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Kinesys Apex Hoist 500 Servo

Operating & Maintenance Manual
[ORIGINAL]

A variable speed electric chain hoist

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Glossary

The following glossary terms relate to the Apex system specifically as well as the automation industry generally.

Dead end

In relation to electric chain hoists, this is the end of the load chain that does not bear any load. In the case of the Apex Hoist, this end is permanently attached to the bracket on the side of the hoist during operation.

Dead man's handle (DMH)

See "Enabling switch".

Double-reeved

In relation to electric chain hoists, a design that incorporates a load chain that goes around a sprocket wheel inside the main body and then goes around a second sprocket wheel inside the chain hook assembly. After passing through the chain hook assembly, the end is secured inside the main body. This design allows for double the load capacity compared to single-reeved designs but also halves the maximum lifting speed. Synonyms: Double-fall.

Duty cycle

The ratio of running time to running time + period of rest. Synonyms: Duty rate.

Emergency limit

See "Ultimate limit".

Enabling switch

A device that requires continuous input from the user in order to initiate and maintain movement. Once released, movement of the selected channels will stop. This can be in the form of a button, bar or handle, depending on the design of the machinery. Synonyms: Dead man's handle (DMH), Hold-to-run (HTR).

Entertainment Load Limit (ELL)

According to EN 17206, the maximum load that an item of equipment is designed to raise, lower, or sustain.

Hold-to-run (HTR)

See "Enabling switch".

Hook block

An assembly that consists of the hook mechanism, to which loads are attached, a rubber buffer and the casings and fasteners that hold the hook in position on the end of the load chain. Double-reeved hook blocks are significantly larger in order to house a sprocket wheel and bearing mechanism.

Initial limit

The position, in either direction, where the hoist will cause a controlled stop of movement, as programmed by the limit switches during manufacture. Movement beyond this limit is unlikely to cause damage to the equipment. In the Apex Hoist, this limit is known as the "operational" limit, and is displayed as such on the Limits PCB. Synonyms: Operational limit.

Lift limiter

A device assembled to the dead end of the load chain that prevents the chain from passing fully through the hoist. In reality, the chain should never reach this point during normal operation as it would have to overcome both sets of limits. Synonyms: Chain stop.

Limit

The extent of travel allowed for a hoist in either direction, determined by the hoist manufacturer and set during manufacture. According to EN 17206, two types of limit must be programmed into the device to achieve the maximum safety standard: "initial" (sometimes known as "operational") and "ultimate" (sometimes known as "emergency").

Limits PCB

A device located on the inside of the hoist that contains switches for bypassing limits and LEDs that illuminate when limits have been struck. This is needed for some maintenance operations such as removing and installing load chains.

Load chain

A chain designed specifically to withstand the static and dynamic forces experienced during the lifetime of a hoist. In many cases, this gets shortened to just "chain".

Operational limit

See "Initial limit".

SIL 3

(Safety Integrity Level) - the highest level of risk reduction for machinery, according to EN 62061. The Apex system conforms to this standard when used in conjunction with a venue-wide emergency stop system, such as Mentor.

Single-reeved

In relation to electric chain hoists, a design that incorporates a single line of load chain that goes around a sprocket wheel inside the main body and lifts the attached load via the chain hook assembly. Synonyms: Single-fall.

Ultimate limit

The position, in either direction, where the hoist will cause an immediate stop to movement should the initial limits fail, as programmed by the limit switches during manufacture. Movement beyond this limit may cause damage to the equipment. During normal operation, movement should never reach the ultimate limits, but they are required as a redundancy system in order to achieve the maximum safety level. Synonyms: Emergency limit.

1. Introduction

1.1 Product description

The Apex Hoist 500 Servo is a variable speed electric chain hoist with a maximum load capacity of 500 kg and a maximum lifting speed of 610 mm/s. The synchronous servo motor inside the hoist allows for higher lift speeds compared to other Apex Hoist variants. The compatible drive used for controlling the Apex Hoist 500 Servo is the Apex Drive. The Apex family of products is compatible with both Kinesys and TAIT software packages, such as Vector, K2, Navigator, and iQ.

Key features of the Apex Hoist 500 Servo include silent dual brakes, a built-in load cell, ultra-smooth movement and braking, precision speed control, and data monitoring. The hoist has the ability to hold a full load capacity at any speed down to and including zero. These features, combined with high safety standards and its rugged design, allow the hoist to be used in a variety of automation and live event situations., including touring and permanent installations.

Data that can be monitored include run time, maximum load, maximum temperature, and number of brake operations. This data allows users to ensure the hoist is not over-exerted, that regulatory requirements are met, and that maintenance schedules are kept precisely, thus prolonging the life of the equipment.

1.2 Scope and purpose

This manual describes the key features, means of operation and maintenance operations of the Apex Hoist 500 Servo.

The equipment described in this manual may only be operated by personnel qualified to do so. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with this and associated equipment.

Qualified personnel must have training as well as experience in the field of lifting and rigging operations in the entertainment industry. They must possess an excellent knowledge of the relevant work safety regulations, directives, and general accepted rules of lifting techniques, which enables them to decide whether the lifting equipment is in a safe working condition or not.

No responsibility is taken by the manufacturer for damage or operating trouble due to:

- Improper operation
- Operator errors
- Unauthorized modifications to the equipment

1.3 Model part numbers

This manual applies to the following:

Kinesys part number range	Hoist model
ACH-42-1050	Apex Hoist 500 Servo

The Apex Hoist 500 Servo is compatible with the following models of Apex Drive controller:

Kinesys part number	Drive model
APM-44-1010	Apex Drive v2 400V
APM-44-1110	Apex Drive v2 NAV 400V
APM-54-1110	Apex Drive v2 NAV 480V

The Apex Hoist 500 Servo has a nominal 400V. This is factory set to match the supplied Apex Drive controller. However, 400V hoists can also be controlled by a 480V Apex Drive v2 NAV.

The Apex Hoist 500 Servois not compatible with V1 Apex Drive models or Apex Drive models with a rated voltage of 208V.

1.4 Support requests

For technical support on this product, please use the following contact details:

support@kinesys.com
Tel: +44(0) 20 8481 9850

To resolve your support request as quickly as possible, please provide the following information, if available, when contacting Kinesys:

- Site name, address, machine location details and your contact details.
- As much detail as possible on the behaviour observed, including any unusual changes in behaviour that are different from normal operation and any environmental conditions that may be a factor (e.g. fluctuations in temperature and water damage).
- Details on the behaviour that should have been expected.
- The exact steps required that produce the issue.
- Any solutions to fix the issue that you have already tried.
- Any workarounds that you have found.
- Equipment item numbers and serial numbers, such as those displayed on the identification plates/labels.
- Version numbers of any software being used.
- Any screen shots, photographs or videos of the issue.

2. Safety information

The following symbols are used to indicate specific items which require special attention by the user:

	**Warning: Instructions which relate to safety**
	**Warning: Instructions which relate to safety where there is a particular risk of electric shock**
	**Warning: Instructions which relate to safety where there is a particular overhead risk**
	**Danger: Prohibited actions which are forbidden under all circumstances**
	**Additional important information**

2.1 Safety regulations

The following regulations serve as the basis for assembly, installation, certification and maintenance of electric chain hoists within the area of the European community. For countries other than those mentioned, local legislation and directives may apply in addition to or in place of the European regulations as stated in this manual.

The manufacturer's guarantee depends on the consideration of these regulations and the operating instructions.

European regulations

2006/42/EC	EC - Machinery Directive
2014/30/EU	EMC Directive
2014/35/EU	Low Voltage Directive

BGV accident prevention regulations (Germany only)

DGUV Vorschrift 3 (BGV A1)	Principles of accident prevention
DGUV Vorschrift 3 (BGV A3)	Electrical facilities and equipment
DGUV Vorschrift 52 (BGV D6)	Accident prevention regulation for use in crane systems
DGUV Vorschrift 54 (BGV D8)	Accident prevention regulation for electric winches, lifting and pulling equipment
DGUV Regel 100-500 (BGR 500)	Hoisting accessories
DGUV Grundsatz 309-001 (BGG 905)	Principles for crane inspections

Harmonized regulations

EN ISO 12100	Safety of machinery; Basic terminology, methodology
EN 14492-2	Cranes - Power driven winches and hoists
EN 818-7	Short link chain for lifting purposes; Fine tolerance hoist chain, Grade T
EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems; General principles for design
EN 60034-1	Rotating electrical machines; Rating and performance
EN 60034-5	Rotating electrical machines; Degrees of protection provided by the integral design of rotating electrical machines
EN 60204-1	Electrical equipment of machines, General requirements
EN 60204-32	Electrical equipment of machines; Requirements for hoisting machines
EN 60529	Degrees of protection provided by enclosures (IP-Code)
EN 60947-1	Low-voltage switchgear and control gear
EN 61000-6-2	Electromagnetic compatibility; Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility; Emission standard for industrial environments
EN 82079-1	Preparation of instructions for use - Structuring, content and presentation

European regulations

EN 17206	Machinery for stages and other production areas; Safety requirements and inspections

Regulations and technical specifications

FEM 9.511:1986	Rules for the design of series lifting equipment; Classification of mechanisms
FEM 9.683:1995	Series lifting equipment; Selection of hoisting and travelling motors
FEM 9.751:1998	Series lifting equipment; Power driven series hoist mechanisms; Safety
FEM 9.755:1993	Serial hoist units; Measures for achieving safe working periods

2.2 Safety warnings

IF IN DOUBT ABOUT ANY ASPECT OF MOVING OBJECTS, ALWAYS SEEK PROFESSIONAL ADVICE BEFORE OPERATION.

Make sure this Operating & Maintenance Manual is always kept in a complete and fully readable condition and that it is always accessible to all operators of the equipment.

Prohibitions of operation

- **Do not use the hoist to carry people. It is strictly prohibited unless a specific risk assessment by a qualified person states otherwise and a rescue plan has been drafted by a qualified person.**
- **Do not install the hoist or do maintenance to the hoist in an area that is accessible to children or other unqualified persons.**
- **Do not use the hoist in an aggressive environment. An aggressive environment is defined as an environment which contains hazardous substances that may degrade the load bearing capacity of the hoist.**
- **Do not attach a load to the hoist of more than the Safe Working Load of 500 kg.**
- **Do not use the load chain to sling loads - the chain hook is the only permitted method of load attachment.**
- **Do not use a load chain that is longer than that stated on the chain bag.**
- **Do not use the hoist in motor-down/inverted mode (using the chain hook to raise and lower the body of the hoist).**
- **Do not turn the load chain over any edges or surfaces - always make sure the load chain is unobstructed during movement.**
- **If the hoist is being used at a height that is reachable at ground level, do not touch the hoist at the chain entry position. Make sure proper safety measures are in place to avoid the risk of crushing or entanglement.**
- **Do not use the hoist if it does not appear to be in 100% working order.**
- **Do not modify or attempt to repair the hoist in any way other than those described in the maintenance procedures within this manual.**

Safety precautions before operation

- **Do a full risk assessment of the location where the hoist and its connected control devices are intended to be used.**
- **Hoists and their loads must only be attached from suitable scaffolds, approved working platforms, or similar safe working positions.**
- **Make sure a qualified rigging specialist has assessed that the structure where the hoist will be installed can safely withstand the weight of the hoist and its attached load.**

- **Do not start movement operations until a qualified person has inspected the hoist and all other connected equipment, and confirmed that is in 100% working order.**
- **Software-independent means of stopping movement must be provided, including a hardware emergency stop system that is compliant with all local regulations (e.g. Mentor).**
- **Make sure all emergency stop buttons and enabling switches in the system have been tested and are functioning correctly.**
- **Make sure all operators know the locations of the emergency stop buttons and enabling switches in the system.**
- **Make sure the load chain is fully lubricated along its entire length before initial operation.**
- **Make sure the load is always placed vertically underneath the hoist. Do not turn the load chain over any edges or surfaces.**
- **Make sure the load is properly seated in the chain hook.**
- **Make sure the load is attached safely and distributed evenly onto the hoist. Consult an expert or trained specialist if in doubt.**
- **Make sure the load is unobstructed and will not come into contact with other static or moving objects during movement.**
- **Make sure the load is always visible to the operator where possible. If this is not possible, make sure the operator has reliable communication with a person who can clearly see the load.**
- **Make sure all persons in the hazard zone underneath the hoist are aware of the potential for movement.**

Safety instructions during operation

- **If you notice any unexpected or dangerous hoist movement during operation, press the appropriate emergency stop button (either on the connected Apex Drive or on a venue-wide safety controller) to bring all movement to an immediate stop. Note that not all emergency stop buttons in the system necessarily stop the movement of a particular hoist. Alternatively, if an enabling switch is used in the system, then release the enabling switch.**
- **Where emergency stop buttons are used which do not cover the entire installation, familiarize yourself with the operation span of each emergency stop device prior to operating any equipment.**
- **If an enabling switch is used in your system to initiate movement of the hoist, be aware that releasing it may cause movement to stop abruptly.**
- **After an emergency stop button has been pressed, the reason for its actuation must be found, and all possible failures in the system removed by trained personnel. The emergency stop button must then be reset before continuing operation. Note that the emergency stop button reset procedure may be different for different devices - refer to individual product manuals for more details.**

Safety instructions during maintenance

- **Maintenance and repairs to the hoist must only be carried out be competent and trained personnel.**
- **Only use original Kinesys parts when replacing components, including all fixings such as nuts, washers and screws.**
- **Do not modify or attempt to repair the hoist in any way other than those described in the maintenance procedures within this manual. If a hoist needs repair work done beyond what is described in this manual, contact Kinesys or your supplier to arrange a repair.**
- **Always disconnect the power and remove the load when carrying out maintenance procedures, unless instructed otherwise in this manual.**
- **Make sure the maintenance area is secure before carrying out maintenance work.**

2.3 Visible damage

If any damage or breakages are detected during operation or during hoist tests, do not operate the hoist until it has been repaired and a qualified person has checked and approved it.

2.4 Spare parts

Only original fixing components, spare parts, and accessories listed in the manufacturer's spare parts catalogue are acceptable for use. The manufacturer's guarantee is given for those spare parts only. The manufacturer cannot be held responsible for any damages due to the use of non-original parts or accessories.

Use the original 7.9 x 21.8 mm chain of the manufacturer only. Different sized chains are not permitted. The original chain meets the stress and service life standards required for this hoist.

2.5 Operating environment

The Apex Hoist 500 Servo is designed for indoor use only and to work in ambient temperatures between 5°C and 40°C (41°F and 104°F). The humidity of the environment must not exceed 90%.

The storage temperature range of the Apex Hoist 500 Servo extends to between -20°C and 80°C (-4°F and 175°F).

The ingress protection rating for the Apex Hoist 500 Servo is IP55 (protected from low water jets from any direction; limited ingress protection).

2.6 Handling and storage

Condensation

The Apex Hoist 500 Servo is designed for indoor use only. If the product has been exposed to temperature fluctuations, for example during transport, there may be a risk of condensation which may result in damage. Do not connect the Apex Hoist 500 Servo to a power source immediately. Leave the unit disconnected until it has reached a safe temperature

Shocks

Do not shake, knock or drop the Apex Hoist 500 Servo. Avoid excessive force when installing and operating the product.

Handling

Do not lift the Apex Hoist 500 Servo by any of its cables or connectors as this may cause damage to the unit and/or the cables; use the transportation handles instead.

Packaging

Where possible, use the original packaging to transport the Apex Hoist 500 Servo. Alternatively, a purpose-made flight case may be used (available separately).

3. Product overview

3.1 Permitted hoist configurations

- Single-reeved chain hook configurations are permitted on this hoist. Double-reeved chain hook configurations are not compatible or permitted.
- Standard "motor-up" mode is permitted on this hoist. Inverted "motor-down" mode is not permitted.

3.2 External hoist features

Note: The figure below shows a shortened load chain for illustration purposes.

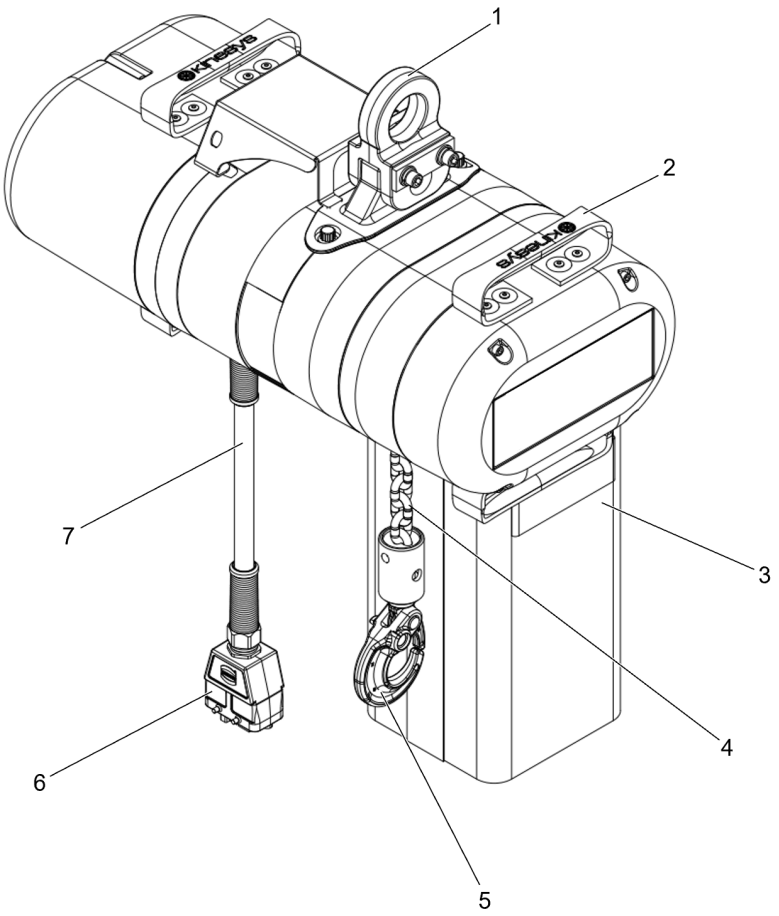


Figure 1. External hoist features

Item #	Description	Notes
1	Suspension eye and load cell assembly	Used for attaching the hoist to other structures
2	Carry handles (x4)	Must be used in order to manually lift hoist safely
3	Chain bag	Used for storing chain that has passed through the hoist
4	Load chain	Maximum length - 31 m
5	Chain hook	Load attachment point - latch lock design
6	Harting connector	Connects to Apex Drive
7	Power and data cable	

3.3 Hoist end covers

For some maintenance procedures, the end covers of the hoist may need to be removed. In this manual, the two end covers are referred to as the "brake end cover" and "motor end cover". The brake end cover can be identified as the longer of the two end covers.

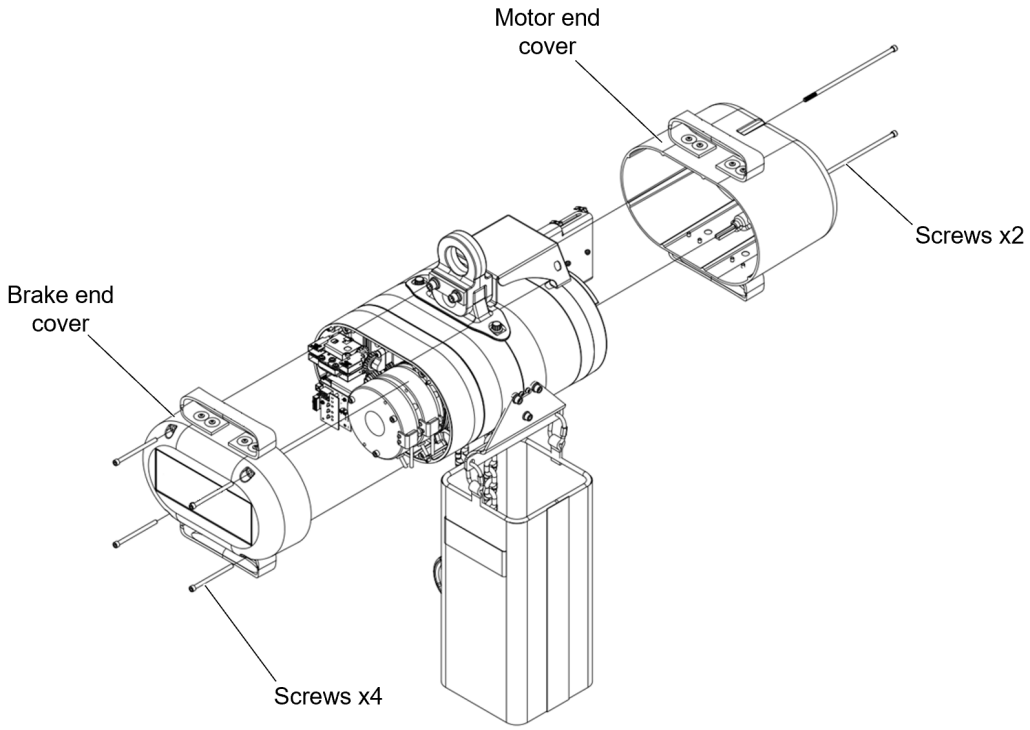


Figure 2. Hoist end covers

3.3.1 Removal

To remove either of the end covers, unscrew the screws that hold the cover in position on the hoist using a hex key and carefully slide the cover away from the main body. Note that the motor end cover has two screws and the brake end cover has four.

3.3.2 Installation

To install an end cover, slide the cover over the main body and install the screws to their original positions. Tighten the screws with the hex key to a torque of 5.7 – 6.8 Nm.

When installing the end covers, make sure no cables become trapped between the covers and main body.

3.4 Brake end components

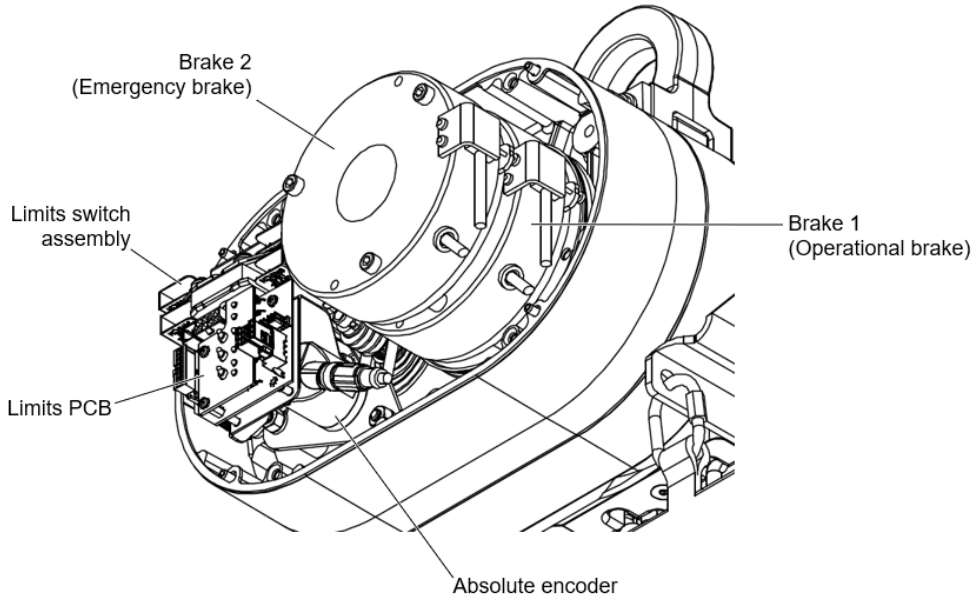


Figure 3. Brake end components

3.5 Internal hoist components

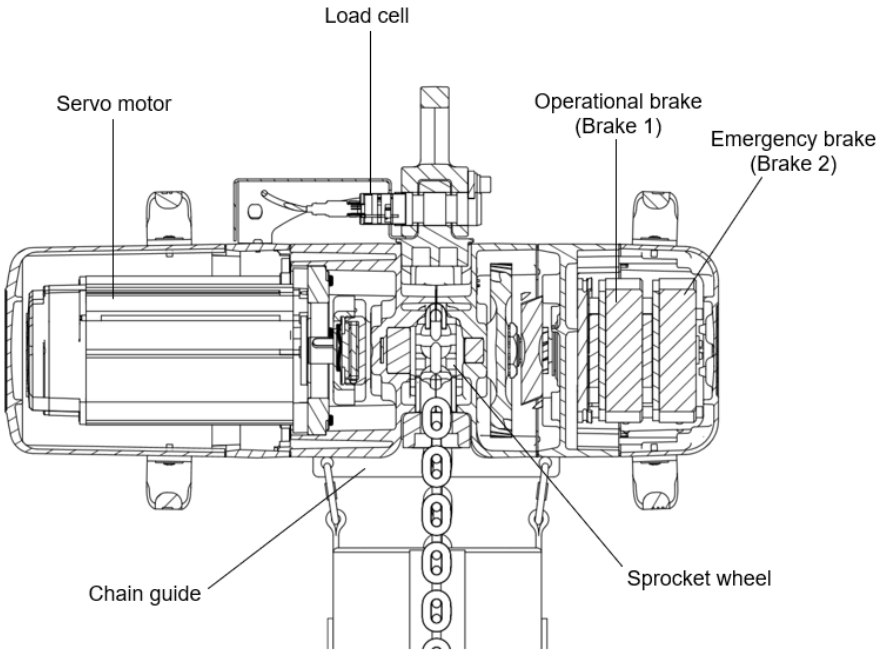


Figure 4. Internal hoist components

3.6 Load chain mechanism and components

Note: The figure below shows a shortened load chain for illustration purposes.

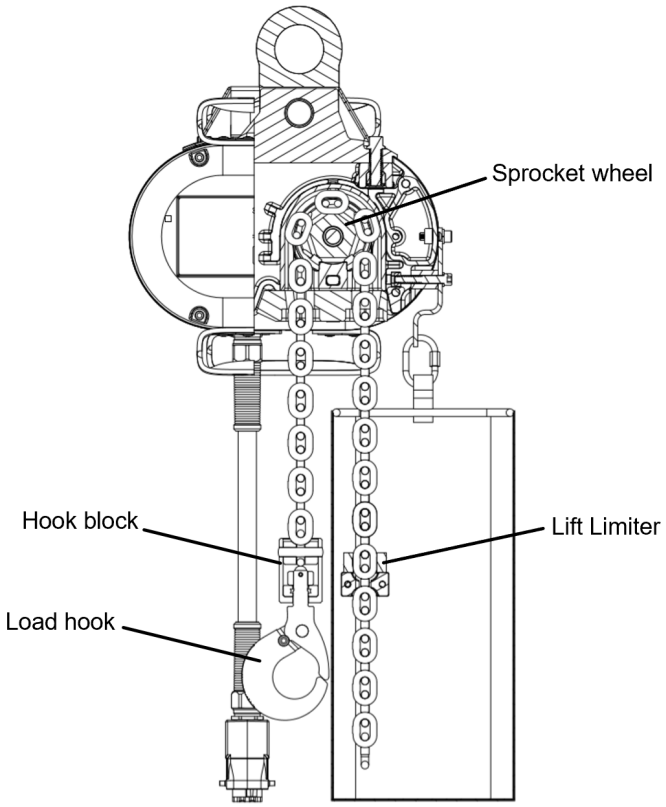


Figure 5. Load chain mechanism and components

3.6.1 Chain bag

Different chain bag designs are available, as shown below. Both types attach to the same mounting bracket on the side of the hoist.

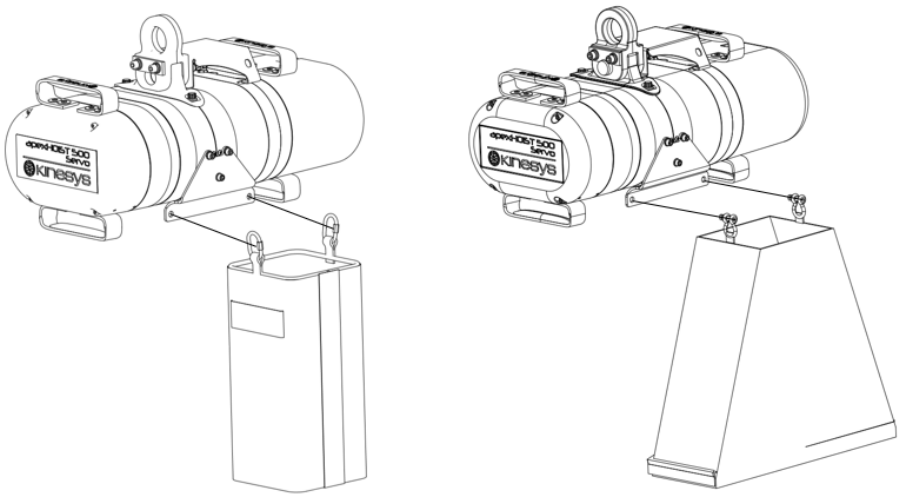


Figure 6. Chain bag options

The chain dimensions and capacity are always shown on the side of the chain bag.

Make sure the chain bag is big enough for the length of chain and do not overfill the chain bag. The chain must fill less than 50% of the chain bag when the hook is fully retracted. There must not be any possibility for the chain to spill due to lack of capacity.

3.7 Chain hook

The chain hook is the point of attachment for all loads onto the hoist. It conists of a hook block, which houses the last link in the chain, and a latch lock hook mechanism for securely attaching the load. The latch lock design is a safety feature that prevents the hook from inadvertently opening.

To open the hook, push the spring-operated release button; this will then allow the latch to be pushed away from the tip. To close the hook, operating the release button is not required. Simply push the latch closed with your hand and make sure it fully aligns with and touches the tip.

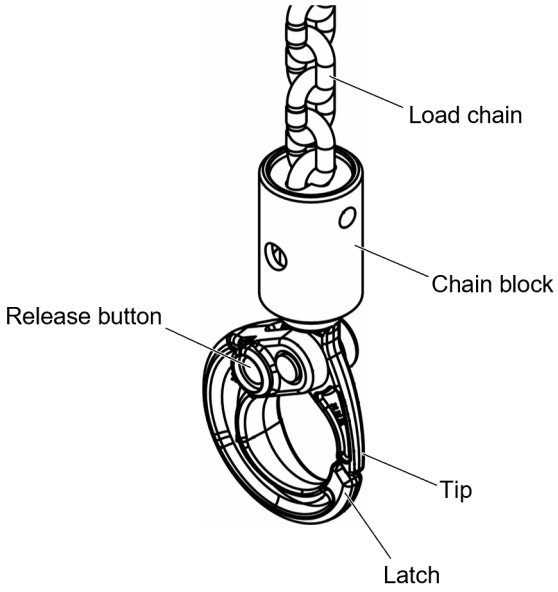


Figure 7. Chain hook components

3.8 Lift limiter

The lift limiter is a safety device installed onto the dead end of the load chain that prevents the chain from leaving the hoist. This end of the load chain must be placed at the bottom of the chain bag.

It comprises two halves that are held together around the load chain links using screws, locking washers and nuts, and a polyurethane stop block above the main body to prevent damage to the hoist body in the unlikely event of contact.

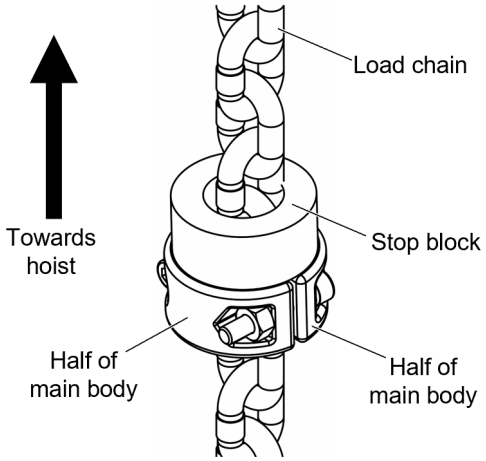


Figure 8. Lift limiter components

3.9 Hoist suspension and load cell

The suspension assembly consists of the Primosensor load cell and suspension eye.

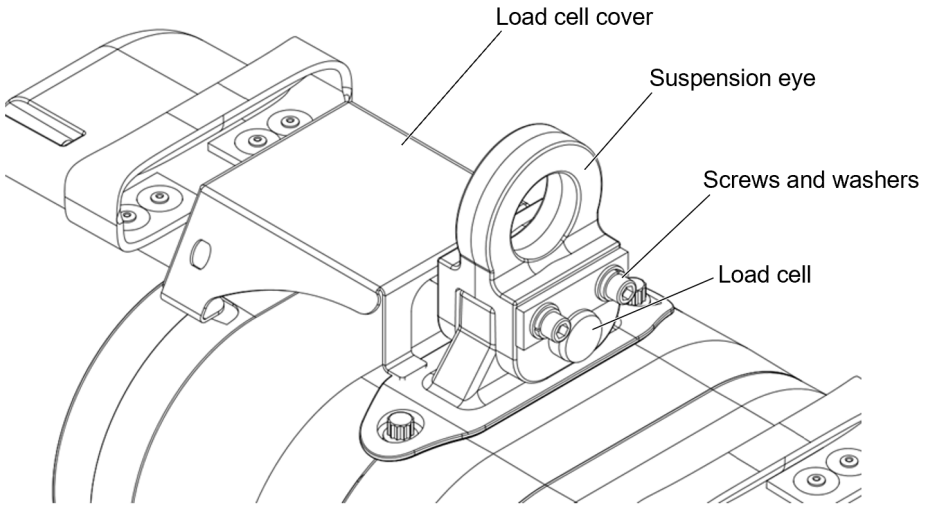


Figure 9. Hoist suspension and load cell

3.10 Encoders

The motor encoder is located on the servo motor at the motor end of the hoist and is used to transfer information on the motor's speed to the Apex Drive in order to maintain the correct speed.

The SSI absolute encoder is mounted underneath the limits assembly at the brake end of the hoist and is used to monitor the speed and position of the load chain.

3.11 Duty cycle of an electric chain hoist

The duty cycle of the Apex Hoist 500 Servo is 50% and is limited by the permissible degree of heat in the lifting motor and other electrical components. However, a 100% duty cycle is achievable with the addition of optional hoist fan cooling.

The allowable running time is dependent on the lifting height, lifting speed and the load.

The Apex system monitors the operating conditions of the hoist and logs usage, enabling the service life to be maximised. This active control allows the hoist to be operated safely within its limits as the control will provide warnings when a cooling interval is required.

4. Installation

Warning! Observe all safety instructions listed in section 2.2 before installation of the hoist.

Warning! The electrical installation must be carried out by suitably qualified personnel. The equipment must first be disconnected from the mains power supply and secured against unauthorized application of mains power.

4.1 Connecting the hoist to Apex Drive

The Apex Hoist 500 Servo has a nominal 400V. This is factory set to match the supplied Apex Drive controller. However, 400V hoists can also be controlled by a 480V Apex Drive v2 NAV.

The hoist power and data cable must be connected to the Harting connector on the rear panel of the Apex Drive. The connection to the Apex Drive is made using a Harting modular connector with two locking levers.

When installing, check the orientation of the connector and socket - the connector can only be inserted one way. To prevent accidental disconnection, make sure both locking levers are secured after making the connection.

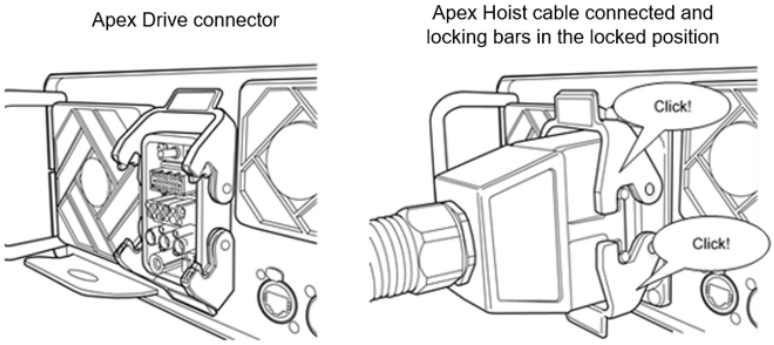


Figure 10. Apex Drive connection

4.2 Chain bag installation

Make sure the chain bag has enough capacity for the new length of load chain - the chain dimension and bag capacity are shown on the chain bag label.

1. Use the Apex Drive in Local mode and run the chain DOWN until the lower initial limit is reached. This means the shortest length of chain possible (without bypassing limits) is visible at the dead end.
2. Attach the chain bag to the bracket by inserting the connectors to the two attachment holes in the bracket - no other fixings are necessary.

3. Use the Apex Drive in Local mode and run the chain UP to its upper initial limit so that the chain passes through the hoist and into the bag. Make sure there are no twists or knots in the chain as it enters the bag.
4. Make sure that the chain fills less than 50% of the bag when the chain has reached its upper initial limit.

4.2.1 Oversized load chains

If the total chain weight is more than 25 kg, the strain of the chain bag must be relieved with a special textile strap. This must be provided by the end-user as the installation conditions are unknown.

5. Operation

The load chain must be properly lubricated before initial operation and at regular 3 month intervals thereafter - refer to section 8 for details.

5.1 Hoist control methods

Movement of the hoist can be initiated in different ways:

- Simple up and down commands can be initiated using the front panel buttons and display on the Apex Drive or a remote hand-held controller / pendant.
- More complex sequences of moves and cues can be programmed using Kinesys or TAIT software applications.

This manual covers the operation and maintenance of the Apex Hoist 500 Servo only. For more details on the different methods of control within the Apex system, refer to the Apex Drive manual as well as the relevant console manuals.

5.2 Safety advice

Safety instructions during operation

- **If you notice any unexpected or dangerous hoist movement during operation, press the appropriate emergency stop button (either on the connected Apex Drive or on a venue-wide safety controller) to bring all movement to an immediate stop. Note that not all emergency stop buttons in the system necessarily stop the movement of a particular hoist. Alternatively, if an enabling switch is used in the system, then release the enabling switch.**
- **Where emergency stop buttons are used which do not cover the entire installation, familiarize yourself with the operation span of each emergency stop device prior to operating any equipment.**
- **If an enabling switch is used in your system to initiate movement of the hoist, be aware that releasing it may cause movement to stop abruptly.**
- **After an emergency stop button has been pressed, the reason for its actuation must be found, and all possible failures in the system removed by trained personnel. The emergency stop button must then be reset before continuing operation. Note that the emergency stop button reset procedure may be different for different devices - refer to individual product manuals for more details.**

5.3 Limits

Four different types of limit have been programmed into the hoist during manufacture using the Stromag limit switch box. These are as follows:

Limit	No. of chain links
Initial UP (BO/UO)	22 between hook and hoist body
Ultimate UP (NO/UE)	5 between hook and hoist body
Initial DOWN (BU/LO)	36 between lift limiter and hoist body
Ultimate DOWN (NU/LE)	19 between lift limiter and hoist body

5.3.1 Initial limit

The UP Initial limit is reached when 22 links can be seen between the top of the hook block and the body of the hoist. The DOWN Initial limit is reached when 36 links can be seen between the top of the lift limiter and the body of the hoist. When an Initial limit is reached, the limit switch will stop movement in that direction and the hoist may then be moved in the opposite direction away from the limit using the standard controls.

5.3.2 Ultimate limits

The UP Ultimate limit is reached when 5 links can be seen between the top of the hook block and the body of the hoist. The DOWN Ultimate limit is reached when 16 links can be seen between the top of the lift limiter and the body of the hoist. When an Ultimate limit is reached, the limit switch will stop movement. However, movement is not possible using the standard controls until the limit switch is bypassed. This can only be done using the bypass switches on the limit switch.

If the load chain needs to be replaced, the operating and ultimate limits must be reset using the limit switch - refer to section 7.5 for details.

6. Inspection

6.1 Regular inspection schedule

The following minimum intervals are recommended for hoist inspections. However, these may be shortened if the hoist is subject to adverse operating conditions on a regular basis such as high duty cycles or extreme temperature environments.

	Minimum inspection interval		
Check	**Weekly**	**Quarterly**	**Yearly**
Visual inspection of the hoist's general condition (wear, deformation, cracks, rusting)	X		
Functional check of the double brake		X	
Functional check of the brake circuits		X	
Functional check of the limit switches		X	
Visual inspection of the load chain		X	
Visual inspection of rubber buffers (hook block and lift limiter)		X	
Visual inspection of the chain hook		X	
Functional check of the load cell		X	
Visual inspection on the condition of the chain bag (particularly wear of the textile material)		X	
Inspection of the brake air gap			X
Visual inspection of all screws			X
Visual inspection of the chain guide			X
Visual inspection of the hoist cable tail			X

6.2 Functional check of the double brake

1. Attach a nominal load to the hoist.
2. Raise the load to a suitable height where the brake behaviour can be observed during lowering.
3. Run the load downwards and then stop movement, either by releasing the button / enabling switch or pressing the emergency stop button. Make sure the load stops smoothly without any unexpected noise and that the length of travel after stopping does not exceed two chain link lengths.

6.3 Functional check of the brake circuits

This functional check ensures that each brake operates independently and can hold the attached load if the other fails.

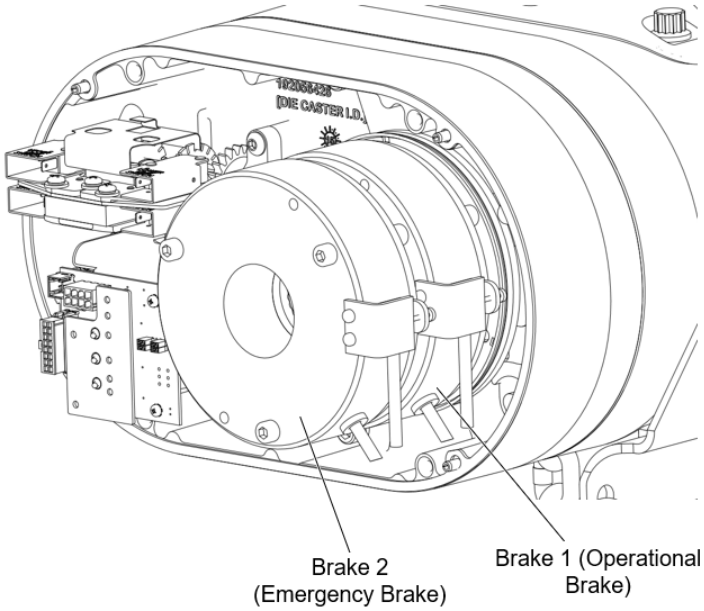


Figure 11. Brake assembly

Note: the following procedure requires the use of Apex Monitor software (v10 or later). Contact Kinesys for details.

6.3.1 Static load test - Brake 1

1. Attach a load of 625 kg (125% x ELL) to the hoist.
2. Open Brake 2.
3. Hold this load for 60 seconds and verify there is no slipping.
4. Close Brake 2.

6.3.2 Static load test - Brake 2

1. Attach a load of 625 kg (125% x ELL) to the hoist.
2. Open Brake 1.
3. Hold this load for 60 seconds and verify there is no slipping.
4. Close Brake 1.

6.3.3 Brake opening times test

Use the feedback monitoring screen in Apex Monitor to record the maximum open and close time of Brake 1 and Brake 2. The value should be between 190 and 200 ms.

6.4 Inspection of the brake air gap

Under normal circumstances, the brake microswitch gap should not be adjusted from the factory settings. Consult Kinesys before making any changes.

The double brake assembly is designed for long term usage and under normal circumstances the air gap should not deviate from the correct value and should not need to be changed.

The air gap between the armature disk and coil carrier should always be between 0.2 and 0.5 mm. This is the factory setting and ensures correct functionality of the brakes when energised and de-energised.

To inspect the air gap, insert a range of feeler gauges into the air gap on both brake 1 and brake 2. Insert the feeler gauges at different points around the circumference of each brake. Make sure the air gap is within the permissible range of 0.2 to 0.5 mm.

If the air gap is outside the permissible range, contact Kinesys to arrange repair or to have a new brake assembly sent. For instructions on how to replace the brake assembly, refer to section 7.6.

6.5 Visual inspection of the load chain

Regular checking of the load chain is compulsory in order to prevent accidents. The load chain must be inspected before first operation and approximately every 200 operating hours or 10,000 load cycles thereafter under normal conditions.

Check every link in the load chain, particularly at their points of contact, for wear, cracks, deformation and other damage.

If certain sections of the load chain are subject more stresses than others (such as the section that passes regularly through the sprocket wheel) then pay particular attention to those sections during inspection.

6.5.1 Load chain deformation inspection

The load chain must be replaced if:

- The thickness of any link has reduced by 10% or more.
- An individual chain link has elongated by 5% or more.
- A section of eleven chain links has elongated by 2% or more.

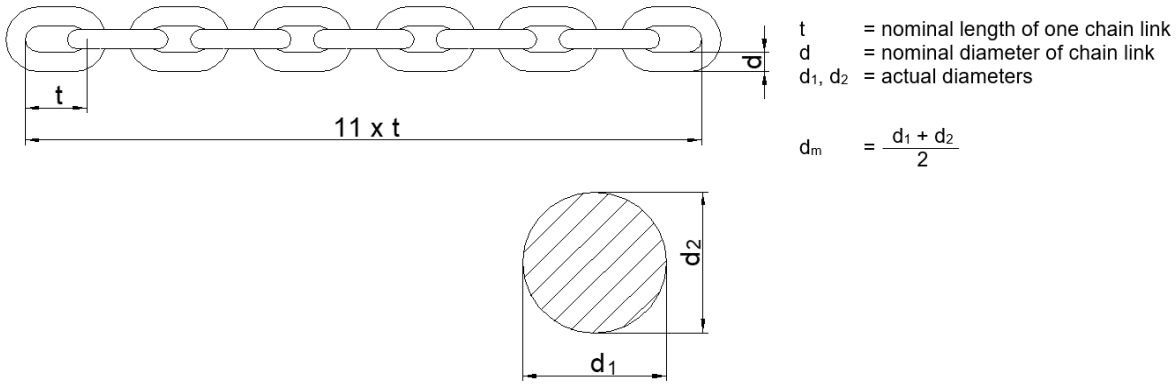


Figure 12. Load chain dimensions

Chain link dimension	Symbol	Value (mm)
Nominal diameter	d	7.9
Minimum allowable wear diameter	d_m	7.1
Nominal length of one link	t	21.8
Maximum allowable elongated length of one link	t_{max}	22.9
Nominal length of eleven links	11 x t	239.8
Maximum allowable elongated length of eleven links	$(11 \times t)_{max}$	244.6

To replace the load chain, refer to section 7.

6.6 Functional check of the load cell

Attach a load of known mass to the hoist and run the chain upwards so that it is suspended in the air. Make sure the value displayed on the software matches the nominal mass of the load.

If the load cell fails the inspection, replace the load cell in accordance with section 7.7.

7. Maintenance

This section explains how to replace certain components of the hoist as well as other important maintenance procedures.

Safety instructions during maintenance

- **Maintenance and repairs to the hoist must only be carried out be competent and trained personnel.**
- **Only use original Kinesys parts when replacing components, including all fixings such as nuts, washers and screws.**
- **Do not modify or attempt to repair the hoist in any way other than those described in the maintenance procedures within this manual. If a hoist needs repair work done beyond what is described in this manual, contact Kinesys or your supplier to arrange a repair.**
- **Always disconnect the power and remove the load when carrying out maintenance procedures, unless instructed otherwise in this manual.**
- **Make sure the maintenance area is secure before carrying out maintenance work.**

7.1 Replacement of the chain hook

The chain hook assembly must be replaced if any of the following conditions are found:

- Excessive damage, corrosion or rusting to the chain hook or hook block
- Excessive damage or wear to the rubber buffer at the top of the hook block
- The latch lock mechanism is deformed or not closing fully

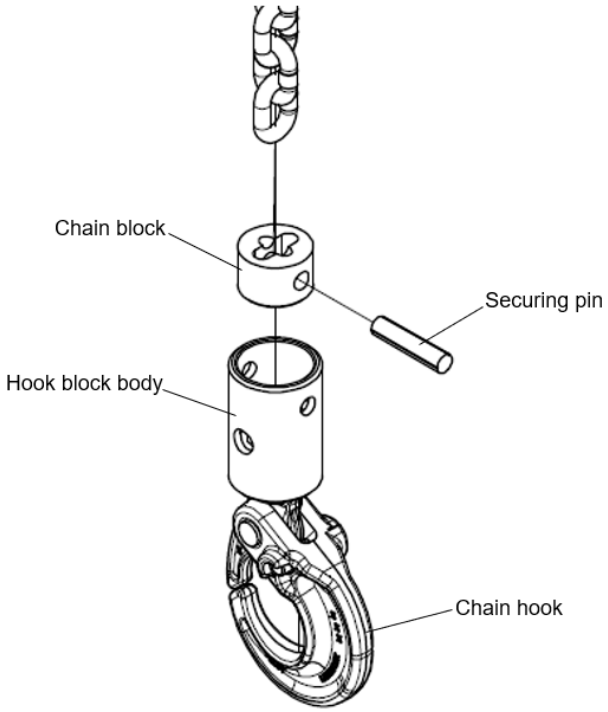


Figure 13. Chain hook replacement

The chain block is where the last link of the load chainis installed, and is held inside the hook block body with a securing pin. Removing and installing this pin requires a V-block, drift and hammer. The drift must be approximately the same size as the pin diameter (9.52 mm). The pin is a tapered groove pin and can only be removed and installed in one direction. The two ends of the pin differ in appearance and size in order to ensure correct assembly: the larger end has three grooves around the edge and the smaller end is flat with no grooves.

7.1.1 Removal

1. Secure the hook block body into a V-block. Then lightly tap the non-grooved smaller end of the securing pin using a drift and hammer until it has been pushed out of the other side.
2. Once the securing pin is removed, the chain block and last link of the chain can be released from the hook block body.

7.1.2 Installation

1. Determine which of the two holes in the hook body is the largest and secure the hook block body in the V-block with the larger hole facing up.
2. Determine which of the two holes in the chain block is largest. Insert the last link of the chain in the slot of the chain block and then insert the chain block, with the large hole on top, into the hook block body so that the two large holes align.
3. Insert the small end of the securing pin in the hole. Push the pin by hand until it stops and use the hammer and drift to hit the large end of the pin until both ends are flush with the outer surface of the hook block body.

7.2 Replacement of the lift limiter

The lift limiter must be replaced if any of the following conditions are found:

- Excessive damage, corrosion or rusting
- Excessive damage or wear to the polyurethene stop block at the top of the lift limiter

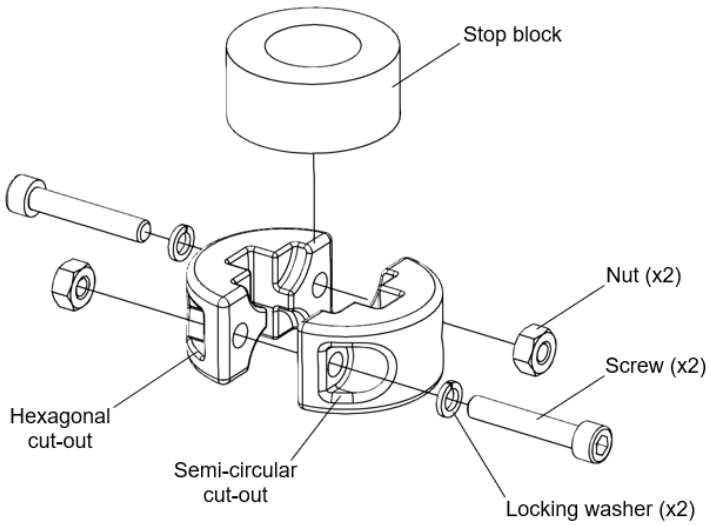


Figure 14. lift limiter replacement

7.2.1 Removal

1. Use a hex key to loosen the two screws that hold the two halves of the lift limiter together.
2. Remove the two screws, two lock washers and two nuts. The two halves will now come apart.
3. Slide the stop block off the end of the chain.

7.2.2 Installation

1. Slide the stop block over the end of the chain past the desired area where the chain stop will be positioned.
2. Place one half of the lift limiter over the chain. Then place the second half over the chain making sure that the semicircular cut-out is aligned with the hexagonal cut-out.
3. Place one nut over the one of the hexagonal cut-outs. Then insert a screw with a locking washer through the semi-circular cut-out on the opposite side and loosely tighten. Do the same thing on the other side of the chain stop. Finally, fully tighten both screw connections with the hex key.

7.3 Replacement of the load chain

Use the original Star (*) grade load chain only (dimensions 7.9 mm x 21.8 mm). Different sized chains or chains made by other manufacturers are not permitted and may cause load loss if used. The original chain also meets the high stress and service life standards required for this chain hoist.

Remove all loads from the hoist before replacing the load chain. Make sure the chain hoist is secure and in a position where the load chain can be safely removed.

After installing a new load chain, make sure it is fully lubricated before operation - refer to section 8 for details.

The load chain must be replaced if it fails any of the inspection criteria listed in section 6.5

7.3.1 Accessing the limits PCB

The load chain replacement procedure requires running the chain beyond its operating and ultimate limits. This can be done by using the limits override switches, located at the brake end of the hoist. When a limit is struck, the appropriate LED on the limits PCB will illuminate.

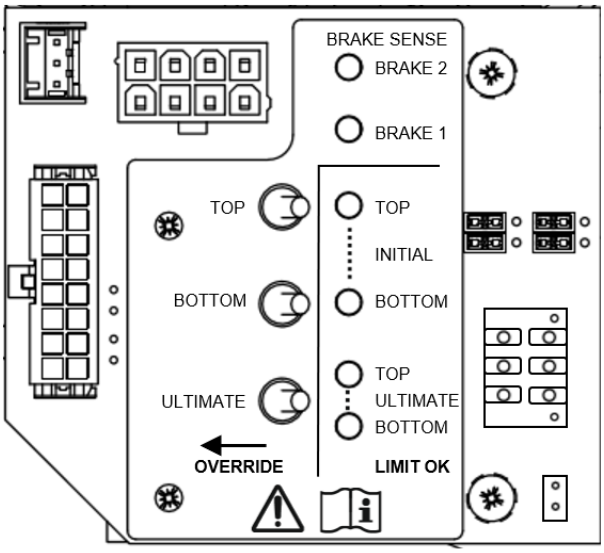


Figure 15. Limits PCB

7.3.2 Removal

1. Run the hoist in the DOWN direction using the Apex Drive in manual mode until the majority of the chain has passed through the hoist and left the chain bag. Remove the chain from the chain bag.
2. Remove the lift limiter from the dead end of the chain - refer to section 7.2.1.
3. Remove the chain hook from the end of the chain - refer to section 7.1.1

4. Continue to run the chain in the DOWN direction using the Apex Drive in manual mode. Once the upper initial bottom limit is reached (36 links), the hoist will stop running and the limits must be overridden in order to continue removing the chain.
5. Gain access to the limits PCB by removing the electronics end cover. With the Apex Drive in override mode, operate both the "Bottom" and "Ultimate" switches and continue to run the chain in the DOWN direction until it has fully passed through the body of the hoist.

7.3.3 Installation without existing load chain installed

This method should be used when there is no existing chain installed to the hoist.

Required item - Pull-in wire (special tool)

1. Insert the pull-in wire through the chain guide cross plate. Push the pull-in wire until the hook on the other side of the chain guide cross plate is visible.
2. Attach the first link of the new chain to the hook that is nearest to the chain bag bracket.

Important: the new load chain must be installed with the weld pattern on the outside of the sprocket wheel as shown in Figure 16.

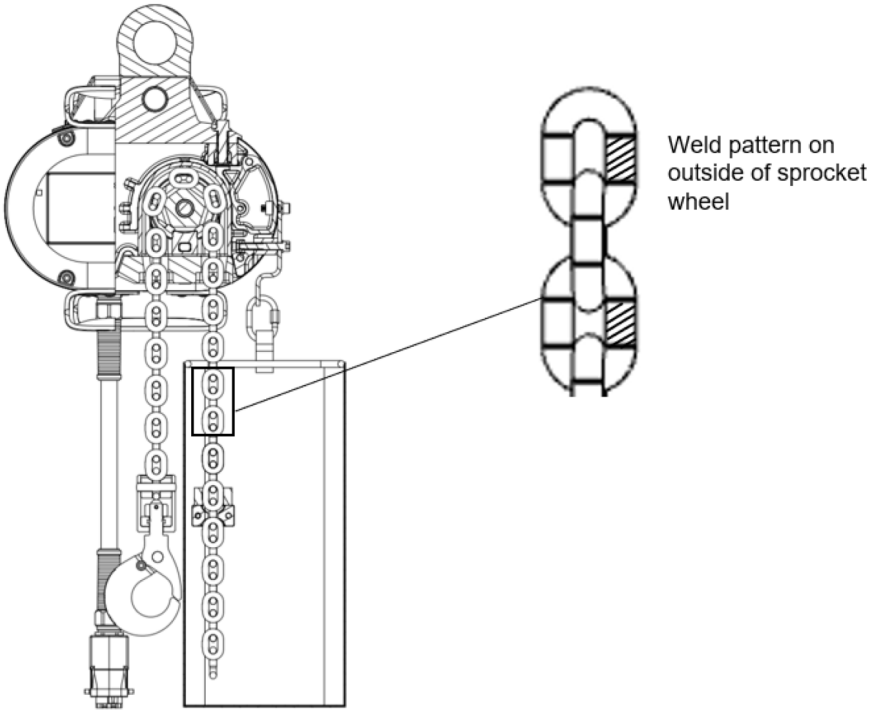


Figure 16. Load chain weld pattern

3. Feed the chain through the hoist by pulling the other end of the pull-in wire. Continue pulling the pull-in wire until at least 0.5 m of chain has passed through the hoist.
4. Remove the pull-in wire from the end of the chain and install the chain hook to that end - refer to section 7.1.2.
5. Attach the lift limiter to the other end of the chain - refer to 7.2.2.

6. Assemble the chain bag to the hoist and install the dead end of the chain into the chain bag.
7. Lubricate the load chain - refer to section 1.2.

Set the zero position of the encoder - refer to section 7.5.

8. Set the top and bottom operating / ultimate limits - refer to section 7.

7.3.4 Replacement with existing load chain installed

This method should be used when an existing chain is already installed to the hoist.

Required item - Cut link (a single chain link with a gap)

1. Run the hoist in the DOWN direction using the Apex Drive in manual mode until the majority of the chain has passed through the hoist and left the chain bag. Remove the chain from the chain bag.
2. Remove the lift limiter from the dead end of the chain - refer to section 7.2.1.
3. Remove the chain hook from the end of the chain - refer to section 7.1.1
4. Attach the cut link to the end of the chain where the chain hook was removed.
5. Attach the new load chain to the cut link.

Important: the new load chain must be installed with the weld pattern on the outside of the sprocket wheel as shown in Figure 16.

6. Run the chain in the UP direction using the Apex Drive in manual mode. Once the upper operating limit is reached (22 links), the hoist will stop running and the limits must be overridden in order to continue.
7. Gain access to the limits PCB by removing the electronics end cover. With the Apex Drive in override mode, operate both the "Top" and "Ultimate" switches and continue to run the chain in the UP direction until the cut link has passed through the body of the hoist.
8. Remove the old chain and cut link.
9. Continue to run the chain in the UP direction until at least 0.5 m of chain is visible on the dead end side.
10. Attach the lift limiter to the other end of the chain - refer to 7.2.2.
11. Assemble the chain bag to the hoist and install the dead end of the chain into the chain bag.
12. Attach the chain hook - refer to section 7.1.2.
13. Lubricate the new load chain - refer to section 1.2.
14. Set the zero position of the encoder - refer to section 7.5.
15. Set the top and bottom operating / ultimate limits - refer to section 1.7.

7.4 Setting the encoder

When installing a new load chain, the encoder's zero position must be reset in order for the hoist's positional data to be recorded accurately.

This procedure requires a number of operations to be performed on the Apex Drive- refer to the relevant Apex Drive manual for details.

This procedure also requires accessing the encoder reset button, located at the electronics end of hoist.

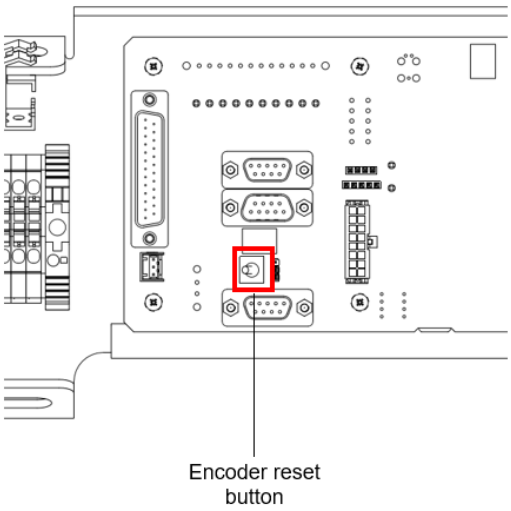


Figure 17. Encoder reset button location

1. A PMT file is must first be installed to the Apex Drive in order to bypass encoder monitoring. Contact Kinesys to obtain the correct version of the PMT file and security password. Once obtained, install the PMT file to the Apex Drive- refer to the Apex Drive manual for details.
2. Remove the brake end cover and electronics end cover to gain access to the limits switch and encoder reset button respectively.
3. Once the new PMT file is loaded, turn the Apex Drive to Override mode. Press the E-Stop on the drive and then release it. You will now have a maximum of 5 minutes to complete the next three steps. If 5 minutes pass, you must press and release the E-Stop again for another 5 minutes of movement.
4. Run the chain in the UP direction using the at a minimum speed. Operate the "Top" and "Ultimate" limit switches and continue to run the chain until the rubber buffer at the top of the hook block touches the body of the hoist.
5. Operate the reset button at the electronics end of the hoist. This action will reset the absolute encoder to a position of 100000 mm (100 m). Make sure this value is shown on the SPLC status screen on the Apex Drive.
6. Reload the original PMT file into the Apex Drive to re-enable normal functionality.
7. Refit the brake end cover and electronics end cover to the hoist.

7.5 Setting the limits

Adjusting the limit switches incorrectly may result in damage to the equipment when limits are reached. This procedure should only be performed by qualified personnel.

The limit switches have been factory set for compatibility with the Apex Drive. Do not use any limit values other than those listed in this manual.

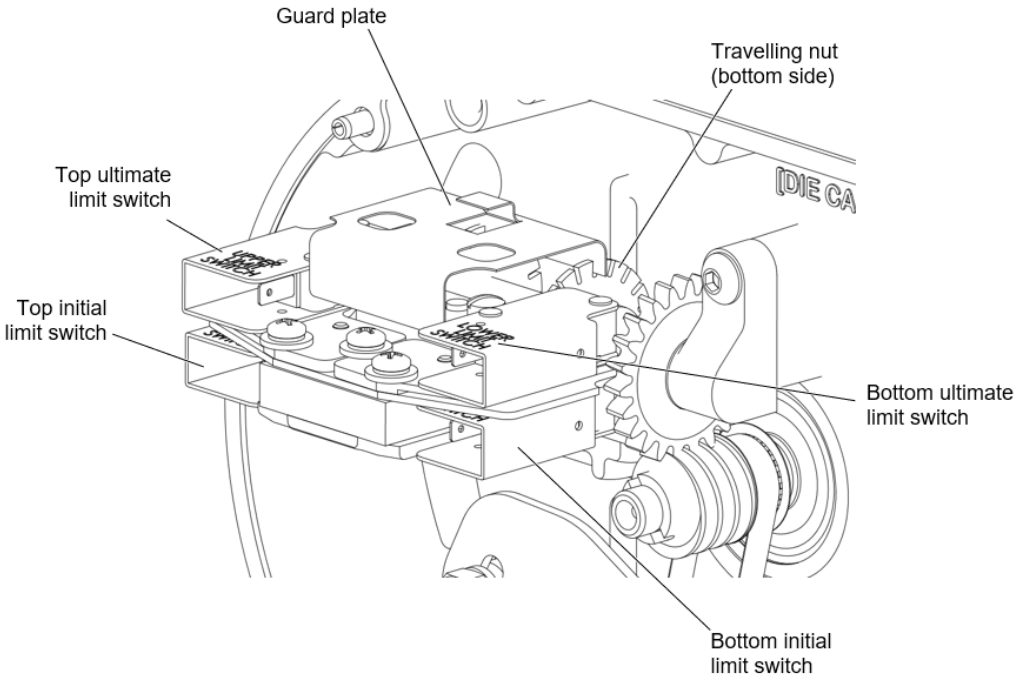


Figure 18. Limit switch assembly

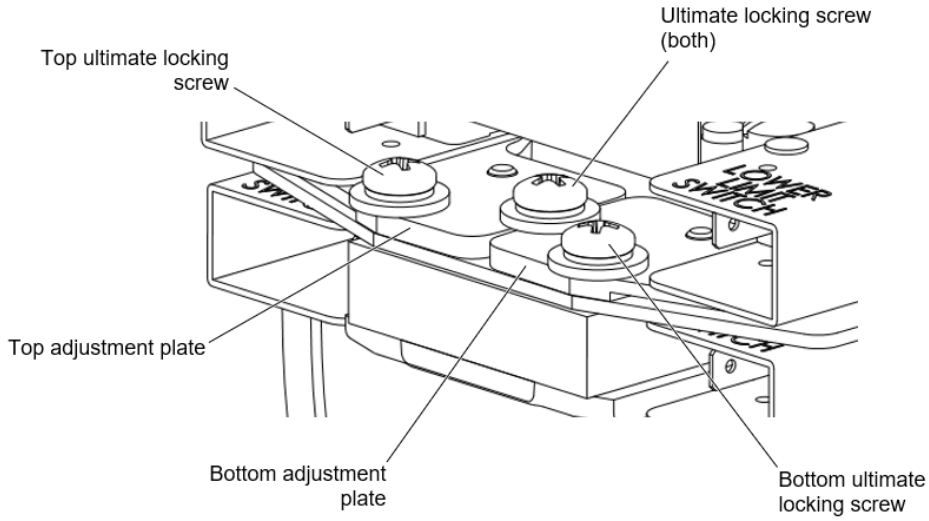


Figure 19. Limit switch assembly

Note: It is recommended to set all four limits together to guarantee correct functionality of the hoist.

Remove the brake end cover to gain access to the limit switch assembly and identify which of the four limits to set:

Limit	No. of chain links
Initial Top	22 between hook and hoist body
Ultimate Bottom	5 between hook and hoist body
Initial Top	36 between lift limiter and hoist body
Ultimate Bottom	19 between lift limiter and hoist body

7.5.1 Setting the Initial Top limit (22 links)

1. Use the Apex Drive in 'Manual' mode to run the chain up to the initial top limit position of 22 links between the hook block and the hoist body.
2. 2. Lift the guide plate (do not remove it) so that the travelling nut closest to the top initial switch is accessible. Rotate the travelling nut until it just breaks the limit switch contacts and an audible click is heard. This is also indicated by the ‘Initial Top’ light on the Limits PCB turning off.
3. Now check that the limit switch has been set correctly. Use the Apex Drive in ‘Manual’ mode to run the chain down and away from the initial limit position. Then run the chain up and make sure the chain stops at the correct position of 22 links between the hook block and hoist body. If the stopping position is incorrect, repeat Step 2.

7.5.2 Setting the Ultimate Top limit (5 links)

1. Bypass the top initial limit by turning the Override key on the front of the Apex Drive.
2. Use the Apex Drive in ‘Manual’ mode to run the chain up to the ultimate top limit position of 5 links between the hook block and the hoist body.
3. Loosen (do not remove) the top ultimate locking screw and the ultimate locking screw (both). Move the top adjustment plate until the ‘Ultimate Top’ light on the Limits PCB turns off. Then re-tighten the two loosened screws.
4. Now check that the limit switch has been set correctly. Use the Apex Drive in ‘Manual’ mode to run the chain down and away from the ultimate limit position. Then run the chain up and make sure the chain stops at the correct position of 5 links between the hook block and hoist body. If the stopping position is incorrect, repeat Step 3.

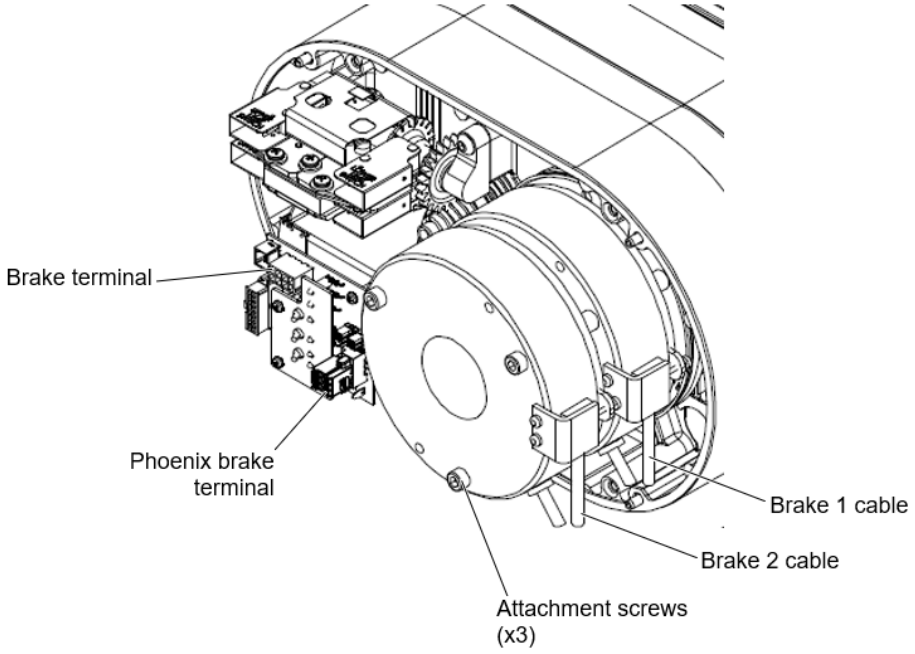
7.5.3 Setting the Initial Bottom limit (36 links)

1. Use the Apex Drive in ‘Manual’ mode to run the chain down to the initial bottom limit position of 36 links between the lift limiter and the hoist body.
2. Lift the guide plate (do not remove it) so that the travelling nut closest to the bottom initial switch is accessible. Rotate the travelling nut until it just breaks the limit switch contacts and an audible click is heard. This is also indicated by the ‘Initial Bottom’ light on the Limits PCB turning off.
3. Now check that the limit switch has been set correctly. Use the Apex Drive in ‘Manual’ mode to run the chain up and away from the initial limit position. Then run the chain down and make sure the chain stops at the correct position of 36 links between the hook block and chain stop. If the stopping position is incorrect, repeat Step 2.

7.5.4 Setting the Ultimate Bottom limit

1. Bypass the bottom initial limit by turning the Override key on the front of the Apex Drive.
2. Use the Apex Drive in ‘Manual’ mode to run the chain down to the ultimate bottom limit position of 19 links between the chain stop and the hoist body.
3. Loosen (do not remove) the bottom ultimate locking screw and the ultimate locking screw (both). Move the bottom adjustment plate until the ‘Ultimate Bottom’ light on the Limits PCB turns off. Then re-tighten the two loosened screws.
4. Now check that the limit switch has been set correctly. Use the Apex Drive in ‘Manual’ mode to run the chain up and away from the ultimate limit position. Then run the chain down and make sure the chain stops at the correct position of 19 links between the hook block and hoist body. If the stopping position is incorrect, repeat Step 3.

7.6 Replacement of the double brake assembly



All assembly and disassembly work on the brake must be done without load and with thw power completely disconnected from the hoist.

7.6.1 Removal

1. Remove the brake end cover.
2. Disconnect the four brake wires (BL/BK) from the brake terminals in the terminal block.
3. Disconnect the six brake wires (BL/BK/WH) from the Phoenix terminal block on the PCB.
4. Unscrew and remove the three long screws from the double brake assembly.
5. Slide the double brake assembly off the main shaft.
6. Discard all the removed double brake assembly as necessary in accordance with local regulaions.

7.6.2 Installation

1. Install the new double brake assembly onto the motor shaft, making sure the cable orientations match that of the removed double brake assembly when installed.
2. Install the three long screws to the holes at the end of brake 2. Tighten the three screws to 5.6 – 6.8 Nm.
3. Connect the six brake wires (BL/BK/WH) to the Phoenix terminal block on the PCB. The Brake 2 wires must be installed on the right side of the connector and the Brake 1 wires to the left side.

4. Connect the four brake wires (BL/BK) to the brake terminals in the terminal block, making sure the larger black looms go behind the PCB. The Brake 2 wires must be connected to the two front terminals and the Brake 1 wires to the two rear terminals.
5. Refit the brake end cover.

Do not operate the hoist until the new brake assembly has been tested in accordance with sections 1.2 and 6.3.

7.7 Replacement of the load cell

Use original manufacturer load cells only. These are designed specifically for this chain hoist.

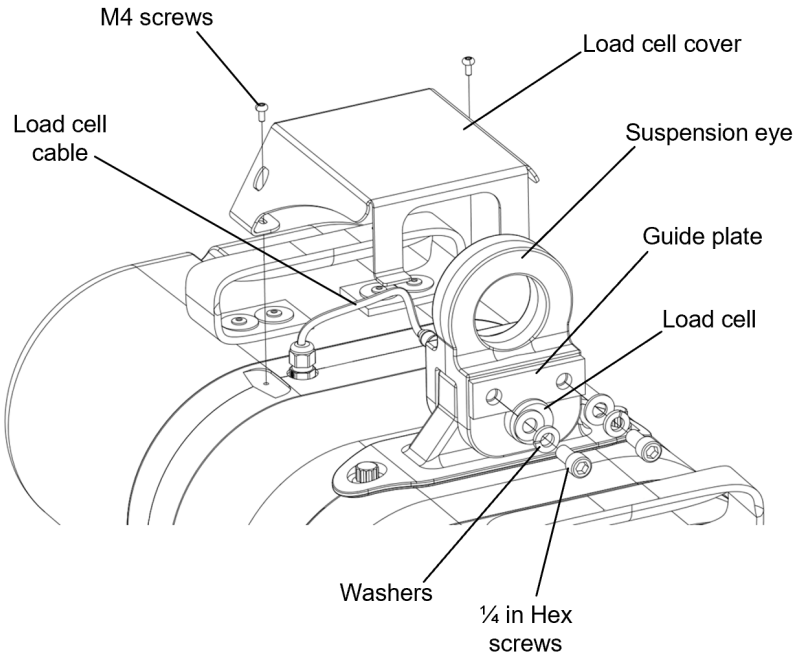


Figure 20. Load cell replacement

7.7.1 Removal

1. Use a hex key to remove the two ¼ in hex screws. Then remove the washers and the guide plate.
2. Remove the two M4 screws and the load cell cover.
3. Unscrew the cable from the load cell.
4. Slide the load cell out from the suspension eye.

7.7.2 Installation

1. Slide the new load cell into the hole of the suspension eye.
2. Screw the end of the load cell cable into the load cell.
3. Install the load cell cover to the top of the hoist and secure with the two M4 screws.

4. Install the guide plate with the semi-circular groove aligned to the top of the load cell and secure with the washers and two ¼ in hex screws.

8. Lubrication

8.1 Regular lubrication schedule

The following minimum intervals are recommended for lubrication procedures. However, these may be shortened if the hoist is subject to adverse operating conditions on a regular basis such as high duty cycles or extreme temperature environments.

	Minimum inspection interval	
Procedure	**Quarterly**	**Yearly**
Lubrication of the load chain	X	
Lubrication of the chain hook		X

8.2 Lubrication of the load chain

The load chain must be properly lubricated before initial operation and at regular 3 month intervals thereafter.

Lubricate the entire length of the load chain using a suitable lubricant. Lubricate the chain without a load attached.

8.2.1 Types of chain lubricant

The following lubricants are recommended for lubrication of the load chain, depending on environmental conditions.

The dry-film lubricant is recommended in environments that are more conducive to wear (e.g from sand, grit).

Supplier	Lubricant
Fuchs	Stabylan 2001
Fuchs	Stabylan 5006
Fuchs	CTP D 350
Fuchs	Renolit SO-GFB
Fuchs	Ceplattyn 300 (dry-film lubricant)
Klüber	Klüberoil 4UH 1-1500
Klüber	Klüberoil CA 1-460
Klüber	Microlube GB 00
Castrol	Optimol Viscogen KL300

8.3 Lubrication of the chain hook

Lubricate the anti-friction bearings of the chain hook after approximately 20,000 lifting cycles or at least once a year.

8.3.1 Types of chain hook lubricant

The following lubricants are recommended for lubrication of the chain hook.

Supplier	Lubricant
Fuchs	Renolit Duraplex EP2, EP3
Fuchs	Lagermeister LX EP2

9. Service & End of Life

In the event of a product being considered beyond economic repair it must be disposed of with care and in line with local legislation on disposal of Waste Electrical and Electronic Equipment (WEEE).

In Europe WEEE shall be disposed of in accordance with European Union Directive 2012/19/EU.

In most regions of the world, similar legislation exists to ensure that WEEE is handled separately to maximise reuse of materials and avoidance of landfill.

The parts must be disposed in accordance with the local laws of environment protection. Metals, rubber, plastics must be disposed or recycled separately.

10. Product specifications

Feature	Specification
Power supply	3-phase + neutral + earth, 400V AC, 6A nominal, 10A peak
Motor	Synchronous servo, 50-60 Hz
Connections	Multi-functional Harting connector
Controller	Apex Drive / Apex Drive v2 NAV
Limit switches	Four individually adjustable switches - end of travel and ultimate
Load cell	Integrated SIL3 load cell
Dimensions (H x W x L)	381 mm x 643 mm x 334 mm x (15 in x 25.3 in x 13.1 in)
Weight (excluding chain)	82 kg (180 lbs)
Chain weight	1.4 kg/m (0.94 lbs/ft)
Chain size	7.9 x 21.8 mm
Entertainment Load Limit (ELL)	500 kg (1100 lbs)
Max lift speed	610 mm/s
Reeving options	Single-reeve only
Brakes	Double silent brakes Brake monitoring by proximity sensors
Encoder	Dual encoder: - High resolution EnDat (motor) - SSI absolute (output shaft)
Duty cycle	50% as standard Up to 100% with additional hoist fan cooling
Max Height of Lift	76 m
Ingress Protection	IP55 (protected from low water jets from any direction; limited ingress protection)
Operational temperature	5°C and 40°C (41°F and 104°F)
Storage temperature	-20°C and 80°C (-4°F and 175°F)
Accessories supplied	Chain bag and support, BGV C1 approved Load chain (black finish), length specified on order Hook block, with latch lock mechanism Lift limiter

10.1 Product dimensions

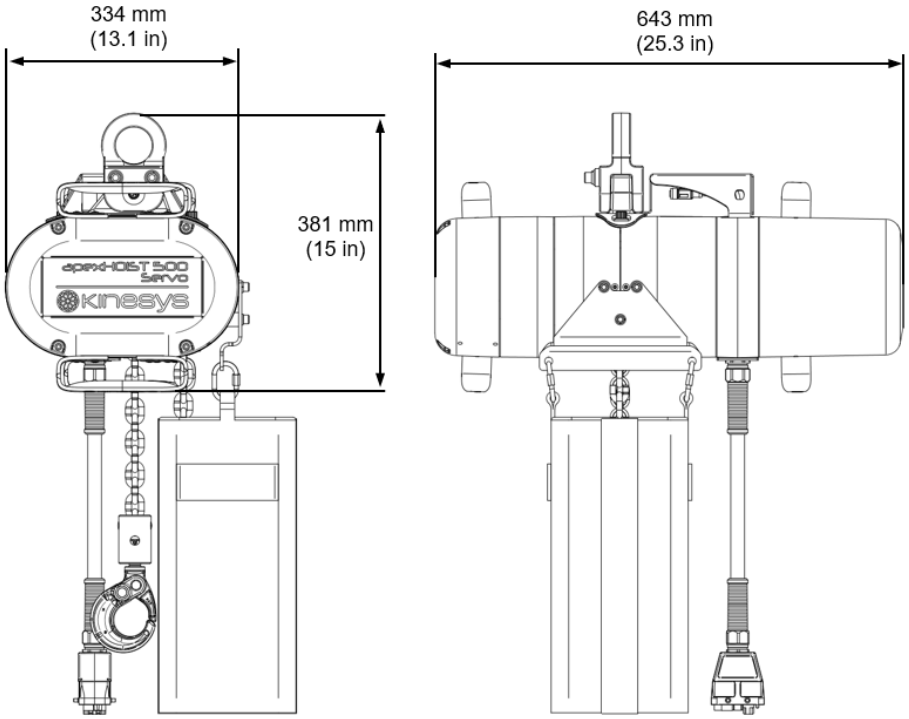


Figure 21. Product dimensions

11. Declaration of Conformity

ORIGINAL

EC Declaration of Conformity

Manufacturer:	Kinesys Projects Limited	
of the address:	Unit 2 Kempton Gate, Oldfield Road, Hampton, Middlesex, TW12 2AF, UK	
in accordance with the following EC directives:	**Machinery Directive**	**2014/30/EU**
	EMC Directive	**2006/42/EC**

declares that the product: **Kinesys Apex Hoist 500 Servo** (when used in conjunction with Kinesys Apex Drive APM-x3-0xxx, APM-x4-0xxx, or APM-x4-1xxx)

with part number: **ACH-42-1050**

is in conformity with the applicable requirements of the following harmonised standards:

EN ISO 12100	**Safety of machinery. General principles for design. Risk assessment and risk reduction.**
EN 60204-32	**Safety of machinery. Electrical equipment of machines. Requirements for hoisting machines.**
EN 14492-2	**Cranes. Power driven winches and hoists. Power driven hoists**
EN 17206-1	**Entertainment technology – Machinery for stages and other production areas – Safety requirements and inspections**
EN 818-7	**Short link chain for lifting purposes. Safety. Fine tolerance hoist chain, Grade T (Types T, DAT and DT)**

and the following standards and technical specifications:

FEM 9.511	**Rules for the design of series lifting equipment. Classification of mechanisms**
FEM 9.751	**Power driven series hoist mechanisms, Safety**

The manufacturer hereby declares that the products named above have been designed to comply with the relevant sections of the above referenced standards. The units comply with all applicable essential requirements of the directives.

In the EU the party authorised to compile the technical file is:
TAIT Netherlands B.V.
Weesperplein 4a, 1018 XA Amsterdam, The Netherlands
In the UK the party authorised to compile the technical file is:
Kinesys Projects Ltd.
Unit 2 Kempton Gate, Oldfield Road, Hampton,
Middlesex, TW12 2AF, UK

Equipment referred to in this Declaration of Conformity was first manufactured in 2020.

D Weatherhead
Managing Director
Hampton, November 2024

The attention of the specifier, purchaser, installer, or user is drawn to special measures and limitations to use which must be observed when these products are taken into service to maintain compliance with the above directives. Details of these special measures and limitations to use are available on request and are also contained in the product manuals.

Kinesys Projects Ltd.
TAIT Technologies UK Ltd.
Unit 5 Langthwaite Road, Langthwaite Grange Ind Estate, South Kirkby, Pontefract, West Yorkshire, UK, WF9 3AP
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