1355 series Vertical Order Picker

Operating Instructions

Model V15 North America

1355 series – 13558011540 US - 04/2021 - 01

Linde – Your Partner

With over 100,000 fork lift trucks and warehouse machines sold annually, Linde is one of the world's leading manufacturers of material handling equipment. There are many reasons for this success: Linde products are renowned not only for their innovative, cutting-edge technology, but also for their low energy and operating costs, which are up to 40 percent lower than those of their competitors.

The high quality of Linde products is also matched by the quality of our service. With ten production plants worldwide and an extensive network of sales partners, we are at your service around the clock and around the world.

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Linde trucks are sold in North America by:

KION North America Corporation
2450 West 5th North Street
Summerville, S.C. 29483
Phone (843) 875-8000
FAX (843) 875-8329

Parts and service

See your Linde dealer for genuine Linde parts (the only factory-authorized replacements), factory-trained service personnel and manuals for your equipment.

Proposition 65

⚠ WARNING

This warning is provided pursuant to **California Health & Safety Code Sections 25249.5 et. seq.**

This product contains and emits chemicals known to the state of California to cause cancer, birth defects and other reproductive harm.

Copyright and proprietary rights

4 Operation

5 Maintenance

6 Specifications

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Introduction

Scope

This manual contains operating and periodic maintenance instructions as well as specifications for the industrial truck to which it applies. If this manual applies to a trailer or other towed equipment, then operation or maintenance of the towing vehicle is outside the scope of this manual. Important safety rules and descriptions of some operating hazards and how to avoid them are also included. The manual is intended to assist the owner and operators in maximizing safety and efficiency in material handling while achieving maximum product life. It describes how to correctly and safely operate and maintain the truck and all standard variants available at the time of printing. Special designs, special attachments, or other custom modifications carried out by the manufacturer to meet specialized customer requests are not covered in this manual.

This manual is not a training manual and is not to be used as the basis for formal training. It is intended to supplement such training with information specific to this truck as well as applicable good practices and safety rules which may be general in nature. This manual cannot address every possible hazard or potential accident situation. Ultimately it is the responsibility of the owner and operator(s) of the equipment to avoid or correct such potential dangers.

To assist in keeping the truck in good operating condition, a separate section devoted to maintenance is included in this manual. This section contains a list of items to be checked daily by the operator. It also has a schedule for maintenance procedures to be performed at regular intervals by those responsible for truck maintenance. All of these procedures are essential for safe operation and maximum service life of the truck. Scheduled maintenance tasks or repairs must only be performed by qualified forklift technicians. Details and instructions for performing such work are outside the scope of this manual. This information is covered in the applicable service manual available from authorized dealers.

The descriptions and specifications included in this manual were in effect at the time of printing. KION North America Corporation reserves the right to make improvements and changes without notice and without incurring obligation. Please check with your authorized dealer for information on possible updates or revisions.

Obligations of the Equipment Owner

The Occupational Safety and Health Administration (O.S.H.A.) requires employers of industrial truck operators to adhere to a number of regulations regarding operation. These regulations are codified in section 1910.178 of title 29 of the Code of Federal Regulations. This section establishes a number of specific rules pertaining to truck operation, inspection and maintenance, and areas of use. It is up to the owner to ensure that use and maintenance of any powered industrial truck is consistent with these rules.

In addition, 29 CFR 1910.178 describes required operator training in detail. It requires employers to establish and maintain a training program to ensure that all operators of powered industrial trucks are competent and trained in the safe and proper operation of powered industrial trucks.

Many of the rules set forth in 29 CFR 1910.178 are based on the American National Standards Institute's (ANSI/ITSDF) B56 standards. The owner should be familiar with 29 CFR 1910.178 as well as the ANSI/ITSDF B56 standards. Other federal standards may apply depending on specific industry. Owners should also be aware of any state OSHA rules that may differ from the federal rule. This equipment meets all applicable requirements of the ANSI/ITSDF B56 standards at time of manufacture. 29 CFR 1910.178 prohibits any modifications and/or additions which affect capacity or safe operation of industrial trucks without prior written approval of the

manufacturer. An owner should consult the authorized dealer if the owner's intended application for a truck is inconsistent with the designated performance characteristics of that truck. KION North America Corporation will not assume, and expressly disclaims, any liability for injuries or damages arising from or caused by unauthorized modification, removal, disconnection or disengagement of any part from any of its trucks. It is recommended that all replacement parts be of OEM (Original Equipment Manufacturer) origin.

Operator Responsibilities

It is the responsibility of the operator to operate any powered industrial truck in a safe manner. In order to do this, all operators must have completed training in the safe operation of powered industrial trucks. Operators must know and understand all general safety rules as well as any safety information specific to the environment in which they will be working. They must then practice these safe operating procedures whenever using a truck.

In addition, all operators must be familiar with the specific truck they use. Therefore they must be familiar with the procedures for correct and safe operation explained in this manual. They must understand the potential hazards and safety precautions covered in the manual. This manual however, cannot cover all possible hazards. Operators must be able to identify any hazards that may exist or arise in their work environment and know how to avoid or correct them.

Finally, operators are responsible for identifying and reporting any truck that is in unsafe condition. They must know how to inspect the truck they operate and they must perform this inspection before placing a truck in service each day. Operators must not operate a truck found to be damaged or malfunctioning.

Proper use

The truck is designed for lifting, transporting, and stacking of palletized or other stable loads. The maximum load to be lifted is specified on the truck data plate. The truck is not designed or intended to lift or transport personnel other than the operator.

For models designated as order pickers, the truck is designed primarily for the collection or distribution of items into or from a container or pallet. Order pickers are not designed for storage and retrieval of loads using the forks in warehouse racking.

The truck may be operated only on surfaces that are level, flat, and stable. If the truck is to be operated in refrigerated storage areas, it must be equipped with an optional cold storage package suitable for the specific application. (Not available on all models.) A truck must not be operated in any hazardous environment unless the truck carries the designation appropriate for that environment per 29 CFR 1910.178. It is the responsibility of the owner to ensure the safety of all operating areas and surfaces and to restrict the truck to the uses and areas for which it is designed and rated.

Hazard messages

Hazard symbols and messages are placed in this manual and on the truck to provide instructions and identify specific areas where potential hazards exist and special precautions should be taken. Operators must understand the meaning of these symbols and messages. Damage to the truck, as well as serious injury or death to the operator or others

Hazard messages

may result if the instructions conveyed by these symbols and messages are not followed.

⚠ CAUTION

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

⚠ WARNING

Indicates a potentially hazardous situation which if not avoided could result in death or serious injury.

⚠ DANGER

Indicates an imminently hazardous situation which if not avoided will result in death or serious injury.

NOTE

Indicates further information presented to ensure clarification of a particular item

ENVIRONMENT NOTE

The information contained herein must be observed, otherwise environmental damage may occur.

2

Safety

Before Operation

Before using the truck, inspect the work area. It should be neat, well lit, adequately ventilated, and free from hazardous material. Aisles and roadways should be unobstructed and well marked.

Operators must know the UL classification for the truck and use the truck only in permissible areas.

Ensure that there are no loose objects on the truck or in the operator compartment, especially on the floor plate where they could interfere with pedal operation (if equipped) or foot room.

Fire extinguishers and other emergency equipment should be visible and easy to reach. Wear safety equipment when required. Don't smoke in "No Smoking" areas, or while charging batteries or refueling combustion engine trucks.

Never operate the truck with greasy hands. This will make the controls slippery and result in loss of truck control.

Any questions or concerns about safety should be brought to the attention of a supervisor. If an accident should occur, it must be reported immediately.

⚠ WARNING

Unauthorized modifications to the truck can result in injury or death.

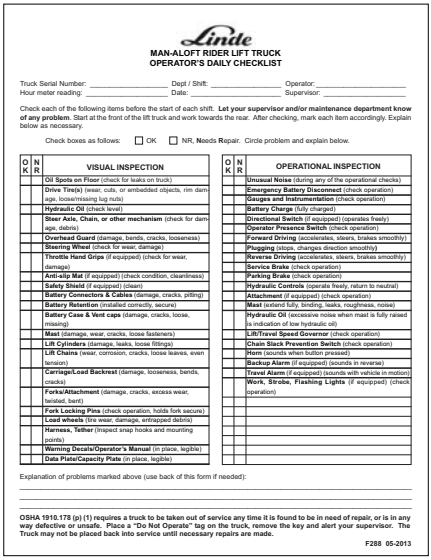
Do not remove, disable or modify any safeguards or other safety devices. These include any alarms, lights, mirrors, overhead guards, and load backrest extensions. If present, an overhead guard is intended to provide protection to the operator from falling objects, but cannot protect from every possible impact.

Operator Daily Checklist ▷

At the beginning of each shift, inspect your truck by using the **Linde Operator's Daily Checklist**. If necessary, refer to the Maintenance section of this manual for details on how to carry out this inspection. Check for damage and maintenance problems. Any necessary repairs must be completed before the truck is operated. In addition to daily inspection, scheduled maintenance is vital to safe operation of the truck. Adhere to the inspection, lubrication and maintenance schedule given in the Maintenance section of this manual.

NOTE

Any repairs or maintenance to the truck must be performed only by trained and authorized technicians.



Linde

MAN-ALOFT RIDER LIFT TRUCK
OPERATOR'S DAILY CHECKLIST

Truck Serial Number: _____ Dept / Shift: _____ Operator:_____
Hour meter reading: _____ Date: _____ Supervisor: _____

Check each of the following items before the start of each shift. **Let your supervisor and/or maintenance department know of any problem.** Start at the front of the lift truck and work towards the rear. After checking, mark each item accordingly. Explain below as necessary.

Check boxes as follows: ☐ OK ☐ NR, **N**eeds **R**epair. Circle problem and explain below.

O K	N R	VISUAL INSPECTION
		Oil Spots on Floor (check for leaks on truck)
		Drive Tire(s) (wear, cuts, or embedded objects, rim damage, loose/missing lug nuts)
		Hydraulic Oil (check level)
		Steer Axle, Chain, or other mechanism (check for damage, debris)
		Overhead Guard (damage, bends, cracks, looseness)
		Steering Wheel (check for wear, damage)
		Throttle Hand Grips (if equipped) (check for wear, damage)
		Anti-slip Mat (if equipped) (check condition, cleanliness)
		Safety Shield (if equipped) (clean)
		Battery Connectors & Cables (damage, cracks, pitting)
		Battery Retention (installed correctly, secure)
		Battery Case & Vent caps (damage, cracks, loose, missing)
		Mast (damage, wear, cracks, loose fasteners)
		Lift Cylinders (damage, leaks, loose fittings)
		Lift Chains (wear, corrosion, cracks, loose leaves, even tension)
		Carriage/Load Backrest (damage, looseness, bends, cracks)
		Forks/Attachment (damage, cracks, excess wear, twisted, bent)
		Fork Locking Pins (check operation, holds fork secure)
		Load wheels (tire wear, damage, entrapped debris)
		Harness, Tether (Inspect snap hooks and mounting points)
		Warning Decals/Operator's Manual (in place, legible)
		Data Plate/Capacity Plate (in place, legible)

O K	N R	OPERATIONAL INSPECTION
		Unusual Noise (during any of the operational checks)
		Emergency Battery Disconnect (check operation)
		Gauges and Instrumentation (check operation)
		Battery Charge (fully charged)
		Directional Switch (if equipped) (operates freely)
		Operator Presence Switch (check operation)
		Forward Driving (accelerates, steers, brakes smoothly)
		Plugging (stops, changes direction smoothly)
		Reverse Driving (accelerates, steers, brakes smoothly)
		Service Brake (check operation)
		Parking Brake (check operation)
		Hydraulic Controls (operate freely, return to neutral)
		Attachment (if equipped) (check operation)
		Mast (extend fully, binding, leaks, roughness, noise)
		Hydraulic Oil (excessive noise when mast is fully raised is indication of low hydraulic oil)
		Lift/Travel Speed Governor (check operation)
		Chain Slack Prevention Switch (check operation)
		Horn (sounds when button pressed)
		Backup Alarm (if equipped) (sounds in reverse)
		Travel Alarm (if equipped) (sounds with vehicle in motion)
		Work, Strobe, Flashing Lights (if equipped) (check operation)

Explanation of problems marked above (use back of this form if needed):

OSHA 1910.178 (p) (1) requires a truck to be taken out of service any time it is found to be in need of repair, or is in any way defective or unsafe. Place a "Do Not Operate" tag on the truck, remove the key and alert your supervisor. The Truck may not be placed back into service until necessary repairs are made.

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Operating Position

Face the truck when mounting and dismounting. Maintain a three-point contact, one foot and two hands with the truck when mounting or dismounting. Never exit a moving truck.

The normal operating position is defined as standing with hands and feet inside the operator compartment on or near the controls. Side rails must remain in the closed position throughout operation.

⚠ WARNING

Risk of injury!

Operate the truck only when you are in the normal operating position. Always keep hands and feet inside the operator compartment during operation. Keep hands, feet and legs out of the upright.

⚠ WARNING

Risk of injury!

Do not place yourself between the mast and the body of the truck. Do not use the mast as a ladder. Do not transport personnel at any time. Do not lift personnel using the forks of the truck, or with a work platform. The truck is not designed to lift personnel.

⚠ WARNING

Risk of falls!

Never climb out onto the forks or onto any item supported on the forks. Never leave the operator compartment unless it is fully lowered and the truck is properly parked.

Pedestrians

Watch out for pedestrians. Always yield the right-of-way to pedestrians. Do not drive the truck up to anyone standing in front of a rack or fixed object. Do not pass another truck travelling in the same direction at an intersection, blind spot or other dangerous location. Sound the horn at intersections and other locations where vision is obstructed. Always look in the direction of travel.

Never engage in stunt driving or horseplay. Use lights in dark and dim areas. Always ensure that there are no pedestrians in the truck's rear swing area before turning. Watch for pedestrians around the truck.

⚠ DANGER

Risk of injury!

Watch for people in your work area because they may not watch for you, even if you have lights or alarms.

Travel

⚠ WARNING

Risk of injury!

Do not walk under raised forks at any time.

110107_04

⚠ WARNING

Risk of injury!

Do not transport personnel at any time. Do not lift personnel using the forks of the truck, or with a work platform. The truck is not designed to lift personnel.

110107_05

Travel

The truck is designed for operation on smooth, level, dry surfaces in warehouse environments. Under all travel conditions operate the truck at a speed that will permit it to be brought to a stop in a safe manner. Avoid running over loose objects on the floor surface.

⚠ WARNING

Loss of control!

Do not travel at excessive speeds; keep your truck under control at all times.

Travel with the forks near the floor when outside of an aisle, and whenever possible when

in an aisle. Never travel outside of an aisle unless the mast is fully lowered. Never raise the mast during travel outside of an aisle. During travel, always watch for overhead obstructions such as lights, wiring, pipes, sprinkler systems, doorways, etc.

When travelling in reverse, always turn around to face the direction of travel and ensure a direct view in the direction of travel. Do not rely on mirrors when travelling in reverse.

Do not operate the truck in reverse if handling bulky loads that restrict your vision. Unstable loads are a hazard to you and to your fellow workers. Make certain that all loads are secured and evenly positioned on the forks.

Do not move railroad cars or trailers with this truck, or use it to operate or close railroad car doors. Do not enter elevators or trailers with the truck or otherwise use it in elevators or trailers. Do not use the truck to carry any type of suspended load.

Raising and Lowering the Operator Compartment

The operator compartment is raised and lowered by the mast. It should only be raised if the truck is stationary or travelling along a straight path. Never turn the truck while the operator compartment is raised. Always ensure there is adequate overhead clearance before raising the operator compartment. Before lifting any load or retrieving one from an elevated location, make certain that the load is stable and evenly positioned on the forks. Never lift a load with one fork.

Avoid any contact with racking or other obstructions while raising or lowering the operator compartment. Always check for hang-up of the forks or operator compartment before moving the truck or lowering the forks or operator compartment.

⚠ WARNING

Attempting to move the truck if the lift chains become slack can result in injury from free-fall of the fork carriage or operator compartment.

Always raise the forks and operator compartment before moving the truck. Watch for slack chain condition. Slack chains indicate that the mast, operator compartment, or fork carriage is hung up. Do not attempt to repair this yourself, always get a trained mechanic.

Avoiding Falls and Tip-overs

Lift truck tip-overs can cause serious injury or death. Following all safety rules when operating a lift truck is the best way to prevent injury.

- Never exceed the lifting capacity listed on the data plate.
- Extreme caution should be taken when working around docks, dock boards and trailers.
- Watch for overhead obstructions. Perform all truck movements smoothly and at a speed that will give you time to react in an emergency.
- An unloaded truck can tip over also. Caution must be taken when using an unloaded truck as well as a loaded one.
- Never raise the operator compartment when outside of an aisle.
- Do not operate the truck on any ramp or inclined surface.

⚠ DANGER

Tip over will occur if this truck is operated on a ramp or inclined surface.

Do not operate this truck on a ramp or inclined surface.

Lateral tip-over can occur with a combination of speed and sharpness of turn. This condition

of instability is even more likely with an unloaded truck. With the load raised, lateral tip-over can occur while turning and/or braking when travelling in reverse or accelerating and turning while travelling forward. Longitudinal tip-over can occur with a combination of overloading and load elevation. This condition is even more likely with increased height, braking during rearward travel, or accelerating forward.

⚠ WARNING

Jumping from the truck during a tip-over can result in severe injury or death.

If the truck starts to tip over, DO NOT JUMP!

Stay in place, hold onto the controls tightly, brace feet, and lean away from the direction of impact.

Parking

When you are finished with the truck, observe proper shutdown procedures.

- Never park on a grade.
- Always come to a complete stop before leaving truck.
- Place travel controls in neutral.
- Lower forks fully to the floor. If the forks can be tilted, tilt them forward.
- If the truck has a manual parking brake, apply it.
- Turn the truck off.
- If the truck has a key switch and the operator is more than 25 ft (7.5 m) away, or out of sight of the truck, the key should be removed.

⚠ WARNING

Failure to properly shut down the truck may allow inadvertent movement and result in a collision.

Never park on a grade. Ensure the parking brake is applied and turn the truck off. On trucks with a direction switch, always place it in neutral.

⚠ WARNING

Improper parking can interfere with emergency response.

Do not block stairways, main passageways or emergency routes. Do not block access to fire or emergency equipment.

Battery Safety

⚠ WARNING

Batteries contain dissolved sulfuric acid, which is poisonous and caustic. Batteries also can produce explosive gases.

Remain aware of the following information.

- Wear protective equipment (protective apron and gloves) and protective glasses when working with battery acid. If clothing, skin or eyes come into contact with battery acid, immediately flush the affected areas with water. If acid contacts the eyes, seek medical attention at once. **Clean spilled battery acid immediately with large amounts of water.**
- Remove any metal rings, bracelets, bands, or other jewelry before working with or near batteries or electrical components.
- Never expose batteries to open flame or sparks.
- Areas in which batteries are stored or charged must be well ventilated to prevent concentration of explosive gases.
- If a battery is charged while installed in the truck, the battery cover must remain completely open during the entire charging period.
- Shorting of battery terminals can cause burns, electrical shock, or explosion. Do not allow metal parts to contact the top surface of the battery. Make sure all terminal caps are in place and in good condition.
- Batteries may only be charged, serviced, or changed by properly trained personnel. Always follow all instructions provided by the

manufacturers of the battery, charger, and forklift truck.

Safety During Maintenance

Personnel Qualifications

Only qualified personnel authorized by the owner are permitted to perform maintenance or repair work. All items listed in the Scheduled Maintenance Charts must be performed by qualified forklift technicians only. They must have knowledge and experience sufficient to assess the condition of a forklift truck and the effectiveness of the protective equipment according to established principles for testing forklift trucks. Any evaluation of safety must be unaffected by operational and economic conditions and must be conducted solely from a safety standpoint.

Daily inspection procedures and simple maintenance checks, e.g. checking the hydraulic oil level or checking the fluid level in the battery, may be performed by operators. This does not require training as described above.

Hazardous Substances

Oils

⚠ WARNING

Oils are flammable!

- Always comply with applicable legal regulations.
- Do not allow oil to come into contact with hot engine parts.
- Do not smoke in areas where oils are used or stored.

⚠ WARNING

Oils are toxic!

- Avoid skin contact, inhalation, or ingestion.
- If oil mist or vapors have been inhaled, seek fresh air.
- If oil comes into contact with the eyes, flush thoroughly (at least 10 minutes) with water and then seek medical assistance.
- If oil is swallowed, do not induce vomiting. Seek medical assistance immediately.

⚠ WARNING

Prolonged intensive contact with the skin can result in loss of natural skin oils and irritate the skin.

- Avoid skin contact.
- Wear protective gloves, long sleeves, and eye protection.
- If oil contacts the skin, wash the affected area with soap and water.
- Change oil-soaked shoes or clothing immediately.

⚠ WARNING

Spilled oil presents a risk of slipping, particularly when combined with water.

- Immediately treat spilled oil with an oil binding agent, and then dispose of it according to local regulations.

ENVIRONMENT NOTE

All oils are potent contaminants of water.

- *Recycle used oil if possible.*
- *Always store oil in appropriate containers.*
- *Avoid spills.*
- *Spilled oil should be removed with oil-binding agents at once and disposed of according to local regulations.*
- *If recycling is not possible, dispose of used oil according to local regulations.*

Pressurized Hydraulic Oil

⚠ WARNING

Like other oils, hydraulic oil is flammable, toxic, and a skin irritant.

- Do not allow hydraulic fluid to come into contact with hot motor parts.
- Avoid inhalation or skin contact of hydraulic oil.
- Refer to the safety information under "Oils".

⚠ WARNING

Hydraulic oil is pressurized during operation of the forklift truck and may remain pressurized after shut down. An escaping stream of pressurized hydraulic oil can cause serious injury.

- If pressurized hydraulic oil is found to be escaping from the truck, shut down the truck immediately and have the leak repaired before returning the truck to service.
- Only trained service personnel should attempt to repair any portion of the hydraulic system.
- Do not allow hydraulic fluid to come into contact with the skin.
- Avoid inhaling spray or mist created by escaping hydraulic oil.
- Penetration of pressurized fluids into the skin is particularly dangerous if these fluids escape at high pressure due to leaks in the hydraulic system. In case of such injury, immediate medical assistance is required.
- To help prevent injury, use appropriate personal protective equipment (e.g. protective gloves, long sleeves and industrial goggles).

ENVIRONMENT NOTE

Hydraulic oil is a potent contaminant of water.

- *Recycle used hydraulic oil if possible.*
- *Always store hydraulic oil in appropriate containers.*
- *Avoid spills.*
- *Spilled hydraulic oil should be removed with oil-binding agents at once and disposed of according to local regulations.*
- *If recycling is not possible, dispose of used hydraulic oil according to local regulations.*

Battery Acid

⚠ WARNING

Battery acid contains dissolved sulfuric acid. This is toxic.

- Avoid contact and consumption.
- In case of injury, seek medical advice immediately.

⚠ WARNING

Battery acid contains dissolved sulfuric acid. This is corrosive.

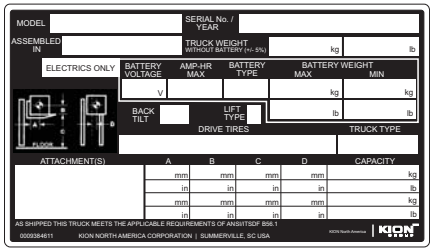
- When working with battery acid, always wear protective clothing and eye protection.
- Do not allow any acid to get onto clothing or skin or into the eyes; if this does happen, rinse immediately with plenty of clean water.
- In case of injury, seek medical advice immediately.
- Immediately rinse away spilled battery acid with plenty of water.

ENVIRONMENT NOTE

- Dispose of used battery acid according to local regulations.

Operator Warning Decals

Data plate



The data plate is designed to inform personnel of truck capacity and other important truck specifications. The operator should locate, read, and understand the data plate prior to using the forklift truck.

⚠ DANGER

Risk of tip-over.

Never attempt to lift a load greater than the maximum capacity listed on this plate.

Voltage decal

These decals indicate the proper battery voltage for the truck's electrical system. Using a battery of wrong voltage could damage the truck.

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Operator warning decal ▷

This decal lists a number of fundamental safety points that are crucial to safe operation. Operators must understand these items and remain aware of them during truck operation.

⚠WARNING

MAN-ALOFT TRUCK OPERATOR WARNINGS

1. CHECK YOUR TRUCK - The truck should be checked daily before being placed in service. If found to be in need of repair, defective, or in any way unsafe it should be reported immediately to the proper authority and removed from service until restored to a safe operating condition.
2. KNOW YOUR TRUCK - Do not operate this truck unless you have been trained and authorized to do so. Read all warnings and instructions in the operator's manual on this truck or obtain them from plant Safety Director or the local Linde representative.
3. KEEP INSIDE - Operate the truck only when you are in the normal operating position and within the confines of the operator's compartment. Never place any part of your body into the mast structure, between the mast and the truck, or outside the truck. Do not carry passengers.
4. PROTECT YOURSELF - If the truck has an overhead guard, be sure it is in place before operating the truck. Ensure side rails are lowered and all safety equipment is working properly.
5. SAFETY HARNESS - Some models require that a safety harness be worn during operation. If so, make sure it is fastened before operating the truck.
6. LATERAL TIPOVER - Can occur loaded or unloaded by a combination of speed and sharpness of turn. SLOW DOWN BEFORE TURNING. With the forks raised, lateral tipover also can occur by accelerating or braking while turning. TRAVEL WITH THE MAST AND FORKS LOWERED WHEN OUTSIDE OF AN AISLE. The potential for lateral tipover will be further increased by overloading, or off-center positioning of the load. Don't risk injury or death. Drive smart.
7. LONGITUDINAL TIPOVER - Can occur by overloading or aggressive braking when moving forward or accelerating rearward with the forks elevated. TRAVEL WITH THE MAST AND FORKS LOWERED WHEN OUTSIDE OF AN AISLE. Don't risk injury or death. Drive smart.
8. LATERAL OR LONGITUDINAL TIPOVER - Can occur if the truck is driven over objects on the floor or ground, off the edge of improved surfaces, into potholes, by impacting overhead obstacles or collision with other objects. Don't risk injury or death. Drive smart.
9. COLLISION - If a collision is imminent, stay within the operator's compartment to utilize its protection.
10. HIGH LOADS - Do not handle loads which are high unless load is secured so that no part of it could fall backward.
11. STABILIZE YOUR LOAD - Do not handle unstable or loosely stacked loads. Use special care when handling long, high, or wide loads to avoid losing the load, striking bystanders, or tipping the truck.
12. CENTER YOUR LOAD - When using forks, space forks as far apart as load will permit. Before lifting, be sure load is centered and forks are completely under load. During picking operations, maintain load balance as objects are removed from or added to the pallet.
13. NEVER OVERLOAD - Do not overload truck. Check capacity plate for load weight and load center information.
14. AVOID SUDDEN MOVEMENTS - Start, stop, travel, steer, and brake smoothly. Sudden movements can endanger yourself and others.
15. LOOK OVERHEAD - Watch out for obstructions, especially overhead.
16. EYES AHEAD - Travel with load or lifting mechanism as low as possible. Always look in direction of travel. Keep a clear view and travel with load trailing.
17. RAMPS - The truck is designed for operation on smooth, relatively level surfaces such as warehouse and factory floors, loading docks, or paved areas. Do not operate on ramps or inclines unless specifically permitted in the operator's manual.
18. SLOW DOWN - Observe applicable traffic regulations. Yield right-of-way to pedestrians. Slow down & sound horn at cross aisles and whenever vision is obstructed.
19. WATCH PEOPLE - Do not allow anyone to stand or pass under lifting mechanism, directly behind truck or within rear swing area when turning.
20. WORK PLATFORMS - DO NOT LIFT OR CARRY PEOPLE USING THE FORKS OF THE TRUCK, not even with a work platform. Never step or climb out onto the forks or onto a pallet supported by the forks.
21. SHUT DOWN COMPLETELY - Before getting off truck, neutralize travel control and fully lower the lifting mechanism. If the truck has a manual parking brake, apply it. Shut off power when leaving truck unattended.

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Operator Warning Decals

Trained operator warning decal

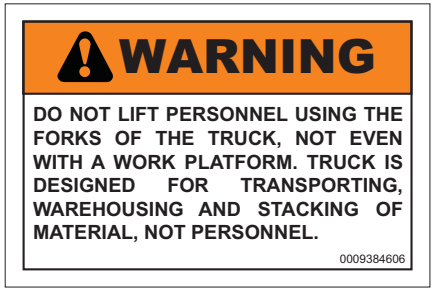
This decal states the requirement that only trained and authorized personnel are to operate truck.

Never stand or walk under forks warning decal

This decal warns personnel not to stand or walk on, or under, the forks at any time. This applies to operators as well as all others.

Do not lift personnel warning decal

This decal states that the operator should never use the forks for lifting personnel for any reason. Even if special work platforms for lifting personnel are available, they are not to be used with this truck to lift personnel.



Crushed fingers warning decal

This decal is placed in areas where parts move close together during normal truck operation. The decal warns personnel to keep hands clear of these areas at all times.

Back up alarm warning decal

This decal is present if the truck is equipped with a back-up alarm. The decal reminds the operator that the alarm must sound anytime the truck is moving in reverse. It also warns the operator to maintain a clear view in the direction of travel.

Platform surface warning decal

This decal warns operators not to operate the truck if the anti-slip mat on the riding platform is worn, damaged, or slippery due to contamination from liquids. This decal is only present on models designed for riding.

Operator Warning Decals

3

Overview

Technical Description

General

The 1355 series of forklifts are stand-up, narrow-aisle electric models (ITA class 2). They are designed for handling loads up to 3000 lbs (1360 kg).

This is a nominal capacity and is based on a 600 mm load center. The capacity may be downrated depending on mast height and/or attachments. Exact capacity limits for individual vehicles are found on the data plate.

Drive unit

The drive unit is comprised of a brushless AC drive motor mounted vertically to a reduction gear unit. The drive unit pivots in the chassis via the steering wheel to determine drive wheel direction. An electromagnetic brake is installed at the top end of the drive motor for use as a parking brake. The brake engages whenever the truck is switched off or remains at rest for more than one second.

Travel control

Travel speed and direction is controlled through a twist grip travel control on the operator console. Maximum speed is limited based on altitude of the operator compartment as measured by a height sensor. When the travel control is released, the truck will decelerate via regenerative braking. More aggressive slowing is available by rotating the travel control in the opposing direction. The degree of braking for both of these functions is adjustable in the truck control software.

Hydraulic system

The hydraulic system utilizes fluid pressurized by a hydraulic pump driven by a brushless AC motor connected to the battery through the truck controller. The pump motor is part of an integrated hydraulic pump unit which also contains the pump, a manifold block, a lowering solenoid valve, and a hydraulic oil reservoir. During lifting, pressurized hydraulic fluid from the pump is routed through a check valve to a lift cylinders which raise the mast. Pump assisted lowering occurs when the lowering solenoid is activated. The weight of the operator compartment (and any load) force hydraulic fluid out of the cylinder and back to the reservoir. The pump also operates in reverse to evacuate the hydraulic fluid from the cylinders faster than would occur under gravity alone.

Steering system

Electric steering is accomplished through a brushless AC electric motor connected to the drive unit through direct gearing. The electric steering motor is controlled by a dedicated transistorized motor controller. The controller compares steering wheel position to motor position and operates the motor as necessary to track the steering wheel position as it is moved by the operator.

Mast

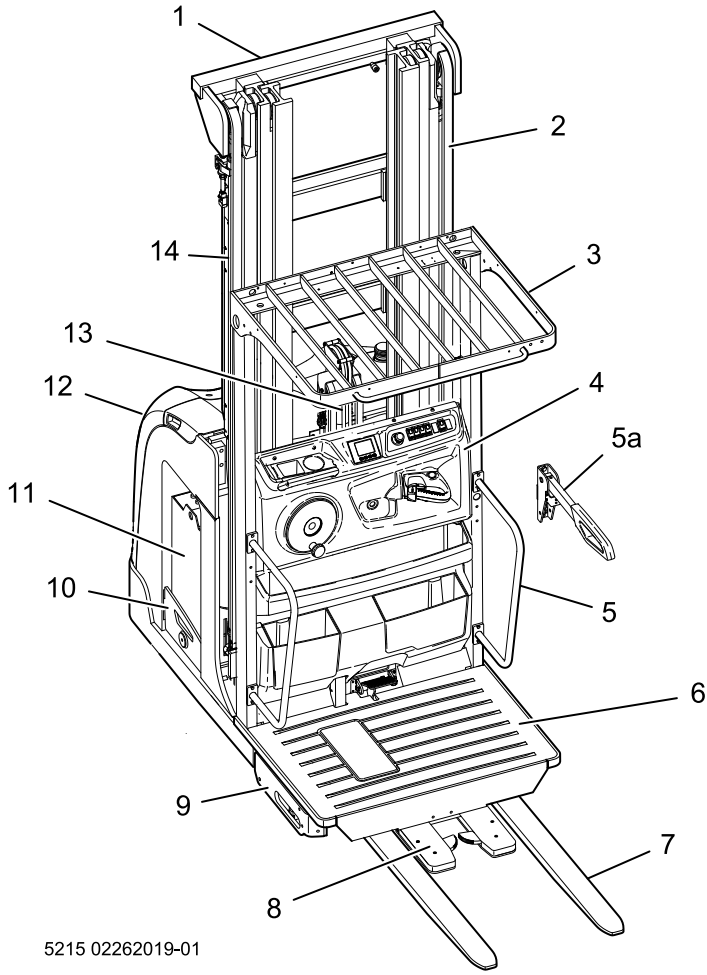
The truck is equipped with a triple mast. It consists of three uprights and a fork carriage/ operator compartment. A pair of lift cylinders raises and lowers the middle (intermediate) upright during lifting and lowering. Lift chains attached to the inner upright are routed over pulleys on the intermediate upright and anchored to the stationary outer upright to raise the inner mast. This arrangement results in a telescopic relationship between the uprights. An additional set of chains is anchored to the inner upright and routed over an additional lift cylinder dedicated to raising and lowering the operator compartment only. Hydraulic fluid does not power the mast lift cylinders until this free lift cylinder has reached maximum extension. This establishes a free-lift function that allows the operator compartment to move independently to the top of the uprights before they begin to move. The free-lift function allows lifting through the lower part of the lift range in areas where overhead clearance is limited. Both sets of mast chains are equipped with slack chain switches to detect possible contact between the operator compartment and surrounding structure.

All operator controls for travel and lift are located in the operator compartment. In the event of an emergency or malfunction, the mast may be lowered by personnel on the ground by means of a manual bypass screw on the valve block in the chassis.

Electrical system

The 1355 is available with 24 or 36-volt electrical systems. The drive, pump and steering motors are powered through dedicated power modules. The drive and pump power modules are mounted to heat sinks across the front of the chassis in the main compartment. A fan is mounted at the left edge of the chassis to cool these power modules. The steer power module is integrated into the motor assembly. The power modules regulate current to the motors based on input from a main control unit. A control unit in the operator compartment processes signals from sensors, interlocks, and operator controls and communicates with a main control unit in the chassis through a CAN bus circuit. The main controller then generates the appropriate release and speed signals to the power modules through the CAN bus circuit. A second CAN bus circuit connects the main control unit to the operator display unit as well as a computer connection port. By connecting a laptop computer to this port, vehicle parameters can be set and diagnostic operations performed. A voltage transformer is also present to provide stabilized low voltage to the display and working power to optional equipment.

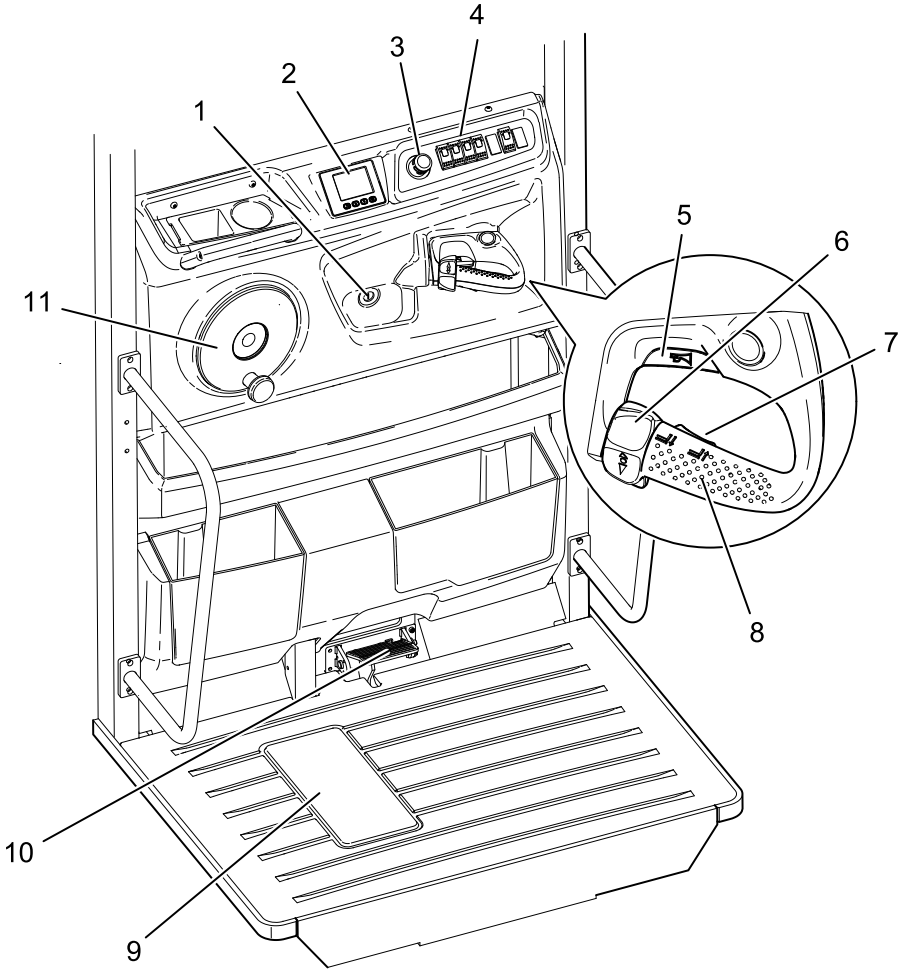
Truck Components



5215 02262019-01

1	Mast	8	Pallet clamp
2	Lift chain (2X)	9	Outrigger (2X)
3	Overhead guard	10	Battery retainer (2X)
4	Operator's console	11	Battery compartment
5	Guard rail (2X)	12	Main cover
5a	Retractable guard rail (2X) (optional)	13	Primary cylinder
6	Operator platform	14	Lift cylinder (2X)
7	Fork arms		

Controls



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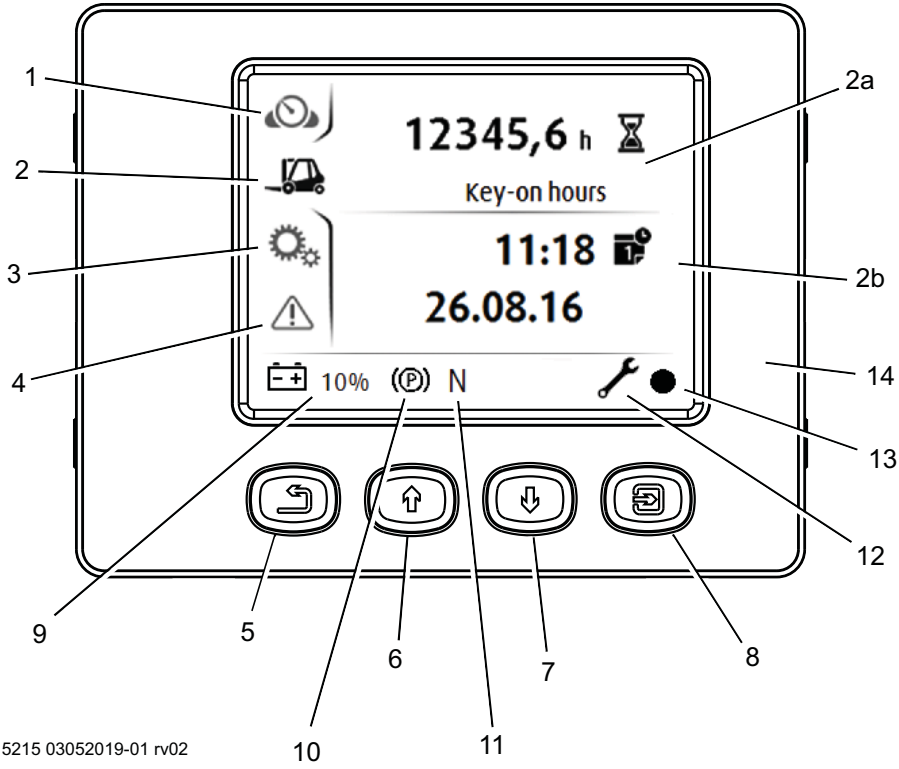
1	Key switch	7	Lift-lower switch
2	Display unit	8	Hand grip
3	Emergency stop button	9	Operator presence pedal
4	Accessory switches, (optional equipment)	10	Pallet clamp release pedal
5	Horn button	11	Steering wheel
6	Travel control		

Display Unit

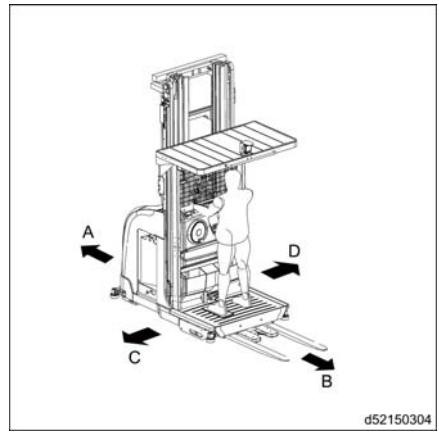


5215 03052019-01 rv02

1	Steer window icon	7	Down/Decrease scroll key
2	Status window icon (shown active above)	8	Enter key
2a	Status window upper section	9	Battery charge status
2b	Status window lower section	10	Parking brake active
3	Settings window icon	11	Travel direction (F, R, or N)
4	Faults window icon	12	Service due
5	Back key	13	CAN communication indicator
6	Up/Increase scroll key	14	Display unit

The display unit is located in the center of the operator console and provides the driver with information about the truck. When the key switch is turned on, the display unit first conducts a self-test and then transmits information.

Definition of directions

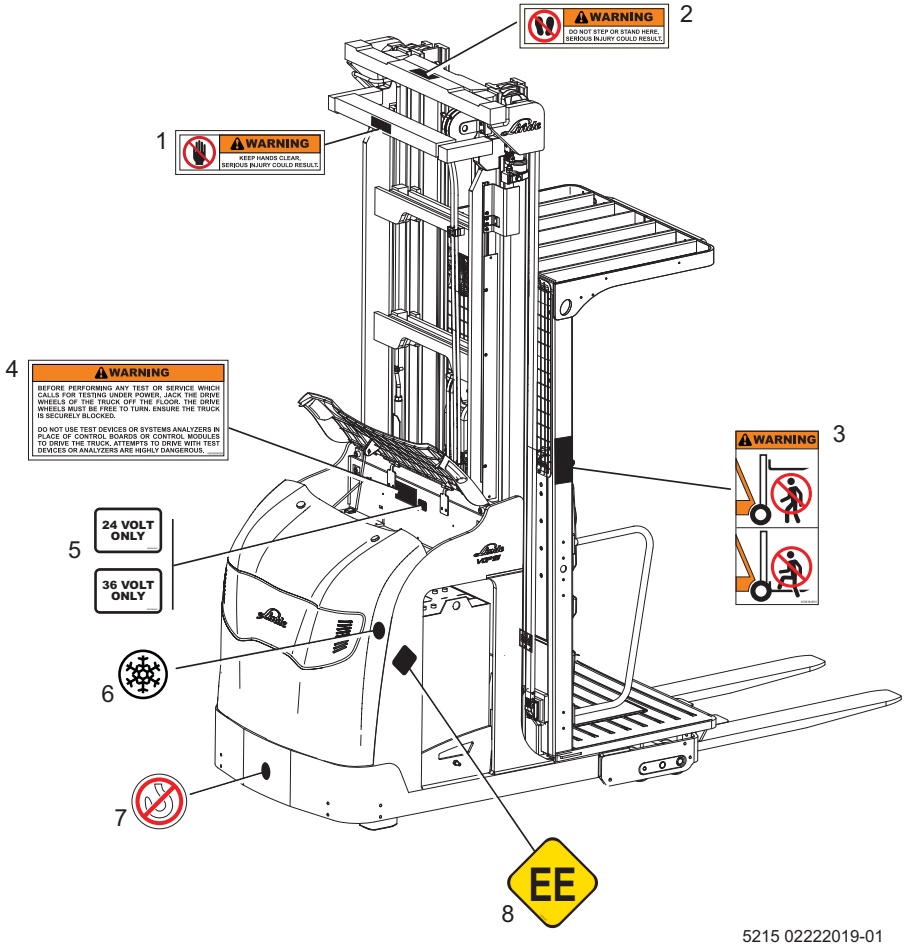


(A)	Forward
(B)	Reverse
(C)	Left
(D)	Right

Directions as seen from the driving position; the load is to the rear.

Decal and Data Plate Location

Exterior



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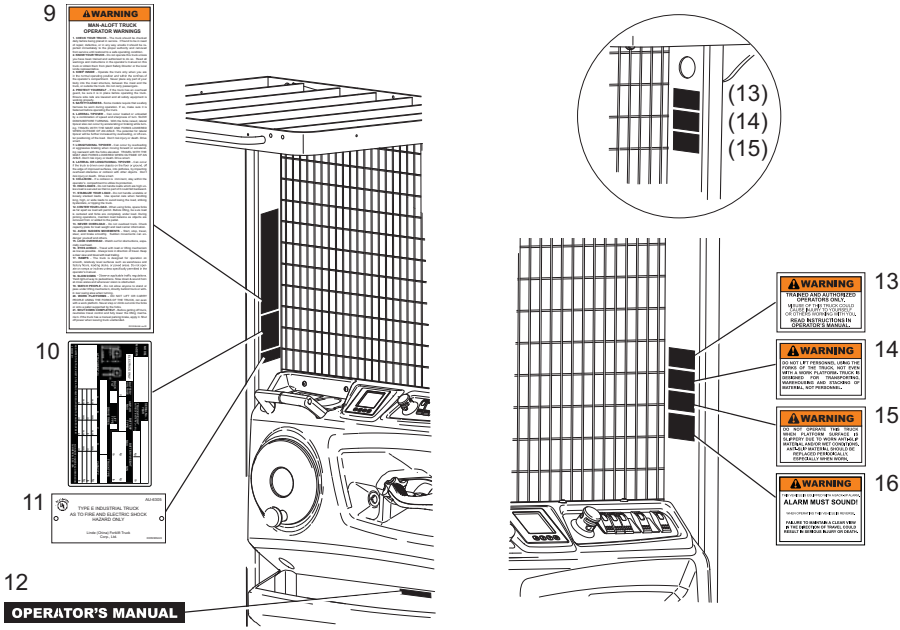
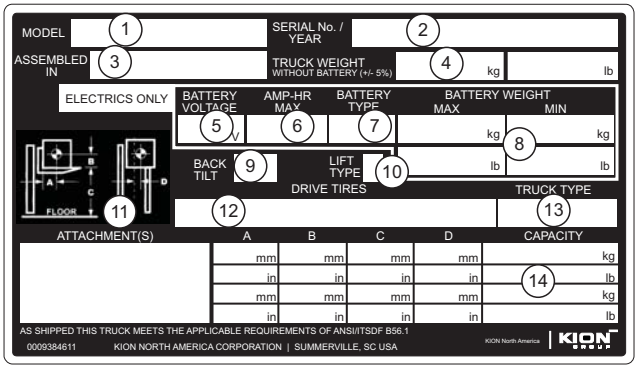
Interior



5215 02222019-01B rv02

1 Warning Decal, Crushed Fingers
2 Warning Decal, No Step
3 Warning Decal, Personnel/Forks
4 Warning Decal, Service Work
5 Decal, Voltage
6 Decal, "Snowflake" (only on trucks equipped with optional cold storage protection)
7 Decal, Do Not Lift
8 Decal, "EE" (only on trucks equipped with optional EE rated protection for hazardous environments)
9 Warning Decal, Order Picker
10 Data Plate
11 Plate, UL Classification
12 Decal, Operator Manual Location
13 Warning Decal, Trained & Authorized Operator
14 Warning Decal, Do Not Lift Personnel
15 Warning Decal, Platform Surface
16 Warning Decal, Back-Up Alarm (optional)

Data Plate



(1) **MODEL** – shows the model designation of the truck.

(2) **SERIAL No./Year** – shows the serial number and year of manufacture of the individual truck.

(3) **ASSEMBLED IN** – shows the country in which the truck was originally manufactured.

(4) **TRUCK WEIGHT** – shows the weight of the truck (in pounds and kilograms) with forks. This weight does not include the battery on electric trucks.

(5) **BATTERY VOLTAGE** – (electric trucks only) – shows the system voltage of the truck.

(6) **AMP-HR MAX** – (electric trucks only) – shows the maximum current capacity in amp-hrs for any battery to be used in the truck.

(7) **BATTERY TYPE** – (electric trucks only) – shows the required battery designation, as outlined in ANSI B56.1. A battery of the correct designation must be installed in order for the TRUCK TYPE designation to be valid.

(8) **BATTERY WEIGHT** – (electric trucks only) – shows the allowable weight range (MAX and MIN) for the battery in pounds and kilograms.

(9) **BACK TILT** – shows the maximum angle that the mast can be tilted back.

(10) **LIFT TYPE** – shows a letter corresponding to the type of mast construction as follows:
S for single masts
D for double masts
T for triple masts
Q for quad masts

(11) **(Diagram)** – illustrates the dimensions A, B, C, and D used in CAPACITY chart (14).

(12) **DRIVE TIRES** – shows the required size and type of drive tire.

(13) **TRUCK TYPE** – shows the designation of the truck with respect to hazardous environments as outlined in 29CFR1910.178. This designation corresponds to the environment(s) in which the truck is approved for use.

(14) **CAPACITY** – shows the maximum load weight (in pounds and kilograms) that can be safely lifted for the corresponding devices listed under ATTACHMENT(S). In order to achieve a listed capacity safely, the lift height must be kept within the corresponding value shown in column C and the load center of gravity must be within the corresponding values shown in columns A, B, and D.

4

Operation

Unloading and Preparing a New Truck for Operation

When unloading a new truck, it may be necessary or desirable to tow the truck before a battery is installed. See "Towing the Truck".

NOTE

New trucks with exceptionally tall masts will be shipped horizontally. In this case, the installing dealer must contact the factory for unloading and commissioning procedures.

Before placing a new truck into service, perform the Daily Maintenance Inspection as found in the Maintenance section.

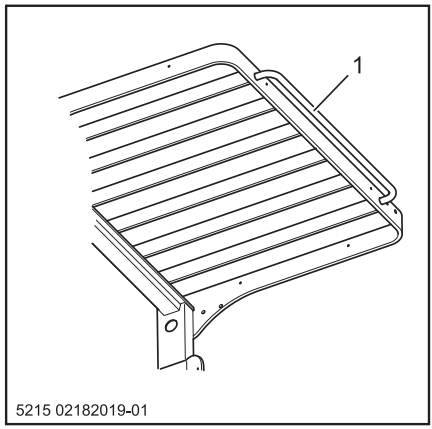
The truck can then be operated at full speed immediately upon being placed in service. However, during the first 50 operating hours, avoid subjecting the drive system or hydraulic system to high continuous loads.

⚠ WARNING

Wheel mounting hardware sometimes requires several cycles of tightening before it fully seats. For this reason, wheel mounting screws or nuts will often work loose in the period immediately following initial tightening.

When placing a new truck into service, the wheel mounting screws or nuts must be checked for tightness every 10 hours until no further loosening is detected. See the procedure for checking wheels and tires in the Maintenance section.

Safety Harness



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⚠ WARNING

Operating the truck without wearing a properly adjusted and tethered safety harness can result in serious injury from falls.

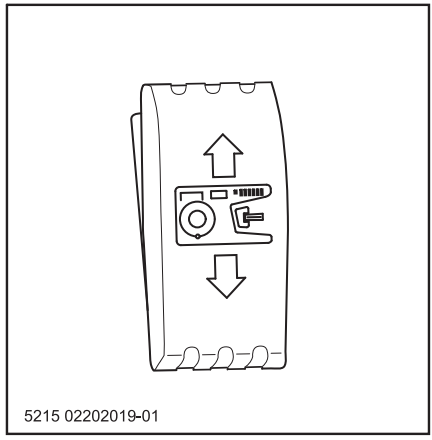
Never operate the truck without wearing a properly adjusted and tethered safety harness.

The truck must be equipped with a harness and tether. The operator must always wear the harness and keep it properly tethered to the truck at all times during truck operation.

Many types and sizes of harnesses and tethers are available. Operators must know how to correctly don and adjust the harness and connect it to the tether. Refer to the harness and tether manufacturer's instructions for this information.

The correct point for attaching the tether to the truck is the horizontal bar (1) across the rear of the overhead guard. Never attach a tether or other fall arrest equipment to any other part of the truck.

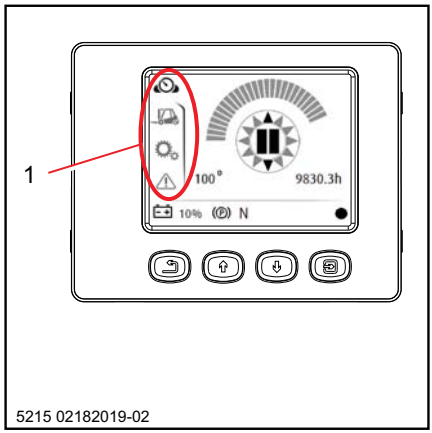
Console Height Adjustment (optional equipment)


5215 02202019-01

If the truck is equipped with the console height adjustment option, the switch shown will be present on the console. This option allows an operator to raise or lower the console electrically to a desired height. The switch is a three-position rocker switch. It will spring return to the center (neutral) position when released. Note the arrows on the switch.

➢ Press the upper portion of the switch to raise the console. Press the lower portion of the switch to lower the console. Release the switch when the desired height is achieved.

Operating the Display Unit



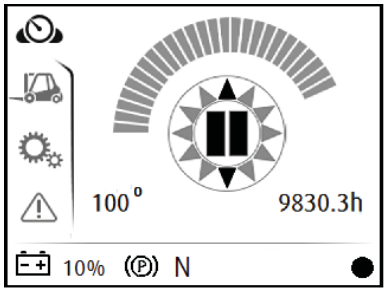
Information in the display unit is shown in four main windows. These windows are represented by four symbols (1) down the left side of the screen. The current window symbol will be highlighted and the others dimmed.

Steer Window (Dial symbol)
Status Window (Forklift symbol)
Settings Window (Gears symbol)
Faults Window (Warning symbol)

The Steer window appears by default at start-up after a brief display of a logo window and truck hour window. The other windows may be accessed by using the scroll keys and pressing the enter key when the desired window symbol is highlighted. Always use the back key to return to the previous window.

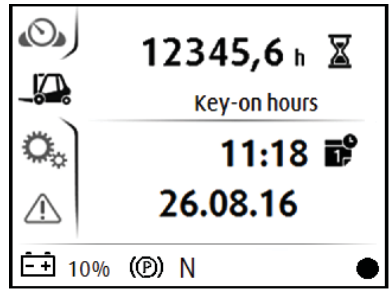
If an operating condition is not satisfied, a pop-up window with a status message will appear. It will clear automatically when the condition is satisfied.

Steer Window



This window is the default window after the start sequence is complete. This window displays the steering angle both graphically and numerically in degrees. Operating hours are shown to the right.

Status Window



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The window is divided into an upper section and a lower section. Each section displays one of the following data sets:

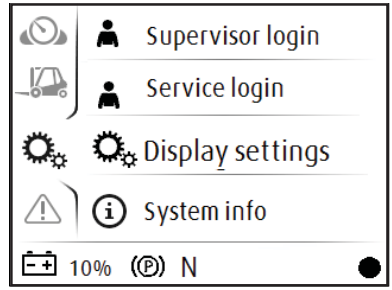
- Time and date
- Battery charge state
- Height (measured from fully lowered position)
- Operating hours
- Service hours
- Battery service hours
- Truck speed
- Key switch hours

The operator can choose which of these will display in the upper and lower sections.

- To select a data set for display, press the enter key and use the scroll keys to highlight the upper or lower section as desired.
- With the desired section highlighted, press the enter key again. The highlighted section will begin to flash.
- Use the scroll keys to scroll through the data set options until the desired option appears.
- Press the enter key a third time to select the displayed option.

The selected data will now appear in the selected (upper or lower) section of the status window whenever the truck is on.

Settings Window



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To select the settings window, scroll down to the gears symbol and press the enter key. The settings window has four sub-menus:

1 Supervisor login - for supervisor access
2 Service login - for service access
3 Display settings - explained below
4 System info - read-only values for software version

These menus are selected with the scroll keys and the enter key.

Display settings	
Language	Four choices - highlight with scroll keys and press the enter key.

Operating the Display Unit

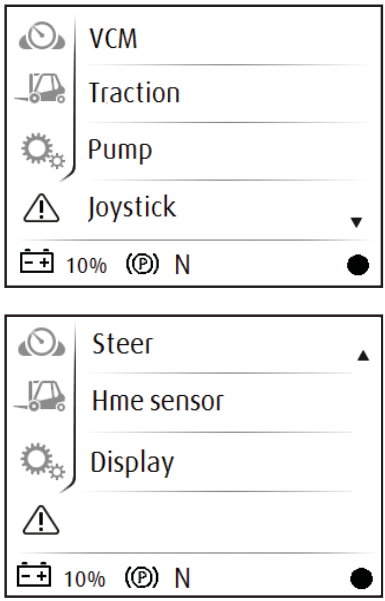
Units	Imperial or metric - highlight with scroll keys and press the enter key.
Date format	Three choices - highlight with scroll keys and press the enter key.
Date	Highlight month, day, or year with the scroll keys and press the enter key to make the value flash, then edit with scroll keys. Press the enter key again to accept the new value.
Time	Highlight hour, minute, or second with the scroll keys and press the enter key to make the value flash, then edit with scroll keys. Press the enter key again to accept the new value.
Backlight	As a percentage - press the enter key to make the value flash, then edit with scroll keys. Press the enter key to accept the new value.
Restore	Restores default display settings.

Faults Window

To select the faults window, scroll down to the warning symbol and press the enter key. The faults window has seven sub-menus. The list is continued into a second window:

VCM (vehicle control)
Traction
Pump
Joystick
Steer
Hme sensor (lift height)
Display

If there are active faults, a +++ symbol will be displayed by the relevant menu. Also a plus sign will be present beside the faults window triangle icon at the main level. Use the scroll keys to highlight a choice and press enter. Each choice has two sub-menus (Active error codes and Stored error codes). If an active fault is present, a pop-up window will appear. It may be cleared by pressing the back key. The first fault in the list will be highlighted. Press enter to read the fault description.



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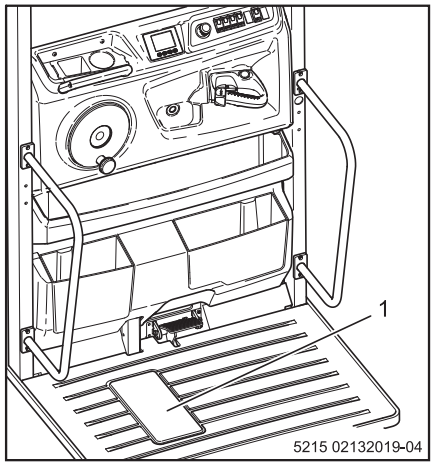
Turning the Truck On and Off ▷



Switching the Truck On

The operator presence pedal (1) and all hand controls must remain in the neutral, released position throughout the startup sequence.

- Ensure that the emergency stop switch is released. Pull to release if necessary.
- Insert the key in the key switch and turn it clockwise.

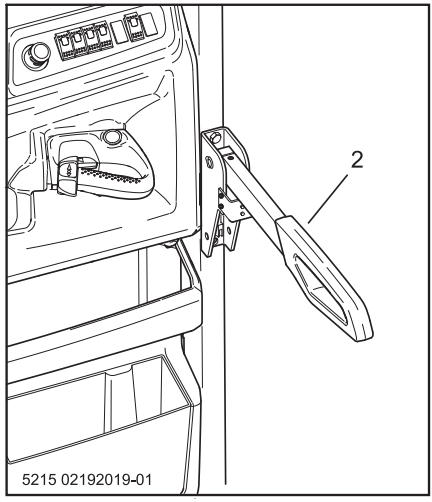
The electrical system is switched on.

- Check display unit.

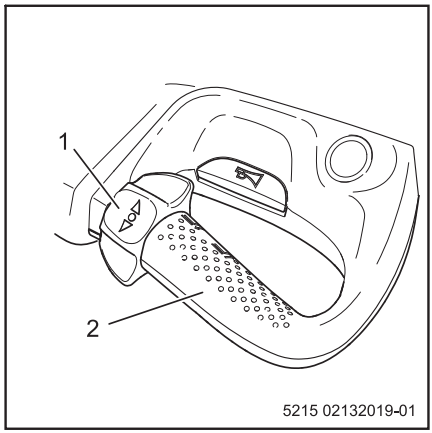
NOTE

After the key switch has been switched on, the display unit performs a self-test. All indicator lights are extinguished on the display unit after approximately 4 seconds. Do not step on the operator presence pedal or operate any controls until the self-test is complete.

The truck is now ready for use. The operator presence pedal must be pressed in order for travel or lift functions to operate. If the truck is equipped with the optional retractable side rails (2), they must both remain closed in the position shown in order for travel or lift functions to operate.



Driving



⚠ WARNING

Operators must be familiar with all safety procedures that apply to forklift operation before driving.

Read and understand all safety information in Section 2 before operating the truck.

Forward is defined as forks trailing. Reverse is defined as forks leading. See section three if necessary.

- Switch the truck on with the key switch. See "Turning the truck on and off" if necessary.
- The travel control (1) is designed for right-hand operation. Grasp the hand grip (2) with the right hand.

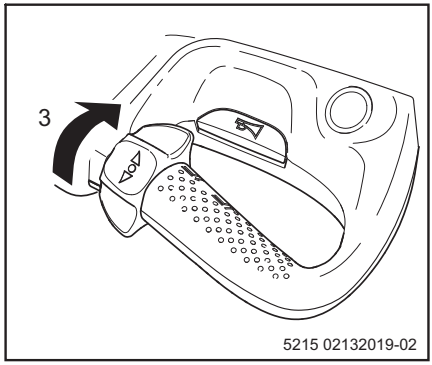
NOTE

The hand grip is equipped with a sensor to detect hand contact. The hand grip must be grasped while driving or the travel function will be disabled.

NOTE

The operator's weight must remain on the operator presence pedal while driving or the travel function will be disabled. If the truck is equipped with the optional retractable side rails, they must remain closed or the travel function will be disabled.

Forward motion



- Press the travel control so that it rotates in the direction shown (3).

The electromagnetic brake should release with an audible sound and the parking brake symbol in the display should go out. The truck will move forward. The speed is proportional to the amount of control rotation. Always maintain a grasp on the hand grip while driving.

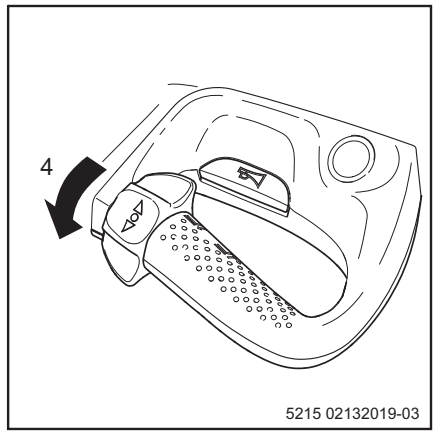
NOTE

The maximum acceleration rate is set by the main control unit.

If the handle is released, the electric braking function will automatically slow the truck.

Reverse motion

▷



- Grasp the hand grip with the right hand.
- Press the travel control so that it rotates in the direction shown (4).

The truck will move in reverse. Control of speed and braking in reverse is the same as for forward motion.

Changing direction

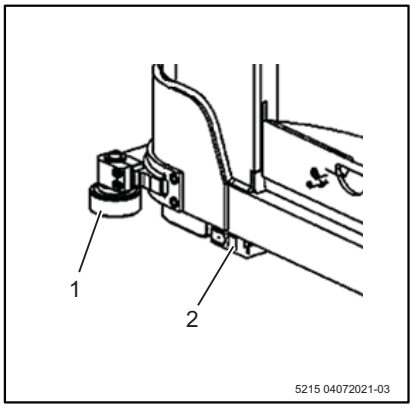
- To change direction at any time during travel, rotate the travel control in the opposite direction. This can be done while the truck is still moving in the original direction. The truck will be electrically braked to a stop and then begin moving in the new direction.

Aisle Guidance Systems (optional equipment)

The truck may be equipped with mechanical guidance or inductive guidance. These systems take over steering when the truck is operating within an aisle. Both types of guidance system are explained on the following pages.

Since these are options, it is possible the truck may not have either system installed.

Mechanical Aisle Guidance (optional equipment) ▷



When trucks are equipped with this system, the warehouse facility in which the truck operates will have rails installed on each side of the aisles. Trucks in the facility are equipped with rollers (1) at the corners of the chassis that engage the rails as the truck enters an aisle. Once engaged, the rollers constrain truck movement to the straight-line path of the rails. When in an aisle, the truck operates in a guidance mode which maintains steering position and determines maximum travel speed.

Side sensors (2) are installed on each side of the truck to detect the rails and switch the control mode. Switching into and out of the guidance mode is determined by the sensors alone. There are no operator actions necessary to activate or cancel mechanical guidance mode.

Entering an Aisle

When entering an aisle with mechanical guidance, positioning of the truck is crucial to smooth entry.

- ➢ Align the truck with the aisle before entry. Do not approach the entrance at an angle.
- ➢ Continue into the aisle.

Once the truck has entered the aisle, the side sensors are activated. This automatically selects the guidance mode of operation. The drive wheel is then automatically brought into the straight-ahead position.

Once in the aisle, steering is maintained in the straight position. Travel, lift, and lower functions operate normally.

Exiting an Aisle

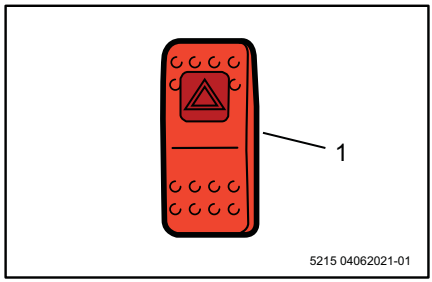
⚠ WARNING

Risk of collision.

Always proceed carefully when exiting an aisle to avoid collision with personnel or vehicles which may be in cross-aisles.

- Ensure the steering is in the straight-ahead position.
- Slowly drive the truck straight out of the aisle. The truck must be completely out of the aisle before guidance mode will turn off. When the truck is completely out of the aisle, manual steering will be activated again.

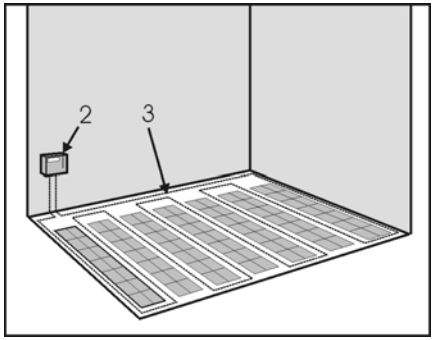
Inductive Guidance (optional equipment) ▷



System Description

If the truck is equipped with inductive guidance, a red toggle switch (1) will be present on the console. This button is used to switch from manual steering mode to inductive guidance.

With inductive guidance, a frequency generator (2) provides an AC supply to a wire (3) installed in the floor. This AC supply is registered as a signal by antennas that are installed at the front and rear of the truck. The signal allows the control system to steer the truck along the wire. The wire is typically installed within the aisles of warehouse storage racking.

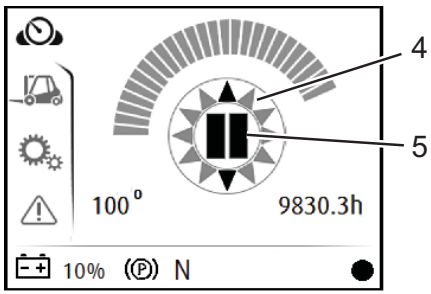


Entering an Aisle

During aisle entry, the system undergoes a transition sequence to switch from normal operation to inductive guidance. This is explained below.

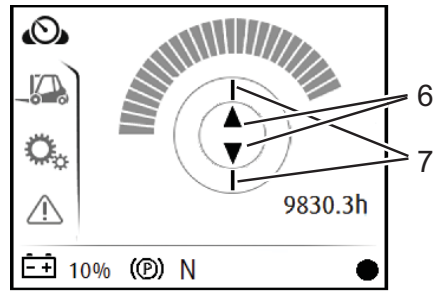
When entering an aisle, positioning of the truck is crucial to smooth entry. The truck should be aligned with the aisle as closely as possible.

- ➢ Drive the truck towards the wire groove (induction track). The angle to the wire must not be greater than 60 degrees.
- ➢ Press the red inductive guidance switch (1) on the console to activate the inductive guidance system. The light in the switch will illuminate and begin to flash to indicate the system is searching for the wire and an audible tone will sound intermittently (beeping). The circle of directional arrows (4) in the display will also begin to flash. Travel speed is automatically restricted.
- ➢ Continue driving towards the wire groove, steering manually as required to merge onto the wire path.



- When the control system detects the wire via the leading antenna, the steering wheel is disabled and the control system takes over steering. The drive wheel symbol (5) in the display window will be replaced with two directional arrows (6). The circle of directional arrows (4) will be replaced with two line segments (7). These display symbols will flash until transition to guidance mode is complete.
- Continue travel into the aisle. The truck will be steered automatically into alignment with the wire.
- When the second antenna detects the wire, both directional arrows (6) will light continuously.
- Continue travel. The system will complete the transition to inductive guidance mode and programmed aisle speed will become available. The intermittent tone will sound continuously for a second and then become silent. The light in the red switch and the line segments in the display will stop flashing and remain continuously displayed as long as inductive guidance mode is active.

The steering wheel has no function during operation in an aisle while inductive guidance is active. Travel, lift, and lower functions operate normally.



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Exiting an Aisle

⚠ WARNING

Risk of collision.

Always proceed carefully when exiting an aisle to avoid collision with personnel or vehicles which may be in cross-aisles.

- Slowly drive the truck straight out of the aisle.
- When the truck is completely out of the aisle, press the red inductive guidance switch (1) to turn the system off. The truck may be manually steered and driven at a reduced speed until the antennas lose contact with the wire. At this point, normal speed becomes available.

Braking

The truck has electric braking built in to the motor control equipment as well as an electromagnetic parking brake in the drive unit. Electric braking is controlled by the position of the travel control. Electric braking will also be applied by releasing an operator presence pedal on the floor plate.

Electric braking

There are two modes of electric braking. The first mode activates when the truck is in motion and the travel control is simply released to the neutral position as if coasting. The second mode activates when, after the travel control is released, it is moved further in the opposing direction. The braking force is greater with the second mode than with the first. The second mode is sometimes referred to as "plugging". Both modes are regenerative and therefore convert truck momentum back into energy to recharge the battery. The amount of braking force that occurs in each of these modes is adjustable in the truck control program. The first mode can be disabled completely in the program. In this case the truck would truly coast when the travel control is simply released. The second mode can be minimized but not disabled completely in the program.

- While travelling, release the travel control.

The truck will slow to a stop depending on the setting of the electric brake function.

NOTE

Slow or quick release of the travel control into the neutral position allows the braking action to be sensitively controlled, from gentle to hard braking.

- While travelling, move the travel control to the opposite direction until the truck has been electrically braked to a stop.

The truck will slow to a stop faster than if the travel control is simply released. After stopping, the truck will accelerate in the new direction unless the travel control is then released.

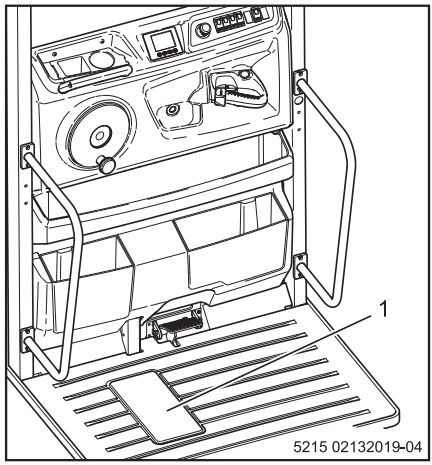
Operator Presence Pedal

An operator presence pedal (1) is located on the floor plate and is intended to be operated using the left foot. This pedal must remain depressed during truck operation. Releasing the pedal will disable drive and hydraulic functions. If the truck is moving, it will brake to a stop with maximum regenerative braking. The parking brake will then engage.

Parking Brake

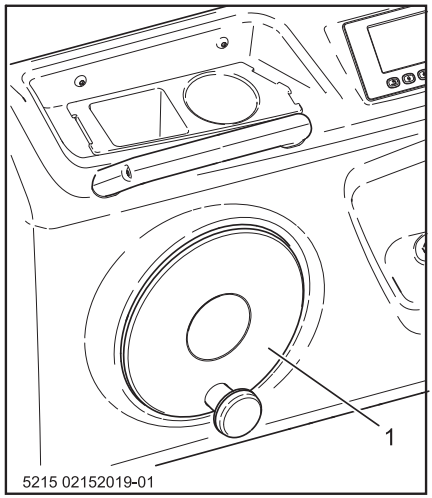
The truck is equipped with an electromagnetic parking brake in the drive unit. This brake is fully automatic. It will engage whenever the truck is switched off or remains at rest for more than one second. If the truck is on, the parking brake symbol will appear in the display unit whenever the parking brake is engaged.

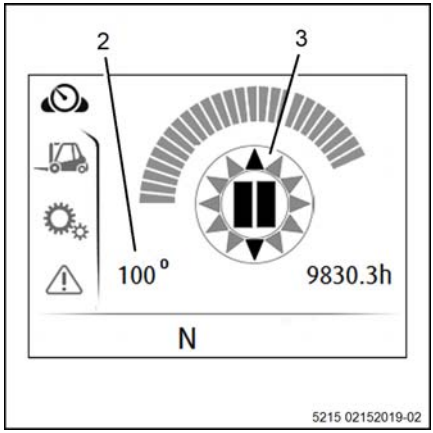
▷



Steering

The truck is equipped with electric steering. It will be operational upon switching on the key switch. Turn the steering wheel (1) to steer the truck. The system will rotate the drive unit located at the front of the truck to achieve the desired steering angle. The steering wheel does not have end stops, but its movement will stiffen when the drive wheel reaches the end of the steer angle range. The actual steer angle of the drive wheel is shown both numerically (2) in degrees and graphically (3) in the default screen of the display unit. The ratio of steering wheel revolutions to steer angle range can be adjusted in the truck software to suit the truck application or operator preference.

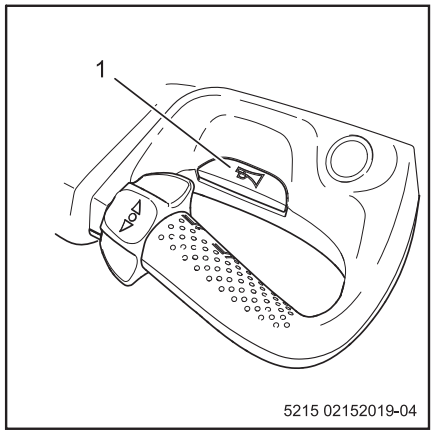




Horn

The horn is used as a warning signal, e.g. at blind spots and junctions.

➢ Press the horn button (1) on the console to sound the horn.



Pallet Clamp

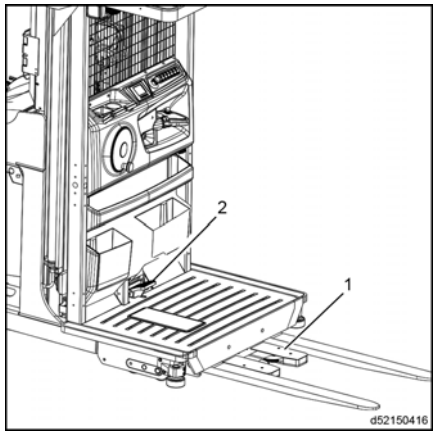
The truck is equipped with a pallet clamp (1) mounted at the center line. The clamp will automatically engage when the forks fully enter a pallet with a centerboard. The center of the pallet must be aligned with the center of the truck when approaching the pallet.

⚠ WARNING

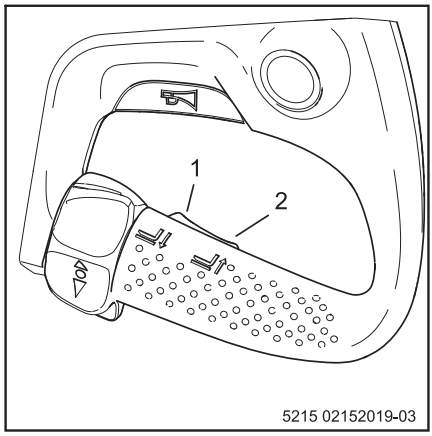
Pallets do not provide a stable platform for the operator or any other personnel. Falls and serious injury can result if the operator or other personnel step onto or ride upon a pallet carried by the truck.

Never step onto or otherwise get onto a pallet carried by the truck. Never carry any personnel on a pallet or anywhere else on the truck.

To unload the forks, the pallet must be in contact with the floor and the clamp released by pressing the release pedal (2). The truck may then be driven away from the pallet.



Raising and Lowering the Operator Compartment ▷



⚠ WARNING

Operators must be familiar with all safety procedures that apply to forklift operation before operating hydraulic functions.

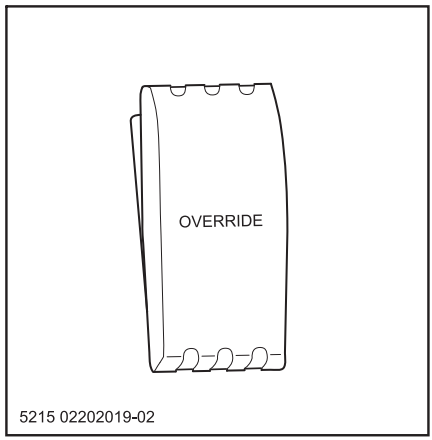
Read and understand all safety information in Section 2 before operating the truck.

NOTE

The operator's weight must remain on the operator presence pedal or the lift and lower function will be disabled. If the truck is equipped with the optional retractable side rails, they must remain closed or the lift and lower function will be disabled.

The operator compartment and forks will lift or lower together as the mast as raised. The mast is controlled by a toggle switch on the inside of the travel control hand grip. Press the left side (1) of the switch to lower the mast. Press the right side (2) to raise the mast.

Lift Limit Function (optional equipment) ▷



If the truck is equipped with the lift limit function, the switch shown will be present on the console. This function can automatically stop the lifting function at a pre-set height. There are two modes of operation. One is a conventional lift limit. The other is a lift memory. The desired mode of operation is selected through the Pathfinder software interface. The desired lift height on which the function is based is also programmed in the Pathfinder interface. The override switch is a simple two-position spring-return button switch. Its effect depends on the mode selected for the truck.

Lift Limit

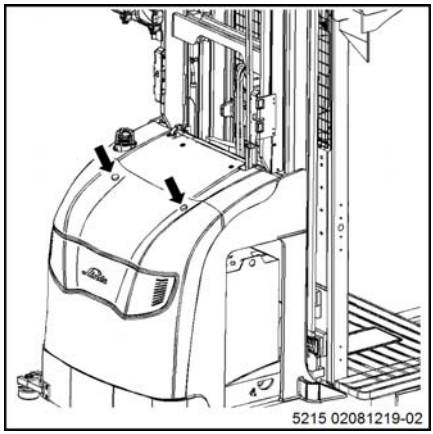
If the truck is configured with this mode, the mast will automatically stop when the programmed height is reached. Further lifting is

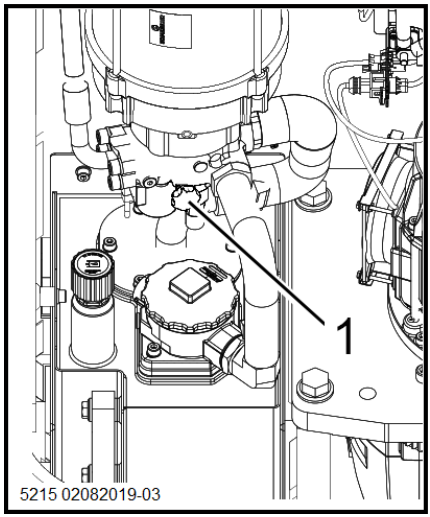
possible only after momentarily pressing the button (1).

Lift Memory

If the truck is configured with this mode, the mast will function normally throughout its full range unless the button (1) is momentarily pressed. This will engage the memory function and cause the mast to automatically stop at the programmed height.

Manual Lowering of Operator Compartment ▷





The truck is equipped with a manual lowering valve. If a technical defect causes the truck to shut down when the operator compartment is raised, or if an operator in the raised cab becomes incapacitated, e.g. falls unconscious, the operator compartment can be lowered by personnel on the ground using the manual lowering valve.

⚠ WARNING

Risk of injury

The attachment and load must have enough space from the racking on all sides. Otherwise, safe lowering of the cab cannot be guaranteed.

If the operator falls unconscious, make sure that all parts of the body are completely inside the driver's cab and that there is no risk of injury for the operator during the lowering procedure.

The operator of the manual lowering valve must be certain that the moving components of the lift mast are immediately set in motion on opening the valve. Special attention must be given to the cab, the chains and the inner masts of the lift mast.

All of the load chains in the lift mast must remain taut throughout the whole of the lowering procedure. If the mast components do not immediately begin normal lowering after opening the manual lowering valve, close the valve immediately.

The person operating the manual lowering valve must maintain a clear view of the mast during lowering. If this view is obstructed, a third person with full view of the mast must be involved. This third person must be able to communicate readily with the operator of the lowering valve and the truck operator.

If a movement like the one described cannot be detected immediately or if one of the chains has slackened, a mechanical jam at the lift mast is suspected. The lowering procedure must then be stopped immediately by closing the manual lowering valve.

The operator must then be retrieved some other way. A second man-aloft truck could be used if suitable, or a lifting working platform.

Follow these steps to lower the operator compartment with the manual lowering valve:

➢ Unscrew the two mounting screws (arrows) on the front cover and lift the cover off.

- Slowly turn the lowering valve knob (1) counter-clockwise approximately one and one half turns. The operator compartment will begin to lower.
- When the lowering procedure is complete, turn the knob clockwise and tighten snugly to close the valve again. This must be done to restore normal operation.

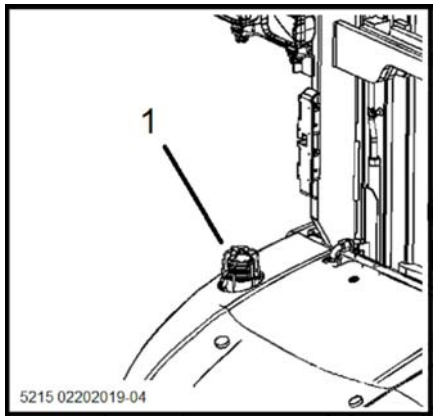
Restarting after emergency lowering

⚠ WARNING

Risk of accident

If the emergency lowering function was required because of a technical defect, the truck may only be put back into operation if the cause of the error has been corrected by a qualified technician.

Lights and Back-Up Alarm



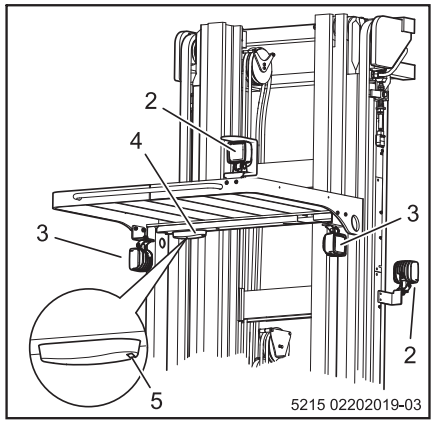
The truck is equipped a flashing beacon as standard equipment. Additionally, a pair of front and rear work lights, and/or a pair of lateral work lights are available as separate options.

A dome light is also available as an option.

NOTE

Other types or combinations of lighting may be fitted as custom options. Such custom options are not covered by this manual.

Lighting Arrangement



The flashing beacon is mounted to the chassis. Other lights are mounted to the overhead guard or mast.

(1) Flashing beacon

(2) Front and rear work lights

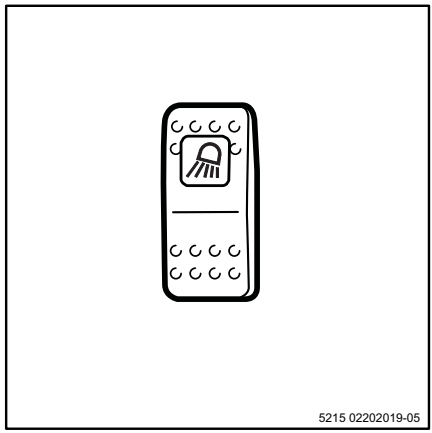
(3) Lateral work lights

(4) Dome light (optional)

Switches

Lights may be configured to operate from a switch on the dash, when in reverse, or continuously whenever the key switch is on. If switch operated, each pair of lights will operate with the switch shown. If both front and rear work lights and lateral lights are present, there will be two of these switches on the console.

The optional dome light is operated at a touch sensitive button (5) on its lens.

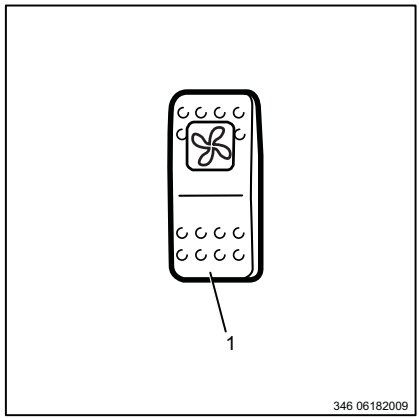


Back-Up Alarm

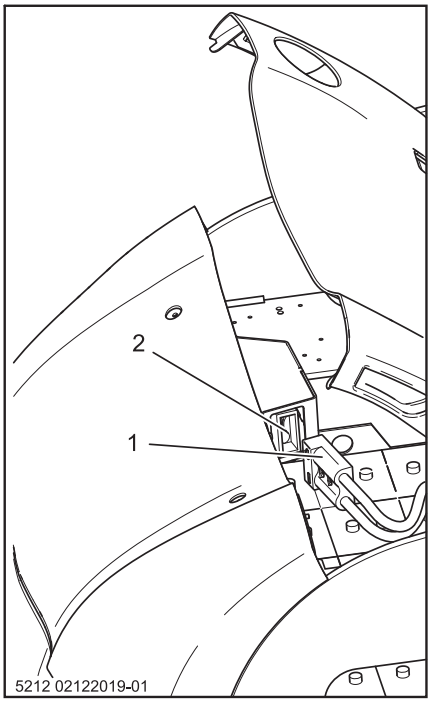
A back-up alarm (optional) is configured to automatically operate when the truck is travelling in reverse. This alarm unit is mounted in the front compartment of the chassis. The alarm can also be configured to operate as a travel alarm. In this case it will operate in both forward or reverse.

Fan (optional equipment)

A cooling fan for the operator is available as an option. The fan is mounted to the overhead guard. Use toggle switch (1) to turn the fan on or off.



Changing the Battery



⚠ WARNING

Specialized training is required to handle batteries safely.

Batteries may only be changed by properly trained personnel in accordance with the instructions of the battery manufacturer and the following procedure.

The truck is equipped with battery rollers so that the battery can be changed using conventional battery stands with rollers.

⚠ WARNING

If any battery handling equipment (lifting equipment or stands) used to change a battery has insufficient load carrying capability, there is a risk of accidental injury or death.

Use only equipment of sufficient size and load carrying capability to change batteries.

⚠ WARNING

Batteries must not be changed if the truck is bearing any load. The weight of the battery affects truck stability so there is a risk of the truck tipping over with injury to operators or bystanders if a battery is changed while the truck is loaded.

Always lower the forks fully so they are resting on the ground before changing a battery.

- Park the truck safely.
- Fully lower the fork carriage.
- Switch off the key switch.
- Press the emergency stop button.
- Open the battery cover.
- Pull the battery plug (1) out of the battery socket (2).

⚠ WARNING

Shorting of battery terminals can cause burns, electrical shock, or explosion.

Do not allow metal parts to contact the top surface of the battery. Make sure all terminal caps are in place and in good condition.

- Position a battery stand beside the truck to receive the battery. Ensure that its height is even with the bottom of the truck battery. Batteries may be removed or installed from either side of the truck.
- Remove the battery retainer from the side on which the battery is being removed. If necessary, loosen the lateral adjustment stop on the left-hand battery retainer to unload the battery retainers.
- Ensure that the battery cable is free and not in danger of becoming pinched during removal.
- Grasp the battery and slowly slide it out onto the battery stand.
- Check the battery for leaking acid, cracked housing or raised plates.
- Check that the battery plug and cable are in good condition and store the battery in a safe place.

⚠ WARNING

Batteries of incorrect size or weight will affect truck stability and cause the risk of tip-over.

Install only batteries whose weight meets the specification listed on the truck data plate.

⚠ WARNING

Use of a fuel cell can affect truck stability and cause the risk of tip-over.

Contact the factory for written approval for use of a fuel cell with the truck. Do not install a fuel cell in the truck without written approval.

- Position a new battery on a stand at proper height beside the truck.
- Ensure that the battery retainer on the opposite side is in place.
- Carefully slide the replacement battery into the battery compartment. Ensure that it is firmly against the opposite retainer.
- Install the remaining battery retainer. Adjust the lateral adjustment stop if necessary to ensure the battery is secure.

Changing the Battery

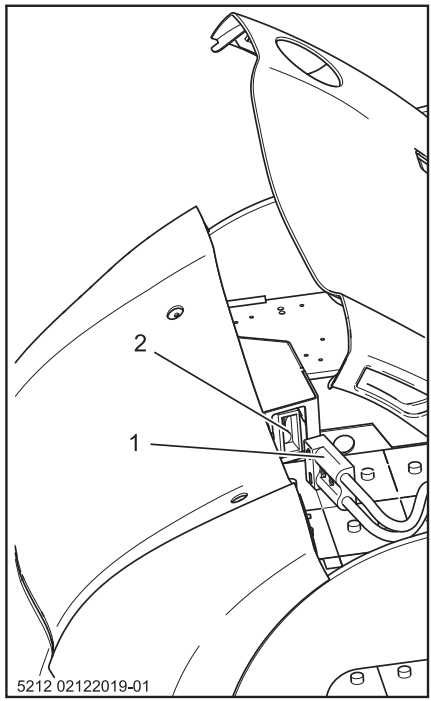
- Plug the battery plug (1) into the battery connector socket (2).
- Pull the emergency stop button out. The truck is now ready for service.

⚠ WARNING

Batteries produce explosive gases.

Always store batteries in well ventilated areas.

Connecting the Battery to an External Charger ▷



⚠ WARNING

Specialized training is required to charge batteries safely.

Batteries may only be charged by properly trained personnel in accordance with the instructions of the charger manufacturer and the following procedure.

⚠ WARNING

Explosive gases are released during battery charging.

Charge batteries only in well ventilated areas.

- ➢ Park the truck safely.
- ➢ Fully lower the operator compartment.
- ➢ Switch off the key switch.
- ➢ Press the emergency stop button.
- ➢ Open the battery cover.

⚠ WARNING

Dangerous concentrations of explosive gases can occur during battery charging if the battery cover is not open.

The battery cover must be left completely open during the entire charging period to allow ventilation.

- ➢ Remove the battery plug (1) from the connecting socket (2).
- ➢ Attach the connector plug of the external battery charger to the battery plug (1).
- ➢ Switch on the battery charger.

Towing the Truck

The truck is equipped with an electro-magnetic parking brake which is engaged whenever the truck is stationary, switched off, or power is otherwise not present. For this reason, the drive wheel must be lifted just clear of the floor during towing.

⚠ WARNING

Towing the truck with the mast raised can result in tip-over.

Lower the mast completely before towing. The mast may be manually lowered If necessary by using the manual lowering valve.

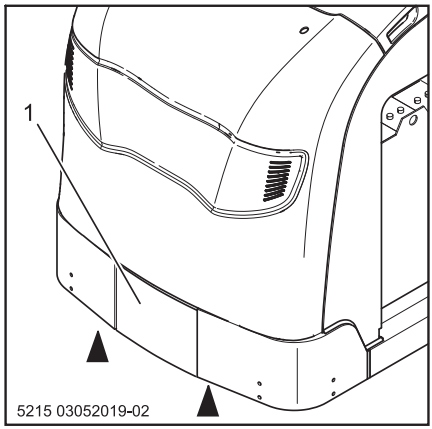
- Fully lower the mast and remove any load from the forks.
- Switch the truck off and disconnect the battery.
- Lifting equipment must not contact the inspection plate (1) in the center of the bumper. Position a forklift with fork tips beneath the chassis at points slightly outboard of the inspection plate (arrows). Do not contact the drive wheel or drive unit. It is not necessary to extend the fork tips more than three of four (75 to 100 mm) inches under the truck.
- Lift the rear of the truck just enough for the drive wheel to lose contact with the floor. Do not lift the truck so much that the fork tips drag.

⚠ WARNING

Excessive lifting will result in tip-over.

Lift the rear of the chassis just enough for the drive wheel to clear the floor and no more.

- Do not allow any personnel to occupy the truck during towing.



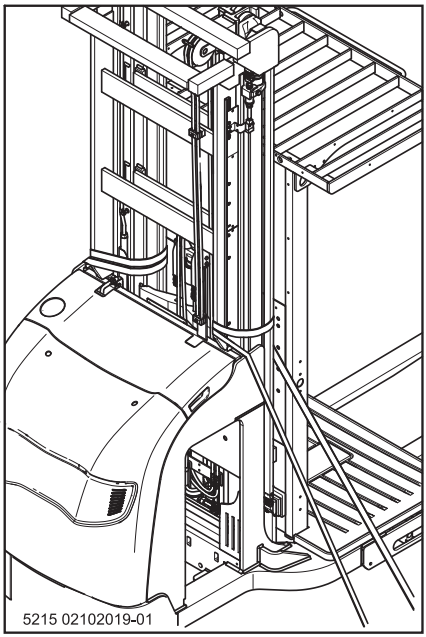
⚠ WARNING

Loss of control will occur if the towing vehicle lacks braking force sufficient to accommodate the truck mass.

Towing the truck requires a towing vehicle with sufficient tractive power and braking force for the truck mass.

- Do not exceed 1.5 mph (2.5km/hr) during towing.

Securing the Truck for Transport ▷



This procedure explains the attachment of equipment to the truck for the purpose of securing it for ground transport by tractor-trailer or other vehicle. Securing the truck for transport must be performed by personnel experienced in rigging loads for transport.

⚠ WARNING

Transport vehicles, loading ramps, or other equipment of insufficient capacity can fail and cause severe injury or death.

Ensure that the transport vehicle as well as any loading ramps or other equipment has sufficient capacity to carry the weight of the truck. Refer to the truck data plate for truck weight.

Ensure that all surfaces on which the truck will be driven or carried can support the wheel load of the truck. Contact the factory for wheel load values if necessary.

⚠ WARNING

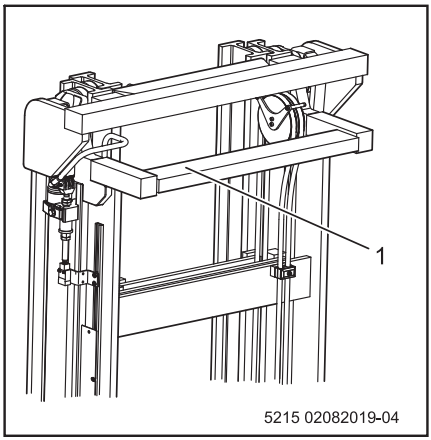
If the truck is to be driven onto the transport vehicle, the operator must be familiar with all safety procedures that apply to truck operation before driving. Be aware of truck turning characteristics during turning. Failure to carefully monitor truck position while turning could cause the truck to fall during the loading process. If possible, align the truck with the load surface of the transport vehicle so that no turning is necessary during the loading process. Be aware that the truck is designed for travel only on flat smooth surfaces and must not be driven on ramps or over transitions. For loading, the transport surface must be level with the surface on which the truck is located.

Read and understand all safety information in Section 2 before driving the truck onto a transport vehicle. Remain aware of truck position at all times especially if turning. If possible, align the truck with the transport vehicle so that it can be driven straight onto it without turning. Drive very slowly during the entire loading process.

- ➢ Once the truck is in position, lower the mast completely.
- ➢ Disconnect the battery.
- ➢ To secure the truck to a load surface for transport, a total of eight wooden wedges and suitable tension belts must be used. Position two wooden blocks at the front of

the truck and two at the rear, and position the remaining blocks in pairs on the right and left of the truck. The tension belts must be guided around the mast uprights on each side and securely attached to the transport vehicle.

Hoisting the Truck



This section explains the attachment of lifting equipment to the truck for the purpose of hoisting it. Many methods of rigging to a crane or hoist are possible. Explanation of such methods as well as operation of lifting equipment is outside the scope of this manual. Both the attachment of lifting equipment to the truck and the hoisting operation itself must be performed by personnel experienced in rigging.

⚠ WARNING

Lifting equipment of insufficient capacity can fail and cause severe injury or death.

Ensure that all lifting slings, hardware, or other equipment has sufficient capacity to carry the weight of the truck. Refer to the truck data plate for truck weight. If a battery is installed, its weight must be added to the truck weight listed on the data plate.

⚠ WARNING

The overhead guard will be damaged if it is contacted by lifting equipment that is under tension from lifting. This can result in later failure of the overhead guard and the risk of severe injury or death.

Ensure that no part of any lifting equipment contacts the overhead guard during lifting.

For an assembled truck with mast (or the mast alone), attach lifting equipment to both sides of the upper cross member (1) of the outer mast upright. This is suitable for lifting the whole truck. To ensure stability, care must be taken to ensure attachment is secure at the outer sides of the cross member and cannot slip toward the center.

Ensure that slings or any other lifting equipment will remain clear of any sharp edges, hydraulic lines or hoses, or attached items such as lights or brackets throughout the lifting process.

Long term storage

Measures prior to storage

If the vehicle is to be stored for more than 2 months e.g. for operational reasons, it should only be left in a well ventilated, clean and dry room free of frost, and the following measures undertaken beforehand.

- Clean forklift truck thoroughly.
- Raise fork carriage several times to the end stop, move lift mast backwards and forwards a few times and operate any attachments several times.
- Lower the fork carriage to a supporting surface until the chains are relieved of load.
- Check the hydraulic oil level and top up if necessary.
- All unpainted mechanical components should be coated with a thin film of oil or grease.
- Grease vehicle.
- Check battery condition and density of acid.
- Lubricate battery terminals with acid-free grease. (Follow instructions of battery manufacturer .)
- Apply a suitable contact spray to all exposed electrical contacts .
- Jack up the vehicle so all wheels are off the ground.

This will prevent permanent deformation of the tires.

NOTE

Do not cover with plastic film or this will encourage the formation and collection of condensed water.

Start up after storage

- Clean forklift truck thoroughly and grease.
- Clean the battery and lubricate battery terminals with acid-free grease
- Check battery condition and density of acid and recharge if necessary.
- Check hydraulic oil for condensed water and change if necessary.
- Perform maintenance as before initial commissioning.
- Put forklift truck into service.

Long term storage

5

Maintenance

Personnel Qualifications

Only qualified personnel authorized by the owner are permitted to perform maintenance or repair work. All items listed in the Scheduled Maintenance Charts must be performed by qualified forklift technicians only. They must have knowledge and experience sufficient to assess the condition of a forklift truck and the effectiveness of the protective equipment according to established principles for testing forklift trucks. Any evaluation of safety must be unaffected by operational and economic conditions and must be conducted solely from a safety standpoint.

Daily inspection procedures and simple maintenance checks, e.g. checking the hydraulic oil level or checking the fluid level in the battery, may be performed by operators. This does not require training as described above.

Cleaning

Cleaning the Truck

The need for cleaning depends on use of the truck. If highly aggressive media are involved, e.g. salt water, fertilizer, chemicals, cement etc., thorough cleaning is required after finishing the work assignment.

Hot steam or cleaning materials with a powerful degreasing effect should only be used with great caution as this will affect the grease filling of bearings with lifetime lubrication, causing it to escape. As re-lubrication is not possible, the bearings will be irreparably damaged.

When using compressed air for cleaning, remove stubborn soiling with cold cleaner.

During cleaning pay special attention to cooling fins on drive axles or electric motors. On motors or other electric components, remove caked deposits from cooling fins and heat sinks with a cloth.

Clean all oil filler openings and the surrounding areas. Always clean grease fittings prior to greasing.

Run the truck immediately after cleaning to aid in drying and check operation.

⚠ CAUTION

Never wash truck when switched on.

Switch the truck off before any cleaning operations.

⚠ CAUTION

When cleaning with a water jet (high-pressure or steam cleaner etc.), it should not be applied directly to the area of the drive unit, electric and electronic components, connector plugs or insulating material. Water should not be used for cleaning in the area of the central electrical system and switch console.

If this is unavoidable, the parts concerned should be covered up beforehand or only cleaned with a dry cloth or clean compressed air.

NOTE

If the truck is equipped with a sideshifter, its top and bottom bearings should be greased after the truck is washed. Use lubricating grease complying with the recommendations for working materials.

Cleaning the Lift Chains

If the lift chains are so dirty that lubricant penetration is not assured, the chains must be cleaned.

⚠ WARNING

Lift chains are safety elements. Incorrect cleaning materials can damage them.

Do not use cold/chemical cleaners or fluids that are corrosive or contain acid or chlorine. Note the manufacturer's safety information. When cleaning with a steam jet, do not use additives.

- ➢ Place a collection vessel under the mast.
- ➢ Clean lift chains with a paraffin derivative such as petroleum ether.
- ➢ Immediately after cleaning, dry the chains with compressed air to remove any water remaining on the surface and in the chain joints. Flex the chains while drying to ensure thorough moisture removal.
- ➢ Immediately apply chain lubricant to the chains. Flex the chains while applying the chain lubricant to ensure lubricant penetration.

NOTE

Lift chains on trucks used in the food industry must be lubricated with an oil approved for the food industry.

Operator Inspection and Maintenance

Daily Inspection Overview

The following inspection tasks in this section should be carried out by the operator or designated service personnel before each shift or at least daily. This inspection is not part of the regularly scheduled maintenance listed elsewhere in this chapter and is not intended to replace any of it. Regularly scheduled maintenance must be performed by a qualified forklift technician at the intervals indicated.

If any problem affecting safety is noted, it must be repaired immediately by a trained forklift technician. The truck must not be operated until such repairs are complete. This list does not cover attachments or other truck modifications not manufactured by Linde. Refer to the respective manufacturer's documentation for maintenance information pertaining to such items.

⚠ WARNING

To prevent accidents during maintenance activities, the truck must be secured against unintentional movement or start-up. Before beginning any maintenance, the mast should be fully lowered, the parking brake should be on and the key switch turned off. The truck must remain in this state throughout the maintenance process except for individual maintenance activities that specifically require otherwise.

Daily Inspection Checklist

MAN-ALOFT RIDER LIFT TRUCK
OPERATOR'S DAILY CHECKLIST

Truck Serial Number: _____ Dept / Shift: _____ Operator: _____
Hour meter reading: _____ Date: _____ Supervisor: _____

Check each of the following items before the start of each shift. **Let your supervisor and/or maintenance department know of any problem**. Start at the front of the lift truck and work towards the rear. After checking, mark each item accordingly. Explain below as necessary.

Check boxes as follows: ☐ OK ☐ NR, **N**eeds **R**epair. Circle problem and explain below.

OK	NR	VISUAL INSPECTION
		Oil Spots on Floor (check for leaks on truck)
		Drive Tire(s) (wear, cuts, or embedded objects, rim damage, loose/missing lug nuts)
		Hydraulic Oil (check level)
		Steer Axle, Chain, or other mechanism (check for damage, debris)
		Overhead Guard (damage, bends, cracks, looseness)
		Steering Wheel (check for wear, damage)
		Throttle Hand Grips (if equipped) (check for wear, damage)
		Anti-slip Mat (if equipped) (check condition, cleanliness)
		Safety Shield (if equipped) (clean)
		Battery Connectors & Cables (damage, cracks, pitting)
		Battery Retention (installed correctly, secure)
		Battery Case & Vent caps (damage, cracks, loose, missing)
		Mast (damage, wear, cracks, loose fasteners)
		Lift Cylinders (damage, leaks, loose fittings)
		Lift Chains (wear, corrosion, cracks, loose leaves, even tension)
		Carriage/Load Backrest (damage, looseness, bends, cracks)
		Forks/Attachment (damage, cracks, excess wear, twisted, bent)
		Fork Locking Pins (check operation, holds fork secure)
		Load wheels (tire wear, damage, entrapped debris)
		Harness, Tether (Inspect snap hooks and mounting points)
		Warning Decals/Operator's Manual (in place, legible)
		Data Plate/Capacity Plate (in place, legible)

OK	NR	OPERATIONAL INSPECTION
		Unusual Noise (during any of the operational checks)
		Emergency Battery Disconnect (check operation)
		Gauges and Instrumentation (check operation)
		Battery Charge (fully charged)
		Directional Switch (if equipped) (operates freely)
		Operator Presence Switch (check operation)
		Forward Driving (accelerates, steers, brakes smoothly)
		Plugging (stops, changes direction smoothly)
		Reverse Driving (accelerates, steers, brakes smoothly)
		Service Brake (check operation)
		Parking Brake (check operation)
		Hydraulic Controls (operate freely, return to neutral)
		Attachment (if equipped) (check operation)
		Mast (extend fully, binding, leaks, roughness, noise)
		Hydraulic Oil (excessive noise when mast is fully raised is indication of low hydraulic oil)
		Lift/Travel Speed Governor (check operation)
		Chain Slack Prevention Switch (check operation)
		Horn (sounds when button pressed)
		Backup Alarm (if equipped) (sounds in reverse)
		Travel Alarm (if equipped) (sounds with vehicle in motion)
		Work, Strobe, Flashing Lights (if equipped) (check operation)

Explanation of problems marked above (use back of this form if needed):

_____
_____
_____

OSHA 1910.178 (p) (1) requires a truck to be taken out of service any time it is found to be in need of repair, or is in any way defective or unsafe. Place a "Do Not Operate" tag on the truck, remove the key and alert your supervisor. The Truck may not be placed back into service until necessary repairs are made.

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Operator Inspection and Maintenance

Check for fluid leakage

Check the entire truck as well as the surface beneath it for signs of fluid leakage.

Check overhead guard

Check the condition of the overhead guard for deformity, looseness, or other obvious damage.

Any safety glass incorporated into the overhead guard must be checked for chips or cracks. If any such damage to the glass is found, the truck must be taken out of service until the glass is replaced.

Check hydraulic cylinders

Inspect lift, tilt, and any attachment cylinders for damage or leakage.

Check lift chains

Inspect the mast lift chains for broken link plates, broken or deformed pins, rust, and stiffness. Inspect the chain anchor and hardware for damage as well.

Check fork carriage

Inspect the forks, carriage and load backrest for deformity, cracks, or other damage. Check fork latch pins for correct operation. (Trucks equipped with a fork positioner will not have fork latch pins.)

Check battery retention

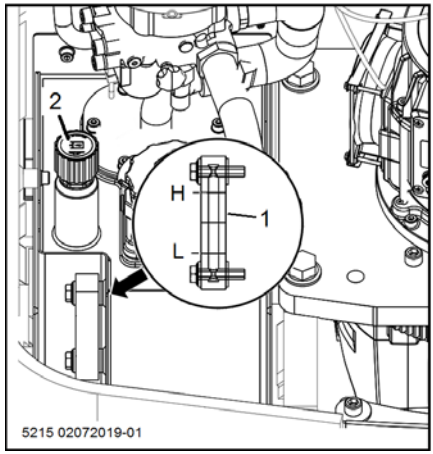
Ensure that all battery retention devices are in place, undamaged, and hold the battery firmly.

Check battery connector

Inspect the battery connector and its cables for damage.

Check hydraulic oil level

▷



- Park the truck on level ground.
- Lower the fork carriage completely and switch the truck off.
- Observe the sight glass (1).

The level should be above the middle line in the upper half of the scale.

- If oil must be added, remove the breather cap (2) and add oil through the opening as necessary to bring the level to the top mark (H).

The difference between the L and H marks is approximately 4.8 quarts (4.6 l).

⚠ WARNING

Hydraulic oil is flammable.

Do not allow hydraulic oil to contact hot components. Use care when adding oil to avoid spilling.

⚠ CAUTION

Incorrect hydraulic oil can damage the truck.

Use only oil that meets the specifications given in the Fluid and Lubricant Specifications section.

- Reinstall the breather cap if removed for filling and seat it fully.

Operator Inspection and Maintenance

Check Drive Wheel and Fasteners

⚠ WARNING

Uneven wear or excessive damage to the tires can reduce stability as well as brake performance. Reduced stability can cause loss of control. Reduced brake performance can cause collisions.

Have worn or damaged tires changed immediately.

Inspect the drive tire for damage or excessive wear.

Check drive wheel mounting hardware for looseness. This is especially important if a wheel has recently been removed and reinstalled for repairs, replacement, or any other reason. Have any loose wheel mounting hardware tightened to the following torque before operation.

⚠ WARNING

Wheel mounting hardware sometimes requires several cycles of tightening before it fully seats. For this reason, wheel mounting screws or nuts will often work loose in the period immediately following initial tightening.

Whenever a wheel is removed and replaced for any reason, the wheel mounting screws or nuts must be checked for tightness every 10 hours thereafter until no further loosening is detected.

Drive Wheel Fastener Torque
144 ft-lbs (195 Nm)

Check all wheels for debris

Check all wheels and caster(s) (if equipped) for debris or entangled material and clean if necessary. Inspect all wheels for damage.

Anti-static strap (optional equipment)

An anti-static strap is typically installed on trucks with non-marking tires that are more prone to static electricity build-up. An anti-static strap may also be installed on trucks that operate in certain applications regardless of

tires. If equipped, inspect the anti-static strap for wear or damage. The strap must maintain continuous contact with the driving surface. If any wear or damage preventing this contact is present, the strap must be replaced. Also check that the strap mounting is secure. Correct as required.

Check decal condition

Inspect all decals and the data/capacity plate for condition and legibility. Decal locations are given in the Overview section of this manual. Refer to the decal descriptions in the Safety section of this manual if necessary. Any damaged or unreadable decals must be replaced.

Operational checks

Before returning the truck to service, conduct an operation check of the following items:

- Emergency stop button
- Foot pedal brake release
- Safety interlocks (contact sensors on controls, foot pedal, guard rail)
- Multi-function display/battery discharge indicator
- Working lights (if equipped)
- Horn
- Forward and reverse travel
- Back-up or motion alarm (if equipped)
- Electric braking (plugging)
- Mast and any auxiliary hydraulic functions (operate through complete range of motion)
- Steering function and angle display

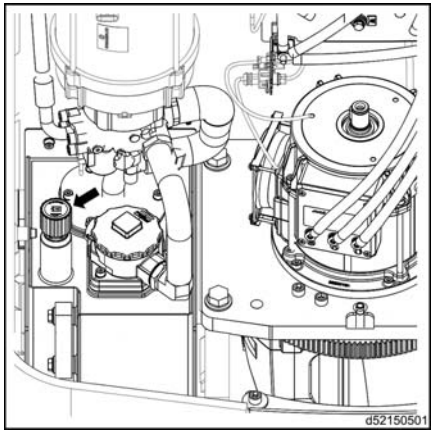
Routine Lubrication and Inspection

Routine Lubrication and Inspection Intervals

The items in this section must be performed based on usage and environment. They do not need to be performed daily but may require completion more frequently than the major scheduled maintenance intervals. These intervals can often be based on maintenance experience by those familiar with equipment in the given environment. Intervals given herein for specific items however must not be exceeded in any case. Your Linde dealer will be able to provide application-specific interval recommendations if required.

Hydraulic Tank Pressure Valve Test ▷

The breather filter (arrow) is equipped with a bleeder valve that permits a slight over pressure in the tank.



- Switch on the truck.
- Extend the lift mast to the stop and lower it again; repeat this step several times.
- Switch off the truck.
- Release the breather filter by slowly rotating the filter housing a half-turn counter-clockwise. It must be possible to hear air escaping from the tank.
- If air cannot be heard escaping, the breather filter must be replaced.

Checking Gear Oil Level ▷

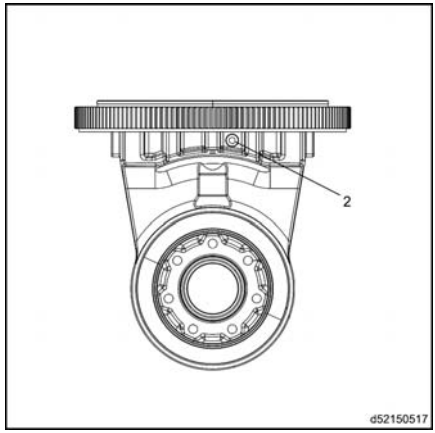
The gear unit has a drain plug (1) and a filler plug (2) on the housing.

- Park the truck and turn the steering to the right until the filler plug is accessible.
- Turn off the truck and disconnect the battery.
- Clean the area around the filler plug and remove it.

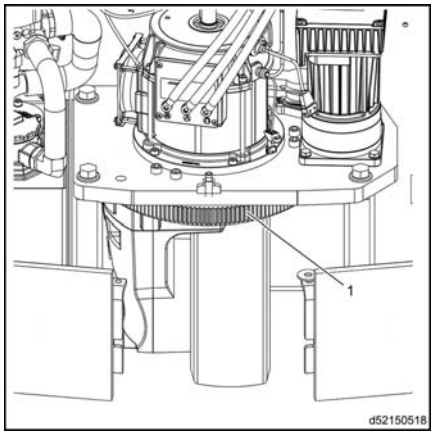
Oil level must reach the bottom of the filler plug opening.

Add gearbox oil as required through the filler plug opening.(2).

- Install the filler plug and tighten to 25 ft-lbs (35 Nm).



Lubricate Steering Gear ▷



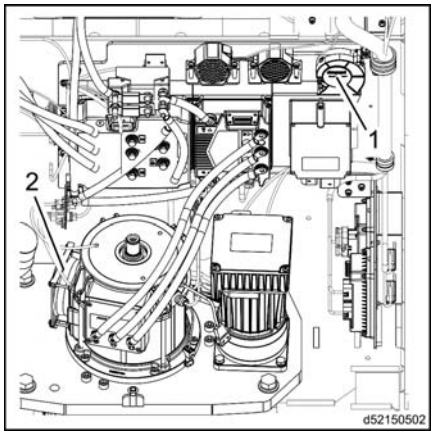
⚠ WARNING

Contact with the steering pinion and gear mesh during motion can cause injury.

Always switch the truck off and disconnect the battery when performing maintenance on or near the steering gear.

Clean the steering gear (1) and pinion with a rag and cold cleaner and apply fresh grease to the operating range of the gear.

Testing and Cleaning the Fans ▷



The forklift is equipped with fans above the transformer (1) and to the left of the drive motor (2). Remove the cover to access the fans.

The fans must be cleaned and checked for normal operation periodically.

The fans should be cleaned with oil-free compressed air and/or cleaning solvent. The truck must be switched off while cleaning the fans.

The fans can be activated for testing using a laptop computer equipped with Linde diagnostic software.

Scheduled Maintenance

General Maintenance Information

This section contains all information required to determine when the truck must be serviced and what must be done. This information is presented as scheduled maintenance charts on the following pages. Be sure to perform maintenance within the time limit given in the maintenance charts. Proper and timely maintenance is essential to obtain the full operability, performance and service life from the truck, and is a prerequisite for any warranty claims.

Maintenance Intervals

Maintenance intervals are based on operating hours but are also subject to the maximum intervals (based on years in service) listed at the top of each chart.

All lubrication and service intervals must be reduced for dusty conditions, large temperature fluctuations or intensive use.

Scheduled Maintenance Charts

The scheduled maintenance charts provide a list of maintenance tasks and associated time intervals at which they must be carried out. Tasks listed under successive intervals are not cumulative; only the additional tasks required are listed under successive intervals.

Use only high-quality lubricants or other materials meeting the specifications listed in Fluid and Lubricant Specifications. All work must be performed only by qualified forklift technicians. Custom-fitted equipment is not covered by the scheduled maintenance charts. If such equipment is installed, refer to the manufacturer's documentation for maintenance requirements.

Scheduled Maintenance Chart

One-time maintenance at 1000 hours.
Drive unit
Change the gear oil.

Maintenance every 1000 hours, but at least every 6 months. (Every 500 hours for cold-storage or extreme climate exposure.)
Preparations
Clean the truck (as required).
Read and clear the error memory.
Enter the next service interval.
Drive unit
Check the gearbox for noise and leakage.
Check the gearbox oil level; top up if necessary.
Check the tightness of the screw connection to the drive unit (note the torque).
Check the condition of the drive wheel and check for wear.
Check that the drive wheel, wheel screws and cushion tire are securely attached.
Check the traction motor bearing for operating noise; replace the bearing if necessary.
Steering
Check the function of the steering system.
Check the maximum steering angle. It must be possible to steer 90° to each side.
Check the level of play and the status of the steering angle measurement (actual value).
Check the steering wheel for ease of movement.
Check the straight-ahead travel of the truck; re-adjust the actual value potentiometer (rail) if necessary.
Check the steering turntable bearing for ease of movement and wear.
Clean and lubricate the steering gears and check gear play.
Check the ease of movement of the steering system.
Check the steering motor bearings for operating noise; replace the bearings if necessary.
Brake system
Check that the foot switch is working correctly.
Check that the reverse brake is working correctly.
Check the thickness and condition of the brake lining; replace the brake lining if necessary.
Check the brake clearance; adjust if necessary (if the gap is less than 0.25 mm or greater than 0.4 mm, it must be adjusted to 0.3 mm).
Blow out the brake lining with oil-free compressed air (caution: abrasion debris is hazardous to your health; use a protective mask).
Check the brake retardation values after each adjustment (dynamometer).

Maintenance every 1000 hours, but at least every 6 months. (Every 500 hours for cold-storage or extreme climate exposure.)
Check that the automatic braking mechanism is working correctly (option).
Check that the inductive transmitter is working correctly (option).
Clean the photo eyes/light barriers and check they are working correctly (option).
Chassis
Check the condition and ease of movement of the cover.
Check the condition, mounting and wear of the load wheels.
Visually check all weld seams. Dye penetrant can be used if there is a suspected crack.
Check the function and condition of the rail switches (option).
Electrical system
Check the condition of the battery cables, battery connections and battery male connectors, and check for secure attachment.
Measure the battery voltage under load.
Check for failure in the insulation between the battery tray and the positive or negative terminal of the battery.
Check the truck battery in accordance with manufacturer guidelines.
Check the driving, accelerating, braking and reversing functions of the traction controller and pump controller.
Check all connections and plugs for secure attachment.
Check the condition of the contactors and check for erosion; replace if necessary.
Check the fuses for correct values and condition.
Check pre-tension of reeved electrical cables that supply the operator compartment.
Hydraulic system
Check the main lift cylinders for leakage and function.
Check the oil level in the tank; top up if necessary. Observe the correct oil grade as per the lubricant table.
Check all hydraulic screw joints for leakage; tighten or replace if necessary.
Check all lines and hoses for leakage.
Check the condition of all lines and hoses and check for pinch points.
Check the condition of the surfaces on all hoses, e.g. porous areas.
Check the replacement interval for the hydraulic hoses. All hydraulic hoses must be replaced after six years of use. To check this, see the date stamp on the hose or the crimping.
Check the pump motor bearing for operating noise; replace the bearing if necessary.
Test the bleeder valve in the hydraulic breather filter. Visually inspect the breather filter. Replace if necessary.
Lifting system
Check the mounting and bearing points of the lift cylinders for good condition.
Clean and lubricate all chains on the main lift and the auxiliary lift, and check for wear, elongation, damage, and tension. The wear limit of the lift chains is 2%.
Check the chain rollers for ease of movement.
Check the condition of the lift mast guide surfaces, and check for wear and lubrication condition.

Scheduled Maintenance

Maintenance every 1000 hours, but at least every 6 months. (Every 500 hours for cold-storage or extreme climate exposure.)
Check the condition of the lift mast rollers, and check the setting.
Check the condition of the guide elements, and check for lateral play between the lift mast parts; replace if necessary.
Visually inspect the forks for cracks and bends.
Subsequent tasks
Carry out functional test and test drive.
Attach maintenance sticker.

Maintenance every 3000 hours, but at least every 18 months. (Every 1500 hours for cold-storage or extreme climate exposure.).
Drive unit
Change the gear oil.
Hydraulic system
Change the hydraulic oil.
Replace the hydraulic filter element.
Replace the hydraulic breather filter element.
Subsequent tasks
Carry out functional test and test drive.
Attach maintenance sticker.

Fluids and Lubricants

Capacities

Assembly	Fluid or Lubricant	Capacity
Hydraulic system	Hydraulic oil	22.2 qts (21 l) ("H" mark with mast fully lowered.)
Transmission	Gear oil	3.0 qts (2.9 l)

Fluid and Lubricant Specifications

Hydraulic Oil

Original equipment specification

The following grades of hydraulic oil are supplied from the factory as original equipment:

ISO-L-HM 46 as per ISO 6743-4 for standard trucks
ISO-L-HM 32 as per ISO 6743-4 for cold storage trucks

Gear Oil

SAE 75W-90 API GL5

Grease

Lithium-based grease with MoS2.

NOTE

Do not mix non-lithium-based greases with lithium-based greases.

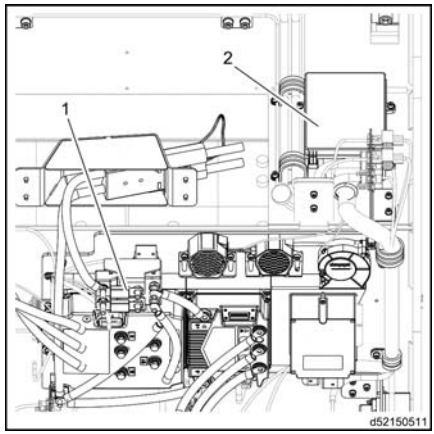
Chain spray

Use a high-quality commercially available penetrating chain spray specifically intended for forklift mast chains.

Troubleshooting

Fuses

The truck fuses are located beneath the battery cover. The main fuses are attached to the main contactor (1). Control fuses are located in a separate fuse and relay box (2).



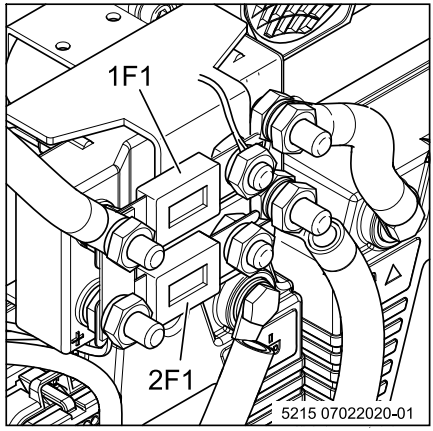
Main Fuses

The truck has the following main fuses:

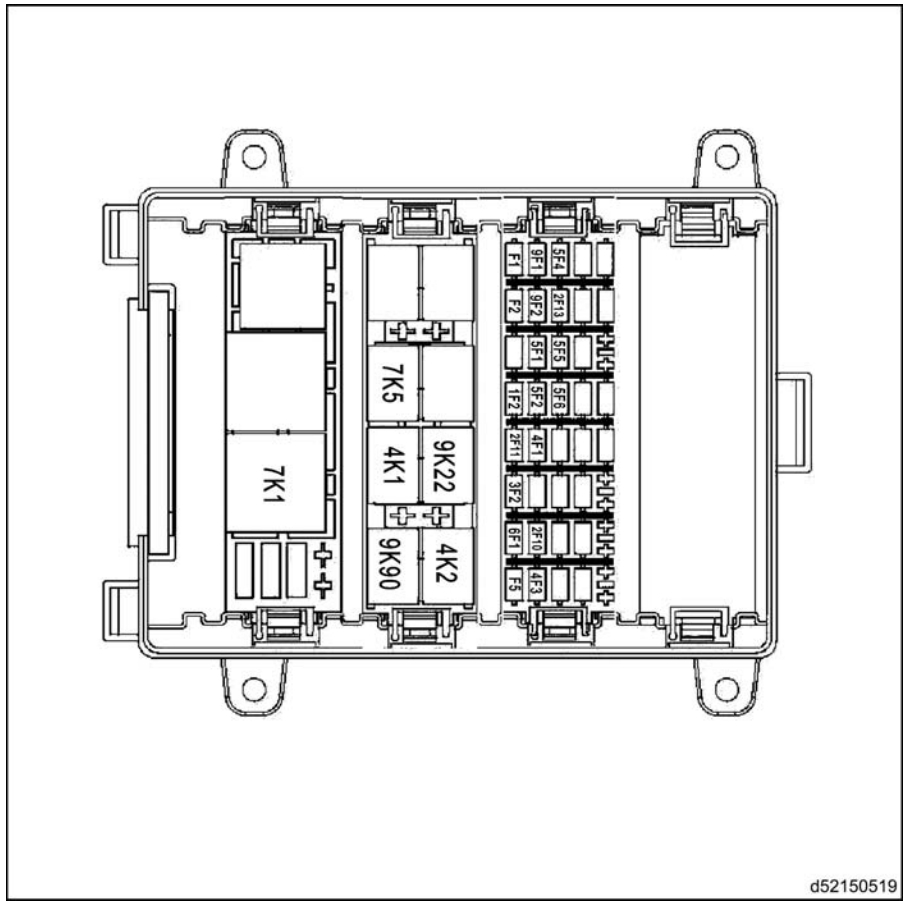
- 1F1 (355A) protects the drive motors and controllers
- 2F1 (500A) protects the pump motor and controller

Control Fuses

The control fuses are contained in one block in the control fuse box. Fuse identification and amperage is listed in the following illustration and table.



Control Fuse Arrangement



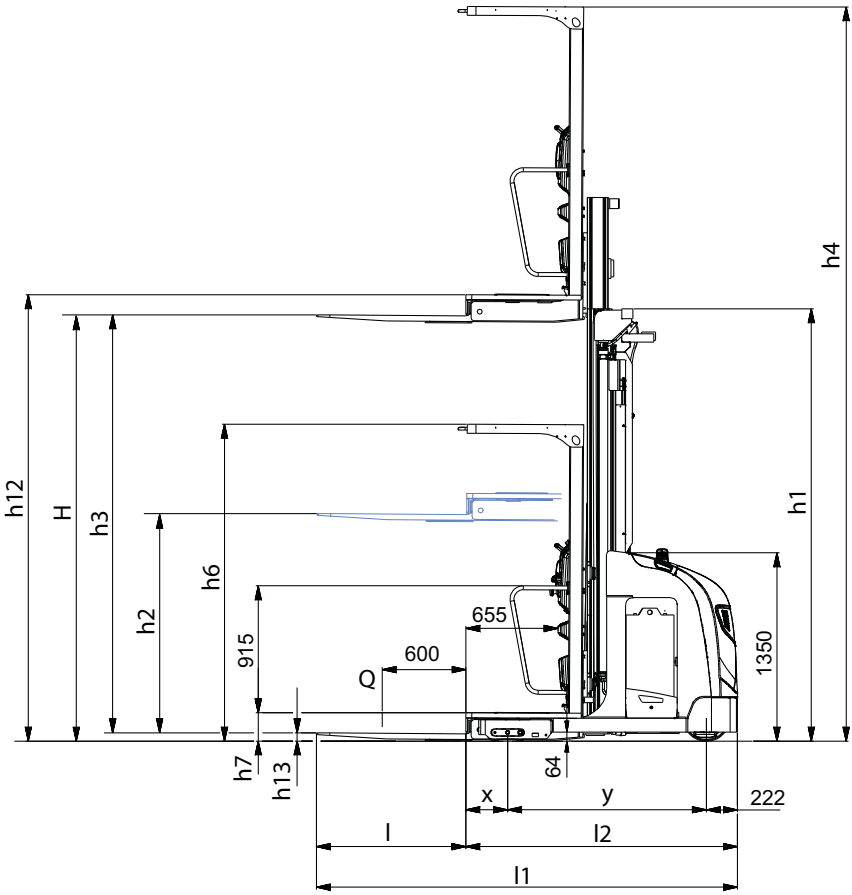
F1	Key 20A
F2	24V/12V Transformer，5A
1F2	B+ — VCM，2A
2F11	Cabin sensors，5A
3F2	Steering unit B+，5A
6F1	Display +12V，2A
F5	Flashing beacon，2A
9F1	Pump motor fan，2A
9F2	Controller fan，2A
5F1	Blue spot，4A
5F2	Head working light，4A
2F10	Cabin controller +24V，4A
4F1	Horn，2A
4F3	Buzzer，2A
5F4	Linear actuator，2A
2F13	36V/24V Transformer，5A
5F5	Working light right，4A
5F6	Working light left，4A
9K90	24V/12V Transformer relay，12V/30A
4K2	Horn relay，12V/30A
4K1	Buzzer relay，12V/30A
9K22	Controller fan relay，12V/30A
7K1	Emergency relay，24V/30A
7K5	Power supply relay，24V/30A

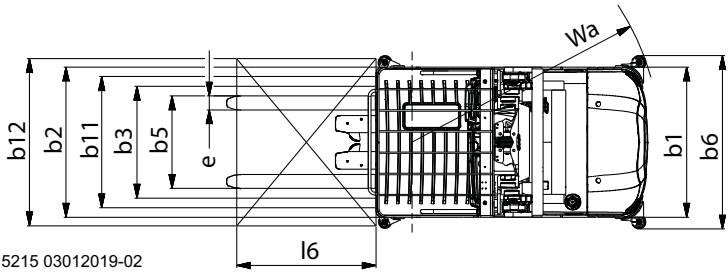
Troubleshooting

6

Specifications

Specifications





General	V 15
Manufacturer (code designation)	Linde
Manufacturer's model designation	V 15
Drive: electric, diesel, gas, LPG	Electric
Operation: manual, accompanied, standing, seated, order picking	Standing
Nominal load capacity (Q) (May be downrated for certain masts or attachments. Always refer to vehicle data plate.)	3000 lbs (1360 kg)
Load center of gravity distance (c)	24 in (nom) (600 mm)
Load distance (x)	11.8 in (300 mm)
Wheelbase (y)	56.1 in (1425 mm)

Weights	V 15
Service weight with minimum battery	Refer to vehicle data plate

Wheels and tires	V 15
Tire type, front and rear	Polyurethane
Tire size, front	13.5 x 5.3 in (343 x 135)
Tire size, rear	5 x 4 in (125 x 105 mm)
Number of wheels, front / rear (x = driven)	1 x / 2
Track width, front (b10)	N/A
Track width, rear (b11) (42/48/54/60 nominal width)	36.8 in (935 mm) / 42.5 in (1077 mm) / 48.5 in (1230 mm) / 54.5 in (1382 mm)

Dimensions	V 15
Mast height, fully lowered (h1)	See "Mast Heights" table
Free lift stroke (h2)	See "Mast Heights" table
Lift height (H)	See "Mast Heights" table
Extended height (h4)	See "Mast Heights" table
Platform height, extended (h12)	See "Mast Heights" table
Platform height, lowered (h7)	8.3 in (210 mm)
Height to top of the standard OHG (h6)	89.8 in (2280 mm)
Fork height, lowered (h13)	3 in (75 mm)

Specifications

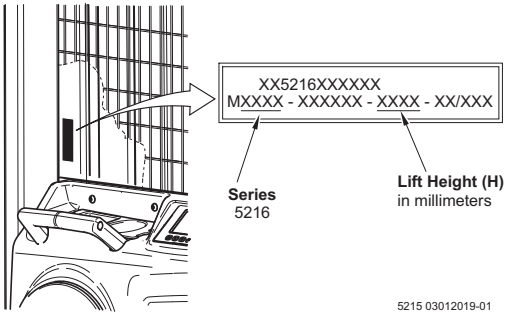
Dimensions	V 15
Fork dimensions (s x e x l)	1.6 x 4 x 42 in (40 x 100 x 1070 mm)
Overall length (l1) (42 inch forks)	118.9 in (3020 mm)
Length to fork face (l2)	76.6 in (1945 mm)
Overall width, front (b1), without rail guidance (all nominal widths)	42.4 in (1077 mm)
Overall width, rear (b2), without rail guidance (42/48/54/60 nominal width)	42.4 in (1077 mm) / 48.1 in (1220 mm) / 54 in (1371 mm) / 60 in (1524 mm)
Overall width, front/rear (b6/b12), with rail guidance (42/48/54/60 nominal width)	49 in (1244 mm) / 55.1 in (1398 mm) / 61 in (1549 mm) / 67 in (1702 mm)
Carriage class per ANSI/ITSDF B56 11-4-2005	II A
Carriage width (b3)	30.8 in (782 mm)
Ground clearance beneath mast (m1)	1.6 in (42 mm)
Ground clearance, center of wheelbase (m2)	2.7 in (70 mm)
Aisle width (Ast) (includes 7.8 inches (200 mm) clearance) 40 inch x 48 inch pallet (crossways)	123 in (3127 mm)
Aisle width (Ast) (includes 7.8 inches (200 mm) clearance) 48 inch x 40 inch pallet (lengthways)	129 in (3280 mm)
Turning radius (Wa), without rail guidance	65 in (1650 mm)
Turning radius (Wa), with rail guidance 42 in nominal width	67 in (1700 mm)
Turning radius (Wa), with rail guidance 48/54/60 in nominal width	70.9 in (1800 mm)

Performance data	V15
Maximum driving speed (with/without load)	7.8 mph (12.5 km/h) with/without load
Lifting speed (24V)	45.3 fpm (0.23 m/s) with load 74.8 fpm (0.38 m/s) without load
Lifting speed (36V)	80.7 fpm (0.41 m/s) with load 104.3 fpm (0.53 m/s) without load
Lowering speed	78 fpm (0.40 m/s) with load 78 fpm (0.40 m/s) without load
Acceleration time (24V) (with/without load)	6.0 / 5.6 s
Acceleration time (36V) (with/without load)	6.4 / 6.0s
Service brake type	Regenerative

Drive Motors and Battery	V15
Drive motor power rating (60 min) (24V)	6.5 hp (4.9 kW)
Drive motor power rating (60 min) (36V)	8.8 hp (6.6 kW)
Pump motor power rating (15%) (24V)	13.4 hp (10.0 kW)
Pump motor power rating (15%) (36V)	23.2 hp (17.3 kW)
Nominal battery voltage/ rated capacity	24V / 750AH or 36V / 625AH
Battery compartment dimensions (width x length x height)	42 in (1067 mm) x 14.6 in (371 mm) x 36 in (914 mm)

Miscellaneous	V15
Drive type	AC
Maximum noise level (average at driver’s ear)	<70 dB (A)

Mast Heights



Mast heights are listed by lift height from the floor (H). This number is found in the mast identification code as shown above. Mast height dimensions in inches are rounded to the nearest 1/2 inch conservatively, ie h1 and h4 are rounded up; H, h2 and h3 are rounded down. Metric mast height dimensions (mm) are design values.

Mast heights - Triple - 1581 Series				
Lift height (H)	Free lift stroke (h2)	Mast height, fully lowered (h1)	Extended height (h4)	Lift stroke (h3)
192.7 in (4895 mm)	65.7 in (1670 mm)	90.8 in (2305 mm)	279.6 in (7100 mm)	190.1 in (4830 mm)
210.4 in (5345 mm)	71.6 in (1820 mm)	96.7 in (2455 mm)	297.3 in (7550 mm)	207.8 in (5280 mm)
239.9 in (6095 mm)	81.4 in (2070 mm)	106.5 in (2705 mm)	326.8 in (8300 mm)	237.4 in (6030 mm)
265.5 in (6745 mm)	93.3 in (2370 mm)	118.4 in (3005 mm)	352.4 in (8950 mm)	262.9 in (6680 mm)
295.0 in (7495 mm)	103.1 in (2620 mm)	128.2 in (3255 mm)	381.9 in (9700 mm)	292.5 in (7430 mm)
312.8 in (7945 mm)	109.0 in (2770 mm)	134.1 in (3405 mm)	399.7 in (10,150 mm)	310.2 in (7880 mm)
332.4 in (8445 mm)	124.8 in (3170 mm)	149.9 in (3805 mm)	419.3 in (10,650 mm)	329.9 in (8380 mm)

Mast heights - Triple - 1581 Series				
350.1 in (8895 mm)	130.7 in (3320 mm)	155.8 in (3955 mm)	437.1 in (11,100 mm)	347.6 in (8830 mm)
362.0 in (9195 mm)	134.6 in (3420 mm)	159.7 in (4055 mm)	448.9 in (11,400 mm)	359.4 in (9130 mm)

Mast Heights

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