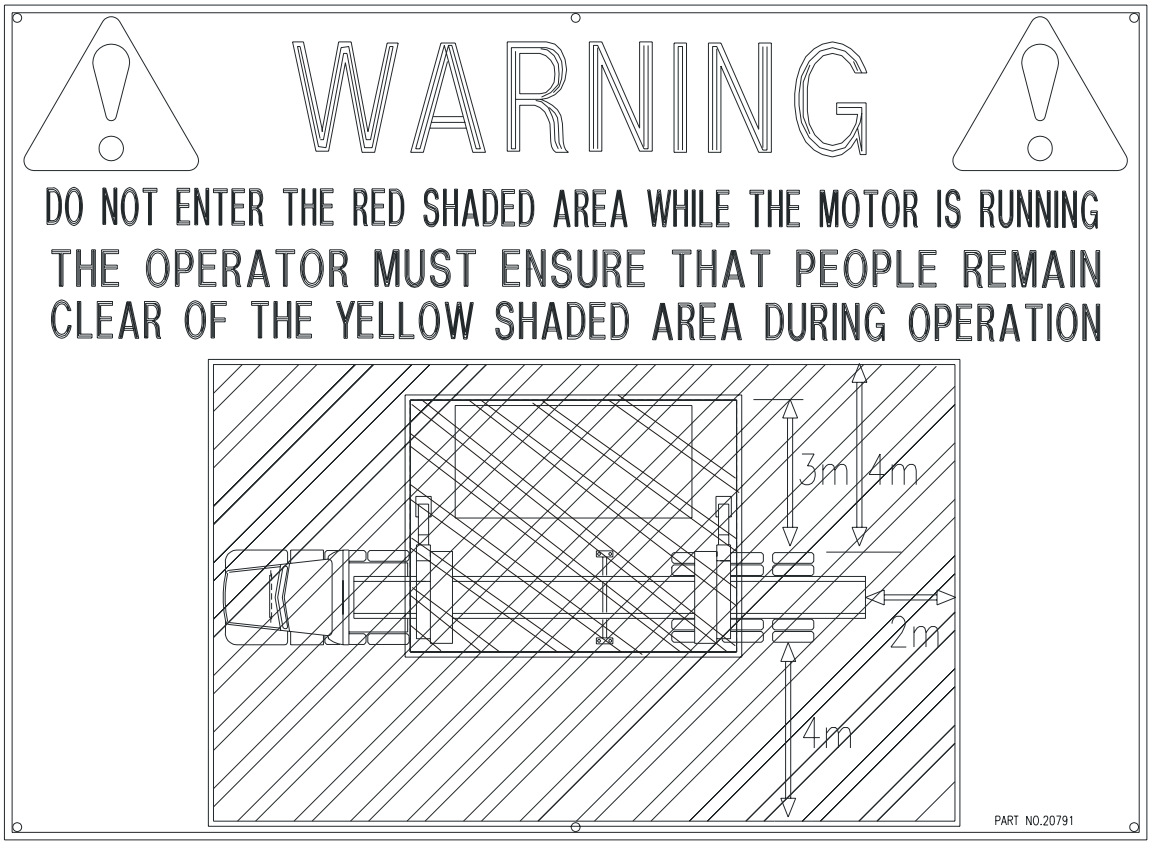
When some tractor unit park brakes are applied, they stop the provision of air to the sidelifter. As the Sidelifter with engine-driven power-pack requires an air supply to operate, the application of the sidelifter park brake may be necessary in some vehicles, rather than the tractor park brake, to maintain sufficient air supply for the Sidelifter to operate.

Stabiliser Legs

Always deploy the stabiliser legs before operating the cranes. Check that the feet have a firm surface sufficient to withstand the combined weight of the sidelifter and load, which could be as much as 25 tonne per foot, before commencing any lifting or unloading.

The stabiliser legs must NEVER be operated when the Sidelifter cranes are under load.

Work Area Safety



= Yellow Area

= Red Area

During operations unauthorised personnel **MUST** keep out of the working area of the Sidelifter as shown in the Dangerous Zone Warning decal.

Always keep the Sidelifter clean and keep loose parts stowed away securely. (Use toolbox provided for this specific purpose)

Never walk or stand below a suspended load.

Never leave the Sidelifter unattended with the load on the hooks and/or the operation controls enabled.

When transferring containers to or from other vehicles the operator must not stand between those vehicles. He should operate from the end of the companion vehicle. Refer to Lifting Safety (on page 9) for more information on the recommended operating areas.

Overhead Power Lines and Cables

Do not operate the sidelifter close to power lines or cables.

Driving Safety

Never drive with a suspended load.

Never use the cranes to drag a container along on the ground.

Always check that the stabiliser legs are fully retracted, the cranes stowed in the low folding position and that nothing is protruding beyond the width of the vehicle before driving away.

Always ensure the twistlocks are locked prior to driving away.

While driving always pay attention to the road conditions and adapt driving style to suit.

Take extreme care when approaching and taking turns. The huge inertia mass of the sidelifter and its tendency to go straight could cause a sideways skid of the whole unit, particularly on a slippery road surface. Road train drivers should take special care.

Take particular care when reversing the sidelifter.

Unladen Trombone machines should only be driven with the chassis in the retracted position.

Lifting Safety

This STEELBRO Sidelifter is designed to lift from one side only. Do not lift any load beyond the centre-line of the Sidelifter onto the ‘non-lifting’ side, referred to in this document as the 'offside'. Do not attempt to lift a container from the offside.

Similarly, if fitted with the SMART*lift* system, do not overuse this system to limit the range of crane movements. This system is a 'backstop' designed to minimise the risk of overextending the crane movements.

Never exceed the maximum capacity stated on the Safe Working Load Chart for your unit.

Always ensure the twistlocks are unlocked prior to commencing lifting operations.

With Sidelifters that traverse to handle different container sizes, lifting is only permitted when the crane modules are placed into the set lift positions.

Lifting lugs are left hand and right hand and must be used in their correct positions. Ensure that lugs are fitted according to the instructions in this manual: Lifting Lug Instructions (on page 20)

Do not lift containers from the top lifting points without the use of a STEELBRO top-lifting frame.

When ISO Tanktainer containers are being charged or discharged, the engine must be **SHUT DOWN** and the battery isolating switch turned **OFF**. When ISO Tanktainers are being loaded or unloaded from the Sidelifter ensure that **ALL TANKTAINER VALVES ARE SHUT.**

The Sidelifter Operator must have a full view of the load during the lift and if required sufficient competent persons must be available to assist. The recommended operating area is shown below:

This is a view from above. Operator stands on the lifting side at least 2metres back from the rear of the sidelifter where he has a clear field of vision of both the lifting side and rear of sidelifter.

Crane Traverse Safety

Sidelifters that handle different sized containers by moving the crane modules, must have all arms and stabilisers in the stowed position when the crane modules are moved. The modules **MUST NEVER** be moved with crane modules loaded or Arms/Stabilisers extended.

Emergency Stop Button

In an emergency, depress the emergency stop button on the remote control, until the engine has stopped.

As an extra precaution, and if it is safe to do so, turn off the engine key switch on the main control panel.

Modifications

No modification may be carried out on the Sidelifter without written authority from STEELBRO.

Hydraulic system

Always ensure when disconnecting hydraulic tubing and hoses that there is no hydraulic pressure in the line before switching off the power supply to the system.

Commissioning Checks

Prior to operation of your new Sidelifter, make the following checks:

- Examine the Sidelifter, checking that the specification is as ordered.
- Check for any damage to exposed equipment that may have occurred during the delivery journey (lights, mudguards, bodywork etc.).
- If the battery and night work lamps have been stowed in the toolbox for security purposes during shipping, then these need to be fitted. Ensure that the battery has sufficient electrolyte and is fitted with negative terminal to earth.
- Check tractor unit turntable compatibility to ensure safe coupling of the kingpin to the tractor unit and fitting of any kingpin blocks in the case of fifth wheel couplings mounted on oscillating 5th wheels.
- Lubricate the tractor coupling; trailer upper fifth wheel plate and kingpin with a good grease (hub grease is ideal). Couple and uncouple the Sidelifter to ensure the coupling lock operates freely.
- Connect up brake hoses and see that couplings are seating correctly. Listen for air leaks. Check brake operation. Ensure spring brakes have had the release bolts removed.
- Check tractor unit electrical coupling and layout compatibility, ensuring proper operation of clearance marker lights, brake lights and indicator lights.
- Ensure tyres are inflated to correct pressure.
- Examine axle alignment for any damage during delivery journey.
- Check axle oil level in hubs if oil filled hubs fitted.
- Ensure landing legs wind up and down while trailer is coupled to tractor.
- Check dry thread torque settings:

Wheel nuts 10 stud	375 - 400 lb.ft (550 - 600 Nm)
Wheel nuts 5 spoke	180 - 200 lb.ft (245 - 275 Nm)
Suspension "U" bolt nuts	375 - 400 lb.ft (510 - 540 Nm)
Rocker shaft nuts	215 - 260 lb.ft (294 - 353 Nm)
Radius rod fixing bolts	215 - 260 lb.ft (294 - 353 Nm)
Radius rod pinch bolts	75 lb.ft (103 Nm)
Drop out bolt	35 lb.ft (49 Nm)

- Check that Hydraulic oil level is between "Min" and "Max" levels as indicated on the hydraulic reservoir sight glass with all crane lifting modules and stabiliser legs fully stowed at the 20' position.
- Ensure sufficient engine oil and engine coolant is in the Power Pack engine when fitted.

Commissioning the Sidelifter

1. For cable remotes, connect the remote control lead from the Sidelifter control cabinet to the remote control box.
2. Clean down the area where the module slides over the chassis top flanges with a clean dry cloth.
3. Start the engine in the following sequence:

- Check the tractor unit is correctly coupled with the park brake applied.

In tractor/trailer combinations where the trailer parks on spring brakes, the park brakes when applied stop the provision of air to the semi-trailer from the tractor. The Sidelifter requires an air supply to retract the crane module locking pins and operate the engine stop and speed control. There is normally enough air stored in the trailer system when it is parked to provide this for a reasonable number of applications. However it is essential that the Sidelifter brake system and piping are always free from air leaks, which waste the stored air. On systems where parking is performed by applying air pressure to the service lines this does not apply.

- Ensure all the Emergency stops are released and remote control (cable or radio) is working.
- Insert the key into the Sidelifter start switch and turn to the preheat position. Hold the key in this position until the amber preheat lamp beside the key switch goes out.

Pre-heating the engine is only necessary when the engine is cold.

- Turn the key to the start position. When the engine starts release the key.

4. If the lifting chains have been stowed in the toolbox during shipping then these need to be fitted as follows:

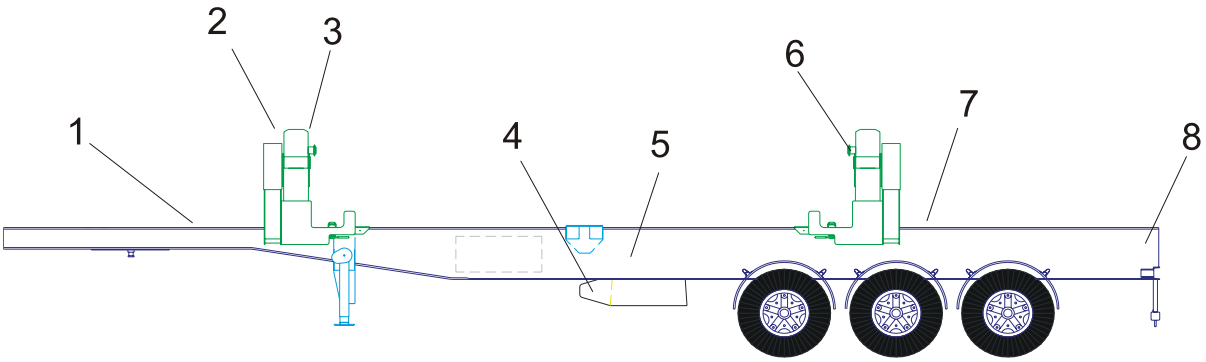
- On the remote control, select Legs, and place the feet on the ground.
- Select High speed () and raise the bottom arms to their maximum.
- For Clevis pins, attach the hammerlocks of the chains to the Clevis. For chains with an oblong link, fit the oblong link over the G pin.
- Raise the top arms until the chains hang freely in the air.

- Check that the lifting lugs, which are left and right handed, are correctly positioned, i.e. ensure that the left and right lifting lugs are in their correct positions. If not, lower the top arm, and reposition. Raise the top arm and check lug position is now correct.
- Return the lifting arms to their stowed position ensuring the lifting chains are in the chain trays beside the twistlocks.

5. Move each lifting module independently from the delivery position to the opposite end of its traverse. Clean down chassis surfaces along where the lifting module moves.

- Shut down the engine by turning off the remote control or pressing any of the red emergency stop buttons on remote control box. Turn off the key ignition.
- Always turn off the radio control when not in use.

Main Components



The main component systems of the SE400 Sidelifter are:

1. Chassis, Suspension and Axles
2. Crane Lifting Modules
3. Stabiliser Legs
4. Hydraulic System
5. Power Pack and Control System (if fitted)
6. Lifting Accessories
7. Pneumatic System
8. Electrical System

This type of sidelifter has at least one traversing module and can carry one 20 foot, one 40 foot or 2 x 20 foot containers.

All that is necessary for operating the sidelifter is a tractor unit of sufficient size, with compatible braking, electrical and kingpin couplings.

Chassis, Suspension & Axles

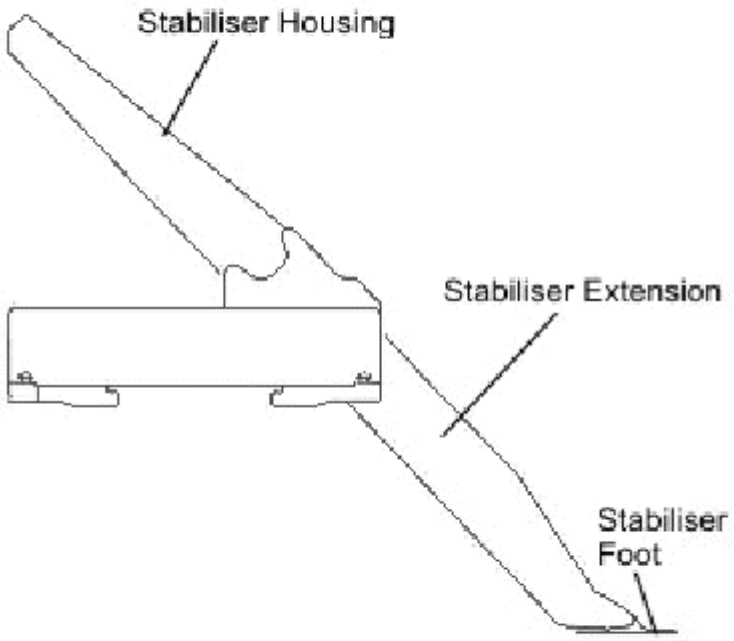
Parts of this chassis are fabricated from high tensile steel and must not be welded without authority from STEELBRO or its authorised service representative.

The standard Kingpin is a 2" S.A.E. removable (bolt in) type.

Two-speed wind up landing legs are fitted behind the gooseneck.

The brand, style, maintenance and servicing of this Sidelifter's axles and suspensions are detailed in separate sections of this manual.

The Stabiliser Legs



The stabiliser legs are continuously welded box sections constructed from high tensile steel. The pins are mounted in glacier bearings.

NOTE: When a stabiliser foot is placed into a hollow or a descending slope, it is necessary to build up the ground level by placing timber (dunnage) under the relevant stabiliser foot before continuing.

NEVER operate the Sidelifter without first deploying the stabilisers.

Ground Pressure

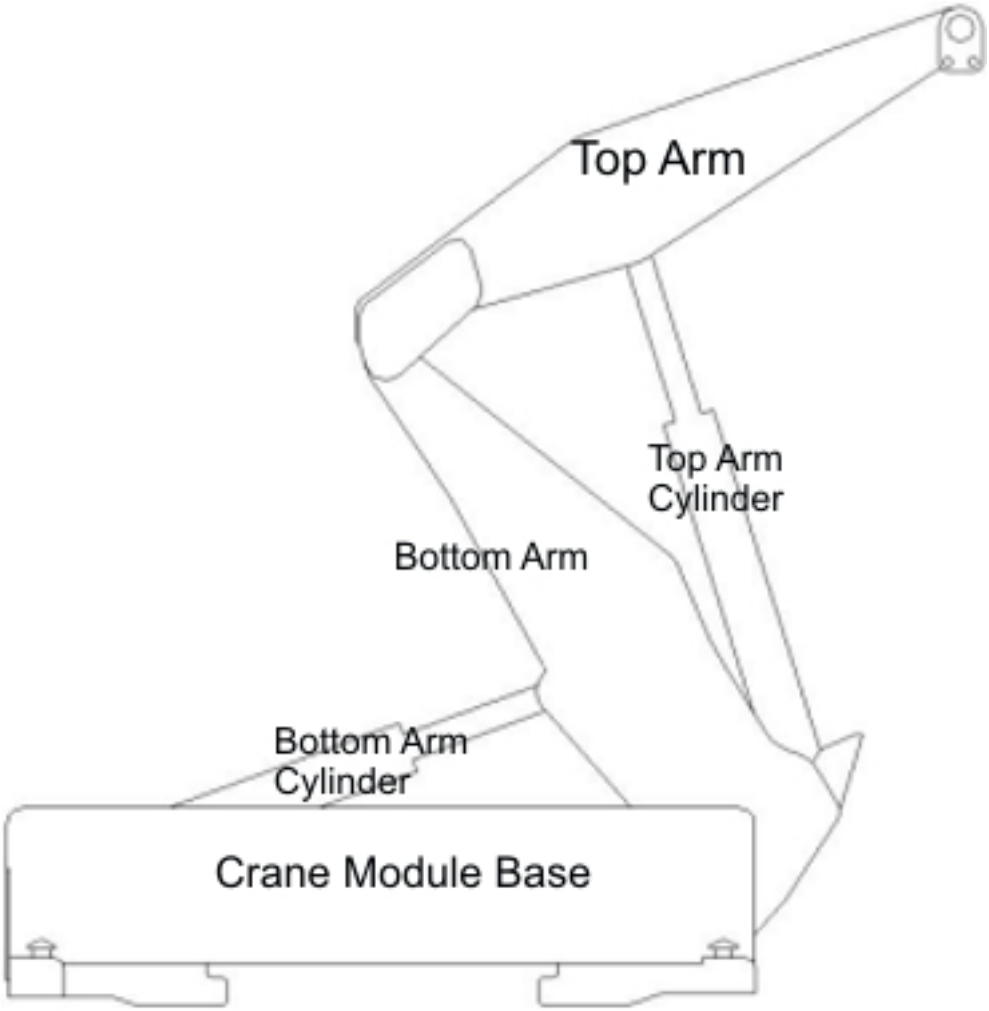
STEELBRO can only give figures based on the Rated Load Lifting Capacity of the Sidelifter. The fact that Sidelifters can lift heavier loads because of their built in Safety Margins must also be considered by designers when designing surfaces on which a Sidelifter will stand during its operations. Based on the Rated Load Lifting Capacity of the Sidelifter, and allowing for the 60/40-ratio load imbalance of containers the ratings are:

Model	Weight of box at Max SWL*:	Load per Foot (tonne)	Ground Pressure (MPa)
SE400	40	31	1.5

*SWL= Safe Working Load.

Where the pre-operational risk assessment reveals the presence of cellars, underground services, ducts or the like, a competent person must assess whether the ground is stable enough to support the load of the stabiliser foot.

Crane Lifting Modules



The crane modules and lifting arms are continuously welded box sections constructed from high tensile steel.

The pins are mounted in replaceable lubricated glacier bearings.

Over-Centre Valves

The hydraulic system is fitted with pilot operated over-centre valves on the crane arms which are preset at the factory to cope with all foreseen shock loads or attempts to lift more than the crane's rated SWL.

The over-centre valve:

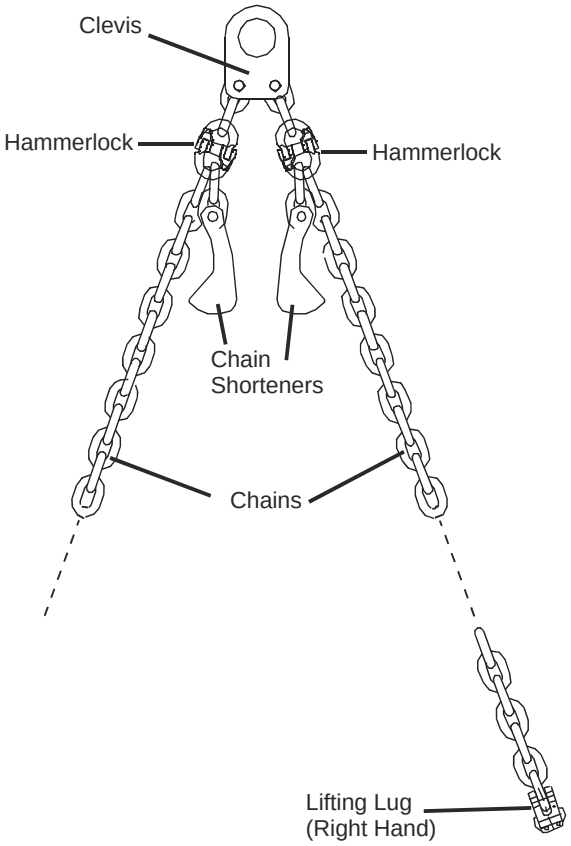
- Prevents the arms from moving unless there is a pressure signal from the main hydraulic valve,
- Helps keep the movement of the load controlled and constant when being lowered, regardless of the pressure that may be in the cylinder,
- Ensures that the cylinders are held in position, should the hydraulic system lose pressure. This stops the arms from dropping and thus preventing any run away of the load in the event of a hose failure.

Lifting Chains

The lifting chain sling is illustrated below. The chains, clevis hook and lugs are all individually tested then the whole sling tested and certified. They should never be welded in any way and should be replaced should there be any sign of distortion, excessive wear or damage. Shorteners are included in chain slings where the unit is capable of stacking containers two high. Instructions for their use are in the section Chain Shortening Instructions.

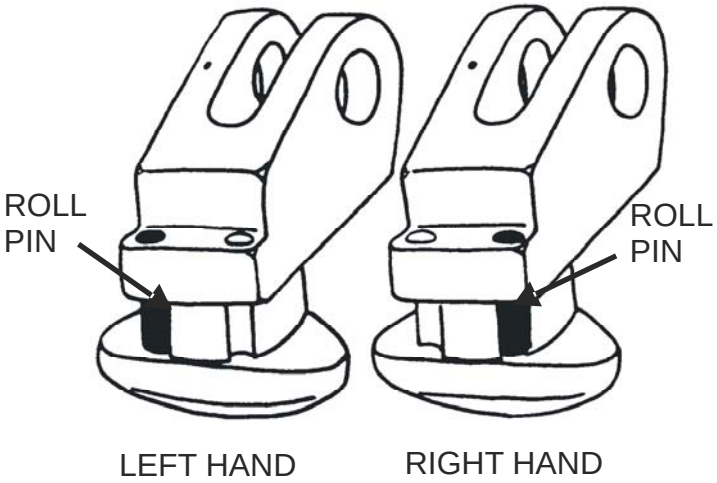
Never switch chains from one machine to another as they may vary between one Sidelifter and another in length and size.

Chains should be proof tested annually. STEELBRO recommends that the inspection certificates supplied be retained for history.



Chain Sling Assembly (note: no shortners on an SE400)

Lifting Lug Instructions

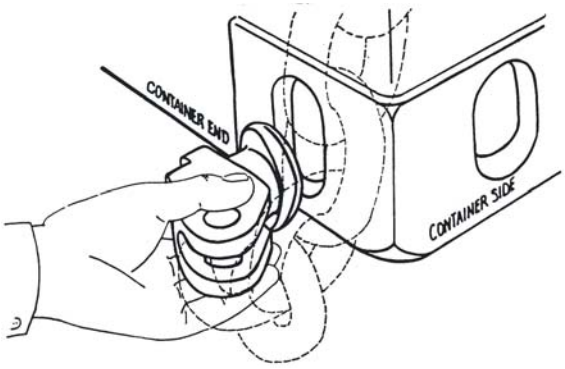


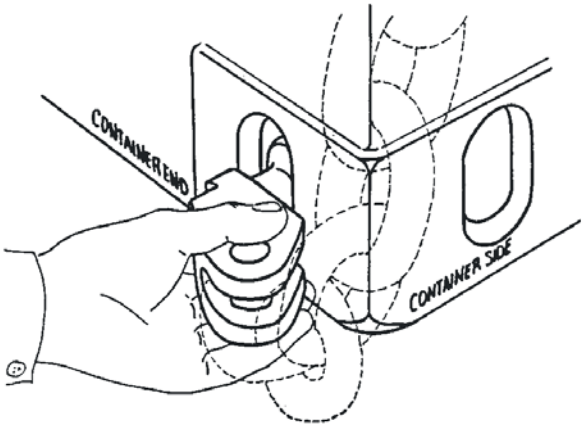
The only, but significant, difference between a left-hand Lug and a right-hand Lug is the position of the roll-pin (marked in black above), which prevents the lug from accidentally falling out of the container-corner-casting. When standing in front of the container, facing the container, the container-corner casting at your left-hand-side is called the Left Hand Container Corner Casting.

Only ever use the correctly handed lifting lug to corner casting i.e. the left lug to the left corner casting and the right lug to the right corner. Failure to do this may result in the container coming loose during a lift with obvious potentially fatal results.

Using the Container Lifting Lugs

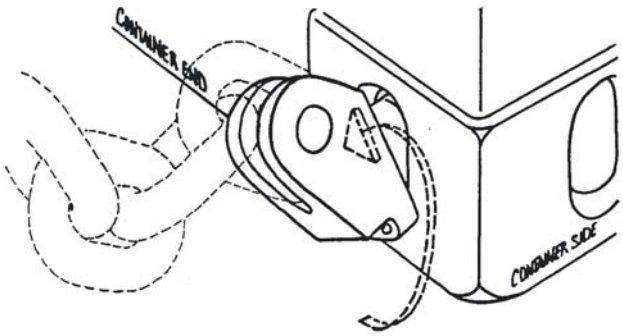
1. With the clevis of the lug facing out from the container, position the lug in the corresponding container-corner-casting-cavity.

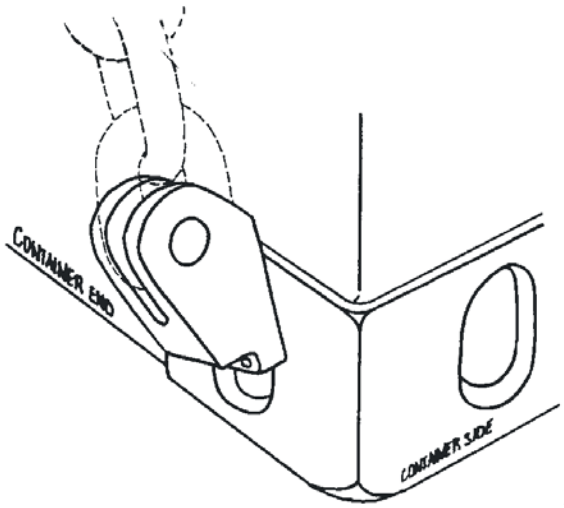




2. Rotate the Lifting Lug over the top of the lug until the rollpin prevents it from rotating any further.

3. The clevis is now pointing IN-wards, under an angle of approximately 60 degrees “UP”. The rollpin prevents the lug from accidentally falling out of the container-corner-casting.





4. When lifting the container, the lug will slide to the top of the container-corner-casting-opening, and in a slightly steeper angle (this to prevent the rollpin from taking any real load), before lifting the container.

The slope of chain legs ensures that the lifting lugs stay locked inside the container castings during the lift cycle.

Using the sidelifter lifting chains instead of appropriate lifting accessories for handling non-ISO container items, or for top lifting of ISO containers, will cause severe damage to the machine, and place personnel at risk. Any such action will void our warranty.

Power Pack

The power pack is a Kubota V2203 Diesel Engine. This engine develops approximately 40 horsepower at 2800 rpm and the motor speed is governed to the required pump speed of 2800 rpm.

The power pack control panel is within a weatherproof cabinet, located either on the side or the rear of the machine.

The electric start key and switch are situated on the control panel, as are any or all of the following:

- Hour meter, water temperature and oil pressure gauges,
- Generator and pre-heat warning lamps,
- E-stop circuit lamp and a glow lamp,

depending on the model and control system.

Electrical System - Power Pack Version

The electrical system consists of the following:

- A 12-volt supply from the engine alternator system
- A main junction box mounted in a cabinet located at the rear of the chassis
- 2 crane module mounted junction boxes.
- One chassis mounted junction box adjacent to the power pack
- Remote control/s - cable, radio or both according to customer specification.
- A chassis mounted junction box for the SMARTlift control system, if fitted.

System Lay Out

Electrical power is supplied from the Kubota alternator system to the main junction box. The cable remote is plugged into this junction box (for radio control the receiver unit is plugged into this junction box). The main junction box is connected to the chassis mounted junction box and the two crane mounted junction boxes. If SMARTlift control is fitted, it is located on the chassis between the main junction box and the crane mounted junction boxes.

System Operation

The main control box is equipped with a key/starter switch, oil and alternator warning lamps, water temperature gauge, glow plug indicator lamp and an hour meter.

When you turn the key, the 12 volt system is energised and the run stop control (solenoid pneumatic actuated air cylinder) moves to the run position, providing the trailer air system is fully charged. The engine can now be started. Movement of the joysticks signals the engine speed control (solenoid pneumatic actuated air cylinder) to maximum speed. When the joysticks are returned to their neutral position the engine speed returns to idle after approximately three seconds. (A timer unit is fitted in the main junction box and set to three seconds to give this delay).

The remote control is equipped with two joysticks to operate all hydraulic functions. A function selector switch allows selection of stabiliser legs, crane arms, and for units with crane traverse function, crane traverse. This allows joystick signals to be transmitted via relays in the main junction box directed to the Danfoss control valves and function diverter valves via the crane mounted junction boxes. The joysticks also incorporate micro switches that independently signal the dump solenoid relay and the "PVEM power relay" (powers up the Danfoss control valve coils). There are more details on how to use the remote control to operate the cranes in the Section: Crane Operations (on page 29).

Also mounted in the remote control is a two-position switch for "High Speed" and "Low Speed" selection. When "High Speed" is selected, two relays in the main junction box are activated, one to direct joystick signals to the Danfoss control valve coils, the other to activate the "High speed load sensed unloader valve" solenoid coils. When "Low Speed" is selected these unloader valve relays are de-energised and the joystick signals are now directed via the E.H.F's. (Electronic Hydraulic flow controllers) to the Danfoss control valves. An emergency stop button ("Mushroom" type) is fitted to the remote control to shut down all systems in an emergency.

Hydraulic System - Power Pack Version

The hydraulic system consists of the following;

- Hydraulic oil reservoir with return oil filter and a breather assembly
- Direct coupled tandem hydraulic pump
- High speed load sensed unloader valve assembly
- High-pressure oil filter.
- Two Danfoss proportional control valves.
- Four hydraulic cylinders fitted with double check valves operating the stabiliser legs
- Two hydraulic cylinders fitted with single over-centre valves operating the top lifting arms
- Two hydraulic cylinders fitted with double over-centre valves operating the bottom arms
- Four hydraulic cylinders or four hydraulic motors to traverse the cranes (except on Truck mounted and Fixed crane units)
- A solenoid operated dump valve connected to the load sense system (optional)
- A hydraulic pressure gauge

System Control

The system is controlled by a remote control. The controls comprise a pair of two axis joysticks, a function selector switch, a high / low speed selector switch and an emergency stop button.

System Operation

The tandem pump delivers oil to the high speed load sensed unloader valve, where the two flows can be combined to give high speed operation, or split to give low speed with the second pump flow returning to the oil reservoir.

Also fitted to this valve is a solenoid operated dump valve that is activated by the joystick controllers and the emergency stop buttons.

The pump flow from the high speed Load Sensor (LS) unloader valve passes through the high pressure filter and is divided and supplied to the front and rear control valves. These valves are connected to each other with a load sense line. This helps to maintain synchronisation of the crane lifting arms when unequal loads are handled.

Fitted into the load sense line is an optional solenoid operated dump valve. When the valve is in the de-energised condition load sensed (LS) oil is dumped to tank. When the valve is energised the LS line is blocked to tank and allows the hydraulic system to operate.

A hydraulic gauge is fitted into the LS line and indicates the pressure in the system.

The crane control valves are Danfoss PVG 32 proportional type and are signalled from the joysticks for directional control. High or low speed can be selected at the remote control. The low speed function only applies to the lifting arms. The stabiliser legs are always in high speed irrespective of the position of the high/ low speed selector switch.

Units without Digital Control only (SB360, SE400, some SB330's): When "Low Speed" is selected only one pump is supplying the system and the joystick signals pass via an electronic hydraulic flow (EHF) control and the function speed is reduced by 50% to allow fine control under heavy and difficult loading conditions.

High Speed Load Sense (LS) Unloader Valve Logic

Following is a summary of the logic and function of the "High speed load sense unloader valve".

Speed Mode	"High speed"	"Low Speed"
Operating oil flow	120l/min	60l/min
Operating Pressure	140bar (2000psi) @ HS-LS-U valve	280bar (4000psi) @ Danfoss PVG32
No of pumps operating	2 x Pumps	1 x Pump (second pump to tank)
High speed Solenoid	Energised	De-energised
High Speed relief	140bar (2000psi)	Not Active
Load Sense Solenoid	Energised	De-energised
Load Sense Relief	140bar (2000psi)	Not Active

Pneumatic System

This system consists of the following:

- A hold back protection valve
- Two crane module locks
- An engine speed control cylinder
- An engine stop control cylinder
- Chassis locks

Hold Back Protection Valve

This valve protects the trailer air system and isolates the Sidelifter pneumatic system if the trailer air system drops below 4.5 bar / 65psi

Engine Speed Control.

An ON/OFF air solenoid valve when activated supplies system air pressure to the base end of the speed control cylinder to obtain maximum engine speed (2800rpm). An air pressure regulator supplies a balanced air pressure to the rod side of the speed control cylinder, retracting the cylinder and returning the engine to the idle speed (approximately 1400rpm).

Engine Run/Stop Control

An engine run / stop control solenoid activated by the key switch and emergency stop buttons supplies system air pressure to activate the cylinder. This cylinder requires air pressure for the engine to run and is spring loaded to the stop position.

Crane Operations

This section covers how to operate the cranes when performing different kinds of lifts.

Operating Near Power Lines

Do not operate a sidelifter close to power lines.

Electricity supply bodies in each State/Country may have issued regulations or guidelines for the use of cranes in the vicinity of overhead conductors (power lines). The Sidelifter operator must be familiar with these regulations and carry out a site-specific risk assessment prior to the start of any operation where working within close proximity to power lines is required.

All aerial conductors (power lines) must be treated as alive unless the electricity distributor or transmission line operator has stated otherwise. Such a statement must be in writing and include date and time frame of the isolation of the power lines.

The Sidelifter, the lifting arms and the load must be kept at least the listed distances from any power lines during operation:

Voltage	Minimum Distance Required
Up to500	2.0 metres
500-40,000	4.0 metres
Up to 133,000	6.4 metres
Over 133,000	10 metres

Where the above stated minimum distances cannot be achieved, the electricity distributor must be notified in writing and the Sidelifter must not be operated within the minimum distance until the following requirements are satisfied:

For Power lines up to and including 133,000V

- Written permission from the electricity distributor has been obtained
- All conditions specified by the electricity distributor are complied with.
- The electricity distributor is notified before work commences.
- A ‘Spotter’ performs spotting duties.
- A pre-start site/job meeting has been convened and a risk assessment completed.

For power lines greater than 133,000V

- The electricity distributor has provided an easement entry permit.
- Written permission from the electricity distributor has been obtained
- All conditions specified by the electricity distributor are complied with.
- The electricity distributor is notified before work commences.
- A ‘Spotter’ performs spotting duties.
- A pre-start site/job meeting has been convened and a risk assessment completed.

Contact with Power Lines (Aerial Conductors)

If the Sidelifter or load contacts power lines, the relevant electricity distributor must be notified immediately. The Sidelifter operator must warn other personnel not to touch any part of the Sidelifter or load and if possible without anyone approaching operate the Sidelifter to break contact.

When unable to move or detangle the Sidelifter from the power line, no further action must be taken until the power is isolated and conditions are confirmed safe.

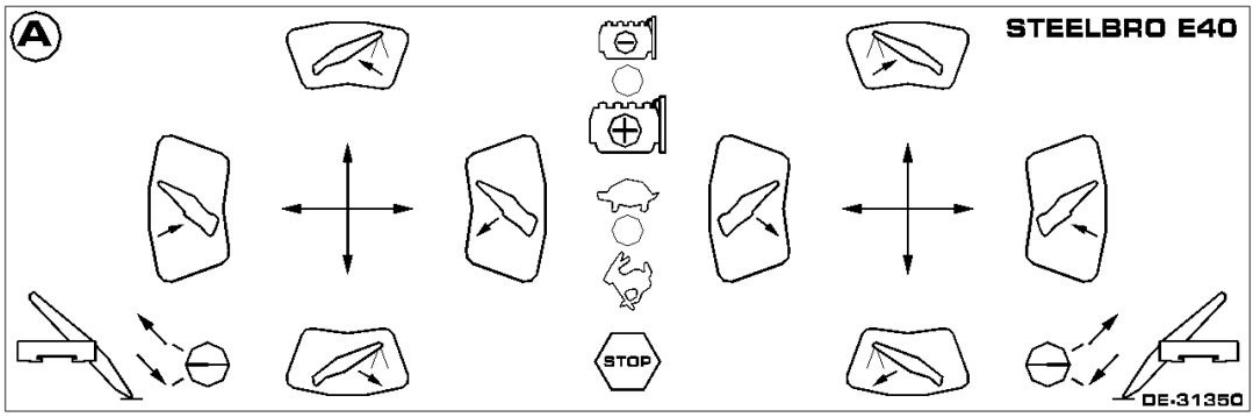
When a Sidelifter has been in contact with a power line, it must be checked by a suitably competent person and must not be returned into service until all recommended repairs have been completed.

Crane Module Operation - Cable Control

All operator controls are on the remote control box. This remote control box contains:

- Two joystick controls that operate the lift arm operations.
- A two position rotary switch for stabiliser operations
- A two position stay put switch throttle control
- A two position stay put switch for high/low speed
- A Red "Mushroom" type stop button for Emergency Stop.
- A rotary switch for traverse operations is in the control box cabinet.

Sidelifter control valves have manual levers. In the event of an electrical breakdown the operating cycle can be completed manually by using these levers.



This diagram shows the decal of the remote cable control.

Operation:	Control:
Top Arm Up	Joysticks Up
Top Arm Down	Joysticks Down
Bottom Arm Out	Joysticks Out
Bottom Arm In	Joysticks In

Positioning the Lifting Cranes

The process of positioning the lifting cranes should happen in this order:

1. Position the Lifting Cranes in the appropriate positions for the size of container. To move the Cranes select the Cranes Mode and use the joysticks as discussed in the previous section.
2. Position the Sidelifter trailer for lifting the container. Do this second so that, in the instance of lifting a container onto the Sidelifter, it is easier to line the cranes up beside the container.

The furthest apart the Cranes can be positioned is 40 feet, and the closest is 20 feet.

Lifting a Container from the Ground

1. Park the Sidelifter alongside the container with approximately 350mm clearance between the container and the Sidelifter.
2. Do the following checks:
   a) Sidelifter twistlocks are directly opposite the container corner castings.
   b) Sidelifter Brake is applied!
   c) No hazards and obstructions such as overhanging building awnings, electric power lines or telephone cables.
   d) Nothing is in the way of the Stabiliser Legs and/or Feet and surface is solid enough to bear them.
   e) Twistlocks on the Sidelifter are in the raised position and unlocked
3. Start the engine and select high speed ( ) operation on the High/Low Speed Switch on remote control box.
4. Switch on throttle on the Throttle Control Switch on remote control box.
5. Extend the stabiliser leg extensions to their maximum until the feet touch the ground.

Ensure that the strength of the ground surface is sufficient to withstand a 22 tonne maximum point loading. If you are in doubt as to this, then hardwood timber packing of at least 50mm thick and 400mm x 600mm should be placed under each stabiliser foot. Also check that the ground is level, if the stabiliser feet have been placed into a hollow or downward slope then sufficient timber packing will need to be placed under the feet to lift them back up to a level position, if you wish to handle a loaded container.

6. Manoeuvre the top and bottom arms until the chains are positioned centrally allowing the lifting lugs to be fitted into the corner castings of the container, ensuring that there are no twists or tangles in the chains and that the left and right hand lifting lugs are in their correct positions.

Do not try to force the cranes alongside a container. If the lifting arms will not clear the container, the lifting equipment and stabiliser legs should be returned to the stowed position and the sidelifter moved so it will clear the container.

7. Take an initial strain on the chains by raising the top arms upwards. Ensure that the lift pins of the crane are in the centre of the container. This can be verified readily by checking that the top chain hoops take the strain in a vertical position. Choose between the movement of the top and bottom arms to centralise the lift pins. Take the weight of the container and check that the Sidelifter is stable with the weight being lifted.
8. Select Low Speed () on the remote control.
9. Lift the container approximately 150mm (6in) off the ground by raising the top arms. In the event that the container is lifting unevenly it may be necessary to operate one end only to bring the lower end of the container up to a level position. Move the container, just above the ground, towards the Sidelifter, until it is about 300 mm from the side of the Sidelifter
10. Raise the top arms until the bottom of the container is level with the top of the Sidelifter chassis.
11. Retract the bottom arm to bring the container over the chassis. Line the container up with the twistlocks.
12. Lower the arms until the container corner castings are above their respective twistlocks.

Rapid starting and stopping movements are stressful on the equipment, and may cause the container to swing, which may damage the cranes and twistlocks. To ensure smooth movement, feather the controls in and out of operation.

13. Lower the container down onto the twistlocks by locating either front corner onto a Twistlock cone, and then the rear visible corner onto its Twistlock cone. With practice, operators will be able to land the containers onto the twistlocks in one smooth operation.
14. Select high speed () and lower the lifting arms to their stowed position.
15. Select stabilisers () and return the stabiliser legs to their stowed position.
16. Stop the engine, turn the key off and stow the controls. Avoid twisting and knotting the remote control cable.
17. Lock the twistlocks.

The Sidelifter can now be driven to the unloading site.

Placing a Container on The Ground

1. Park the Sidelifter alongside the area where the container is to be placed, ensure that the area is clear of obstructions and the Sidelifter park brake is applied.
2. If the container was loaded onto the Sidelifter with a Forklift or similar, it will be necessary to attach the lifting chains to the container.
3. Unlock the twistlocks.

Ensure the twistlocks are unlocked prior to lifting

4. Start the engine. Select high speed () on the High/Low Speed Switch.
5. Fully extend the stabiliser legs and place the feet on the ground. As per the previous instructions: "Lifting a container from the ground", packing may need to be placed under the feet on soft or doubtful ground.
6. Raise the top and bottom arms until the chains are evenly tensioned. This can be verified readily by checking that the top chain hoops take the strain in a vertical position.
7. Select low speed on ()the remote control.
8. Raise the top and bottom arms to lift the container clear of twistlocks.
9. Move the container across the chassis until the container is 350mm clear of the side of the Sidelifter.
10. Lower the top arms to place the container on the ground. If it is necessary to move the container further out from the Sidelifter, do this with the container no more than 150mm, (6in) above the ground.
11. Slacken the lifting chains and remove the lifting lugs from the container.
12. Switch to high-speed operation () and return the lifting arms to the stowed position ensuring the lifting chains are in the chain trays beside the twistlocks.
13. Return the stabiliser legs to the stowed position.
14. Stop the engine, turn the key off, and stow the controls.

Maintenance

Why Genuine Parts?

When you or your service workshop carry out service or repair work on your STEELBRO Sidelifter, it is important that you fit genuine STEELBRO Sidelifter Spare Parts.

The STEELBRO Sidelifter is a product of high technical standard. A guarantee that this quality will continue throughout the life of the Sidelifter requires that it gets regular service and that only genuine spare parts are used.

Preventative Service

The following section describes the service and maintenance requirements of the Sidelifter. All components must be checked regularly for proper functioning and adjustments made only if necessary. Before the Sidelifter left the factory, every valve in the hydraulic system was thoroughly tested and properly adjusted and the complete unit was test operated at full lifting capacity. A duly competent person must carry out all servicing and any subsequent adjustment.

When using a steam cleaner on the Sidelifter, avoid cleaning near hydraulic cylinder shafts, electrical control boxes or junction boxes and switches. While the latter are fully water proofed, they may not tolerate hot steam cleaning jets.

Grease And Oil Specifications

The hydraulic system and the hydraulic fluid are matched in respect of lubricating performance, effect on seals, and non-compatibility with other materials. For this reason do not mix different types of hydraulic fluid, such as mineral oils, synthetic fluids and water based fluids, and never adulterate your hydraulic fluid with diesel oils or alcohol based products.

We recommend the use of non-molybdenum based greases as these do not deteriorate the crane bushings.

Use	Recommended Product
▪ Hydraulic Oil	-Castrol Hyspin AWS46 or equivalent*
▪ Bearing Grease	-Shell Alvania EP or equivalent
▪ Hub Grease	-Shell Alvania EP2 or equivalent
▪ Hub Oil	-Castrol Multitrax 80w/140 or equivalent
▪ Wheel Stud Grease	-Shell Alvania EP2 or equivalent

* May vary for different markets depending on temperature range:

Temperature Range	Recommended Product
From -20°C to +30°C	Castrol Hyspin AWS 32
From -10°C to +40°C	Castrol Hyspin AWS 46
From 0 to 50°C	Castrol Hyspin AWS 68

Servicing Trailer Running Gear

For servicing detail refer to the Suspension and Axle Manuals.

Records

All checks, adjustments, replacement of parts, repairs and inspections performed, and all irregularities or damage potentially effecting the sidelifter's safety should be recorded in an orderly manner. In some countries this is mandatory.

A STEELBRO comprehensive service programme is available through your distributor. As this is designed specifically to support the safety, operation and maintenance requirements of your Sidelifter, we recommend that you contact your distributor for more information if you do not already this programme in place.

For your convenience, a service programme summary logbook is provided.

Daily Inspection Requirements

Hydraulics

- Check the engine oil and water levels.
- Check the oil level in the hydraulic reservoir. (The oil level needs to be between the "Max" and "Min" levels on the sight glass when the Sidelifter is in the stowed position). Check pump suction line shutoff valves are open.
- Check that the lifting arms and stabiliser legs can be operated with ease and that the controls automatically return to the neutral position.
- Inspect the hydraulic lines, connections and other components to detect any oil leakage or damage. Tighten any loose or leaking connections.

Warning: Ensure that when connecting Quick Release Couplings, the low-pressure line is always correctly fitted before fitting the high-pressure line.

When disconnecting hydraulic tubing and hoses, always ensure that no hydraulic pressure has been retained in the line after the power supply to the system has been switched off.

Refer to Precautions with Over-Centre Valves and Check Valves (on page 47)

Lifting Gear and Chassis

- Check the lifting chains, lifting lugs, hammerlocks and other components of the chain assemblies to ensure that they are not damaged. The hammerlocks should be able to fold otherwise they have been overstressed and are in need of replacement.
- Check the Sidelifter, chassis and twistlocks for damage. For example, check that the container guides on the far side of the crane bases are present and not unduly bent or deformed.
- Inspect the lifting module sliding areas on top of the main chassis for cleanliness.

Brakes - Air Pressure Systems

- Run the truck engine to achieve maximum air system pressure. Stop the truck engine and check the truck air gauge does not show a rapid loss of pressure that would indicate an air leak.
- Apply and release the brake pedal twice. Air pressure should not drop abnormally when brakes are applied. Check that the brakes release immediately. Check that the slack adjusters on the trailer axle camshafts do not have excess movement that indicates brake adjustment is required.
- Check that all hoses are firmly connected and that there is no damage caused by cuffing or knotting.
- Vent air reservoirs to expel condensate by using the drain valves.

Lights

- Inspect switches and lights for broken brackets, fused bulbs and cracked lenses. Check for loose wiring connections - usually indicated by flickering, dull or intermittent lights.
- Clean light lenses and reflectors.

Wheels and Tyres

- Check tyre pressures are correct, check that the valves are not damaged and trailer axle dust covers are in place.
- Remove all objects trapped in the tyre tread and ensure tread depth complies with road regulations.
- Ensure tyres have no cuts or bulges.
- Examine all wheels for damage caused by "kerbing" or severe road shock.
- Check that the wheel nuts are properly seated and show no signs of running loose.
- Check oil level in the axle hubs is between the minimum and maximum levels if the axles are of the oil filled type.

WARNING: After any removal and refitting of any wheel with ISO wheel nuts, ensure nuts are re-tightened within 50 to 100km of travel. Neglecting to do so could result in loss of a wheel.

Suspension

- Check springs for shifting or missing leaves, loose or missing clips and any damage.
- Check suspension U- bolt, bearings and bushes for security and condition.
- Check air bags for damage, chaffing etc.

Weekly Inspection and Service Requirements

Perform all activities required for daily and weekly inspections and in addition carry out the following service procedures

Chassis

- Grease all grease nipples on the chassis, brake slack adjusters and landing legs with Shell Alvania E.P. grease.
- Grease semi trailer rub plate and kingpin with a good quality hub grease.
- Clean down lifting module sliding areas on top of main chassis and then wipe over with clean cloth.

Grease points are detailed on the lubrication chart in this manual.

Lifting Modules

- Grease all lifting arms and cylinder pivot bearings at front and rear.
- Check all pivot pin keeper plates and circlips for security.

Landing Legs

- Check landing legs for damage and serviceability.

Monthly Inspection And Service Requirements

Perform all activities required for daily and weekly inspections and in addition carry out the following service procedures:

Hydraulic System and Chassis

- Check all bolts on the Sidelifter, particularly pin keeper plates around the power pack if there is one, and the combined hydraulic reservoir/fuel tank mounting. Tighten any loose bolts.
- Check the Sidelifter operator notices are in place.
- Check the lifting arms and stabiliser legs to detect any visual signs of damage, deformation or wear in the bearings.
- Service engine air filter and change as required.
- Check the Emergency Stop button and the electrical safety devices.

Brakes - Air Pressure Systems

- Check that the linkages on the trailer axle camshafts do not have excessive movement. If so adjust brakes in accordance with brake servicing instructions.
- Listen to air system for any noise of an air leak and tighten any loose connections.

Lights

- Check all cables are firmly connected and not damaged by scuffing or pinching.

Wheels and Tyres

- Check wheel bolt/nut torque settings as detailed in axle manual

WARNING: After any removal and refitting of any wheel with ISO wheel nuts, ensure nuts are re-tightened within 50 to 100km of travel. Neglecting to do so could result in loss of a wheel.

Six Monthly Inspection And Service Requirements

Perform all activities required for daily, weekly and monthly inspections and in addition carry out the following service procedures:

Power Pack and Hydraulic System

- Check all hydraulic hoses and pipe work for wear, scuffing and fretting
- Check the mountings of the power pack and hydraulic reservoir for condition and security.
- Change the following filters
  - Engine oil
  - Engine fuel
  - Hydraulic oil tank
  - Hydraulic oil pressure
- Clean the hydraulic tank breather element
- Change the oil in the power pack
- Change the hydraulic oil if required. If water contamination is present oil should be changed.
- Check fan belt tension
- Check condition of radiator hoses.
- Check engine coolant for condition as detailed in Kubota Operators Manual.

Note: the Kubota Engine Operators Manual provides greater detail for maintenance that must be adhered to.

Chassis

- Disconnect the tractor unit from the trailer and check the king pin for wear and security of attachment.
- Thoroughly clean the Sidelifter.
- Check chassis components for signs of stress, damage, cracking, corrosion etc.

CAUTION: Avoid spraying the chrome shafts of the hydraulic cylinders with water blaster or system cleaner.

Suspension and Axles (As detailed in the suspension and axle manuals)

- Carry out brake servicing
- Check out suspension servicing
- Check axle alignment
- Check nut torque settings

Lifting Modules

Inspecter les patins de glissement de grue pour voir s'ils sont usés. On peut le voir en mesurant l'espace entre la partie inférieure de la semelle haute du châssis et la partie supérieure du bloc de transfert de charge du module, s'assurant que cette espace ne dépasse pas 5mm.

Vérifier que l'espace entre les patins de guidage de côté et le côté de la semelle supérieure n'excède pas 5 mm.

Annual Inspection And Testing

Perform all activities required for daily, weekly and six monthly inspections and in addition carry out the following service procedures:

King Pin

The king pin, connecting the Sidelifter to the tractor unit should be crack tested or renewed. The latter is often the cheaper alternative. This check is required by automotive testing stations in N.Z., and is recommended to all Sidelifter owners because of the stresses applied when lifting loads.

Lifting Chains

Remove both lifting chain assemblies, and inspect and measure, as per the PWB Herc-Alloy Chain Recommendations. Each country has its own requirement for inspection and testing of lifting chains and slings. These must be adhered to. STEELBRO recommends that chains are proof tested annually and that the records are retained for history.

Lifting Equipment

Carry out a full monthly and six monthly inspection, and pay particular attention to the lifting arms, stabiliser legs, and their mountings for any signs of cracking, or other damage. Check top arm lifting pins for wear by ensuring the pins can be rotated in their bearings. Check the emergency stop and the electrical safety devices.

Overload Test

After all other checks have been completed; carry out a 10% overload test:

The load should be 10% of the maximum load shown on the lifting chart, eg.40,000kg + 4,000kg = 44,000kg

When lifting off the Sidelifter, keep the test load close to the Sidelifter.

Carry out test at 300mm clearance from the Sidelifter side rail (i.e. 2800mm from Sidelifter centre line).

Testing after repairs to the cranes

No modification may be carried out on the Sidelifter without written authorisation from STEELBRO. Unauthorised modifications automatically void all warranties and service agreements.

After repairs on the crane and before putting it back into use, an OVERLOAD TEST must be carried out as described in the previous section.

Maintenance Notes

Pressure Line Filter:

This filter is of the full flow type with a bypass valve fitted. It has a replaceable element and this should be changed after the first 50 hrs of operation and thereafter at every 200 hours or six months.

Return Line Filter:

This filter is of the full flow type with bypass and should be changed at the same intervals as the Pressure Filter.

Filler Breather:

One filler breather is on the hydraulic oil reservoir.

The filler cap breather gauze of this unit needs washing out with cleaning solvent and blown dry with compressed air every 500 hrs or 6 months or as required particularly if operating in dusty conditions.

The strainer gauze in the tank aperture should be checked for condition and cleaned as required. Ensure the gauze is intact and no splits or damage is evident.

Emergency Instructions in Case of Electrical Faults:

The PVG control valves are fitted with manual operating handles for emergency or servicing use. In the event of an electrical fault in the control system, they can be used independently to complete the loading or unloading of a container.

NOTE: The plug on the affected solenoid will have to be disconnected before manual control can be operated as the valves are held in neutral with the electrical system connected.

Precautions with Over-Centre Valves and Check Valves

Cylinders, fitted with Check Valves and or Over-centre Valves, can remain pressurised. The pipes connecting the ‘B’ port to the Check/Over-centre Valve Block Assembly, mounted to the ‘A’ port, can remain pressurised.

To relieve the pressure in these systems carry out the following steps.

For units fitted with Over-Centre Cartridges:

Slacken the adjustment lock nut and relieve the cylinder pressure by turning the adjustment screw anticlockwise until no resistance is noticeable (about 5 full turns).

The Over-centre Cartridge can now be screwed outward to a point where the sealing surfaces are separated thus guaranteeing no pressure remains trapped in the cylinder or pipe work.

Notes On Tractor/Semi Trailer Operation

Coupling and Uncoupling

Periodically check that coupling jaws or hook locks are free, working easily and are well lubricated. If the main plate is covered with road dirt and grit, clean off with solvent and re-lubricate with a good quality grease (hub grease is ideal).

Regularly inspect tractors and trailers for damage to couplers, kingpins and pick-up plates, caused by violent impact.

We recommend this, as it is the practice of some drivers to back up to trailers too fast, when coupling.

Undetected damage resulting from the careless and dangerous habit of backing up to the trailer too fast can endanger life and goods.

Experience Counts

Everyone connected with articulation is familiar with the sound of a tractor being coupled to a trailer - but it is difficult to draw a line between the firm, positive "clunk" and an impact between tractor and trailer severe enough to cause damage.

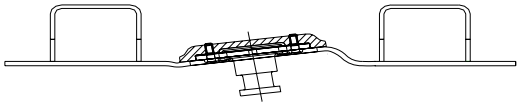
Chief Cause of Trouble

Coupling heights of loaded trailers when parked will vary due to many operating factors, such as difficult road or yard surfaces. Fleet surveys have shown that most damage is caused by attempting to couple up units that are unsuited in terms of coupling heights.

Many of the older tractors have rear springs with a high deflection rate, and when uncoupling a loaded trailer, the landing gear is wound down at the loaded height. As the tractor moves away from the trailer, the tractor springs rise to the unladen position. Thus, when re-coupling, the tractor springs have to be forced down to permit the fifth wheel to pass under the trailer plate. This action requires considerable effort, but if the driver uses too much power, an excessively violent coupling takes place. Damage is often caused to the trailer plate in this way and periodic checks should be made to ensure that the plate is not distorted and that the kingpin is square to the face of the trailer pick - up plate.

Damage can also be caused to the coupler throat, and spreading of the hook jaws, if the trailer is too high for the tractor unit. The surfaces of the trailer pick up plate and fifth wheel coupler should be in contact to obtain correct connection.

Drawing showing a typical damage and misalignment of kingpin caused by an excessively violent coupling of tractor and trailer:



Simple Checking Devices For Semi Trailers

The plate and kingpin can be checked very quickly by using a straight edge. This can be any straight flat piece of metal or timber with an appropriate rectangular section cut out to clear the kingpin.

Place the straight edge across the trailer plate, first across the trailer and then longitudinally, and you will soon see any bow or distortion in the plate. Also by having a cut-away rectangular shape square to the flat edge, any damage or misalignment of the kingpin can be seen. The cut-away portion should be made to the correct depth - the same as the kingpin depth - thus serving to show that the kingpin has not been forced upwards, which would probably impair the coupling mechanism.

To check the tractor coupling, it's a good idea to use part of an old plate of convenient size with a kingpin mounted in position. This way the coupling action can be simulated. When coupled, the pin should be held firmly and snugly without slack.

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