 Contractors & Industrial Supply Co., Inc. Electrode Handling Division 1241 Foster Avenue Nashville, TN 37210 U.S.A. Phone: 615-256-8658 Fax: 615-256-1367 Website: www.electrode-handling.com Email: sales@cisrigging.com	AUTHOR:	CIS	DATE:	11/17/10
	VERSION:	1.0	TITLE:	Metal Lifting Devices For Graphite Electrodes

PRODUCT USE INSTRUCTION

THREADED STEM METAL LIFTING DEVICES FOR GRAPHITE ELECTRODES

PURPOSE

This metal lifting device is utilized for two different functions. 1) Lifting the electrode from horizontal to vertical, and 2) the spin-down at the same thread pitch as the electrode it is joining. These devices are specific to those electrodes using corresponding connecting pin sizes. These pin sizes are standard as established by NEMA and IEC and cannot be used on any electrode other than that specified.

The purpose of this document is to provide guidelines for the proper use procedures of metal lifting devices used to lift graphite electrodes from horizontal to vertical and transport them to and from the electrode holders and/or assembly station. Furthermore, this document will provide instruction on the proper monthly maintenance associated with the metal lifting device.

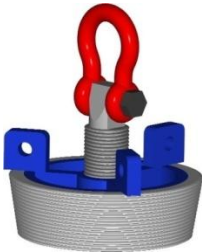
SCOPE

This instruction applies to all metal lifting devices used to lift graphite electrodes or columns of electrodes. It applies to electrodes of various diameters up to and including 32". Care and proper maintenance of these lifting devices (which is outlined within this instruction) is the responsibility of the user.

This information is offered for use by technically qualified personnel at their discretion and risk. This instruction is not to be taken as a warranty or representation for which CIS, Inc. assumes responsibility. It is offered solely for convenience and information of the end user.

DESCRIPTION

CE



Threaded-stem metal lifting devices are used to take an electrode from horizontal to vertical and to add or remove graphite electrodes or columns to and from electric arc furnaces. The most common designs are:

- 1) Threaded stem metal lifting plugs for tapered sockets.
- 2) Threaded stem metal lifting caps for male/female joint systems.

These devices are not designed and /or intended for any other application or use.



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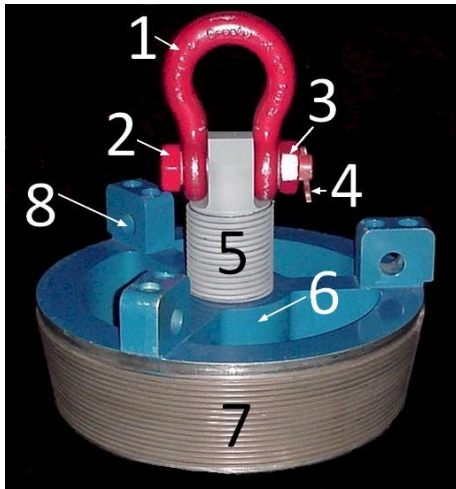
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Note: Metal lifting devices cannot remain on the electrode column during operation due to the thermal expansion of the metal will crack the threads and cavity of the electrode column.




PARTS: (See Diagram Below)

1. Safety Shackle
2. Shackle Bolt
3. Shackle Bolt Nut
4. Cotter Pin
5. Rotating Threaded System
6. Internal Threads
7. Tapered Threads
8. Dog Ears

Threaded-stem lifting plugs and caps are machined from metal castings, burnouts from metal plates, or aircraft grade aluminum for large diameters (for weight reduction). The threaded-stem (5) is rotational so that an electrode can be spun down at the same thread pitch as the electrode it is joining without the metal plug spinning out from the electrode.

Note: Machining tolerances are governed by the National Electrical Manufacturers Association (NEMA). All aspects of the lift plug and lift cap design, manufacturing, use, and disposal must follow NEMA CG3.1-1996, IEC, and ASME B30.20 for "Below-The-Hook" lifting devices.

Metal lifting devices are designed and constructed to withstand the forces imposed by its rated load, with a minimum design safety factor of three (3) based upon material yield strength, for all load bearing structural components. Each metal lifting device is load tested to 200% of its rated capacity. Load test reports are supplied with each lifting device.

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RESPOSIBILITY/AUTHORITY

The Process Engineer is responsible for reviewing and posting this document.

The Furnace Manager, Process Engineer, Crane Operator and Team Members are responsible for following this work instruction and identifying and recording any problems relating to the product, process, and quality system.

The Furnace Manager, Process Engineer, Crane Operator and Team Members have the authority to initiate, recommend, or provide solutions to non-conformities and to suggest continuous improvement activities through designated channels.

NOTE: *This document contains a visual, standardized work instruction that has been posted in the work area. In the event of a process change, the Furnace Manager has the responsibility of ensuring that the most updated version is available to the Team Members and that all outdated materials have been removed from the work area. The hard copy of this instruction is located at the station in the work area. No other copies are authorized.*

DEFINITIONS

Electrode Column – 3 1/3 Electrode sections assembled together

TERMS OF USE

- Responsibility for the use and application of the products rests with the user.
- Failure of the product can occur due to misapplication, abuse, or improper maintenance. Product failure could allow property damage, personal injury or death.
- There are numerous government and industry standards that cover these products made by CIS. This instruction makes no attempt to reference all of them. We do reference the standards that are most frequently questioned.
- Ratings shown in CIS literature are applicable only to new or "in as new" condition products.
- Load limit ratings indicate the greatest force or load a product can carry under usual environmental conditions. Shock loading and extraordinary conditions must be taken into account when selecting



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products for use in a system.

- In general, the products displayed in CIS literature are used as parts of a system being employed to accomplish a task. Therefore, we can only recommend within the Working Load Limits, or other stated limitations, the use of products for this purpose.
- The Working Load Limit (WLL), or Design Factor, or Efficiency Rating of each CIS product may be affected by wear, misuse, overloading, corrosion, deformation, intentional alteration, and other use conditions.
- An inspection must be conducted to determine whether use can be continued at the indicated Working Load Limits, a reduced Working Load Limits, or whether the product must be withdrawn from service.
- CIS products generally are intended for tension or pull. Side loading must be avoided, as it exerts additional force or loading which the product is not designed to accommodate.
- Welding CIS load support parts or products can be hazardous. CIS should be consulted prior to any welding or modification of products.
- The recommended Proof Load on all CIS items is 2 times the Working Load Limit unless otherwise shown.
- Use only new genuine CIS parts as replacements when servicing or repairing CIS products.
- CIS products are to be considered as “sparking” with materials that can emit mechanical sparks that possess heat levels high enough to ignite most flammable or combustible materials unless noted otherwise.
- CIS products can conduct electricity and are NOT insulated from electrical shock or arc flash.

OPERATIONS/PROCEDURES



Note: Any repairs or modifications to the metal lifting device must be performed by the manufacturer, CIS Inc. Use of any metal lifting device that has any modifications or repairs, not performed by CIS Inc., will result in the user assuming all risk, responsibility, and liability for the device's performance and safety.

It is imperative that the Crane Operator and Team Members be well versed in this device, its operations and function!



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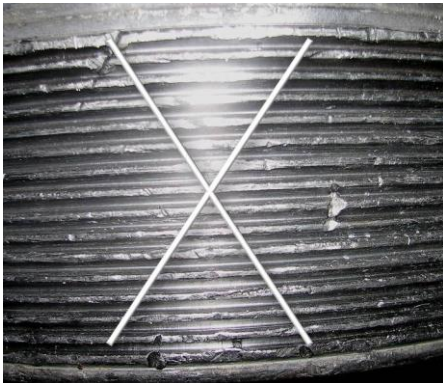
PRODUCT USE INSTRUCTION

STEP 1:



Prior to each use the metal lifting device must be visual inspected for any deficiencies.

- Any damage to the master link, connecting link, safety shackle, threaded stem or plug (including missing, chipped, or worn threads) could cause the device to fail and drop the electrode or column.
- Any chips, dents or burrs in the metal threads can strip and weaken the electrode threads causing the column to drop and/or reduce electrode performance.
- Always check to ensure that the safety shackle cotter pin is installed at all times.
- Check the lateral (side to side) movement of the stem to ensure the internal threads have not sustained excessive wear. The original machining tolerance of the two parts allows for approximately 1/16" of movement. 1/8" would constitute excessive wear.



When visual damage or deficiency is discovered, remove device from service and notify supervising authority. **Safety and care must be exercised at all times when using metal lifting devices.**

STEP 2:

Note: *The entire assembly and socket of electrode should be blown off with a compressed air hose before each use as to remove any debris from the components that may potentially damage the threading system.*



After removing any excess debris from components, carefully insert the metal lifting device into the socket of the electrode. Do not ram or bump the device into the socket as this may damage the threading of the electrode socket. Before threading the device down, rotate the device counter-clockwise until the threads reinitiate into the socket of the electrode. This process will "seat" the device properly and prevent



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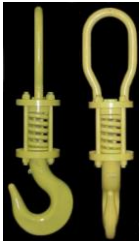
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cross-threading. **(NEVER use a cross-threaded electrode!)** After the device has been properly “seated”, tighten it down and ensure it is secure.



Note: When inserting the lift plug into an electrode socket, the threaded stem must not extend more than 1/3 above the top of the plug or cap. This is to avoid damaging the stem and possibly the electrode while lifting loads from the horizontal position.

Note: Install any cushioned lifting devices upon crane hook prior to engaging the metal lifting device with the crane hook. – **Always use cushioned lifting devices to absorb shock loads during lifting and setting of electrodes and columns.**



Warning: Due to the non-existence of positive safety latches on the crane hook, the electrode column has the potential of becoming a serious hazard if the column becomes disengaged during the lift.

Crane Operator must be skilled and efficient to properly maneuver these electrodes safely! - **Please review ASME B30.17.3 on operator conduct (Appendix A).**

STEP 3:



Note: Before lifting the column from the storage area and transporting the electrode column to the furnace, **ALWAYS** be sure that the deck area is clear of all personnel.

Engage the device with the crane hook (and cushioned lifting device) and slowly take up any slack in crane wire rope. Carefully lift the electrode to the vertical position and transport it to the electrode column assembly station (off-furnace assembly) or to the furnace (on-furnace assembly) for further electrode column assembly (read warning below).



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Warning: Due to the absence of positive safety latches on the crane hook, the electrode column has the potential of becoming a serious hazard if the column becomes disengaged during the lift.

Crane Operator must be skilled and efficient to properly maneuver these electrodes safely! - **Please review ASME B30.17.3 on operator conduct (Appendix A).**

STEP 4:



Note: Before further electrode assembly, make sure the "Rotating Threaded Stem" is completely lowered to ensure maximum spin-down distance.


Once electrode has been transported and is ready for addition, slowly lower electrode towards existing column. Using the wishbone spacer, set the gap between the electrodes at approximately 1"-1 1/4". *Do not ram or bump the electrodes together as doing so can damage threads.* Begin the spin-down of the electrode (by hand, chain wrench, or torque device) until the electrodes are firmly secured and the end faces are joined. The metal plug and the electrode are the only components in the assembly that should be spinning at this time.

STEP 5:



After electrodes have been properly torqued by the use of a wrench or a torquing device, the metal lifting device must be removed before operation of the furnace resumes. To remove the device, unscrew the plug counter-clockwise and fully disengage all threads from the electrode socket. Guide the lift plug carefully out of the socket to avoid damaging any threads. *Do not loosen the lift plug from the electrode socket by hammering on the plugs "Dog Ears"*

Note: Due to conflicting thermal expansion rates, the electrode will be damaged by the metal plug in the event the metal plug remains in the column during operation.

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REQUIRED MONTHLY MAINTENANCE

Monthly maintenance on the metal lifting device is required to ensure maximum life and optimum performance. If during this process there are any problems, questions, or concerns, please do not hesitate to call CIS, Inc. @ (615) 256-8658.

- 1) Remove safety shackle and master link assembly from the metal lifting device by removing the cotter pin and nut. (Cotter pin and nut will need to be kept for re-installation)
- 2) Remove "Rotating Threaded Stem" from metal lifting plug. Threaded stem and internal threads need to be cleaned with a wire brush and a cleaning solvent that will leave no oily residue.
- 3) At this point, inspect stem for dents, chips, or galled threads. Dent or chips can be filed out, but if galled threads are present, the entire plug must be removed from service and replaced.
- 4) Lubricate threaded stem and internal threads with MOLYKOTE™ 321R Bonded Lubricant Spray or equivalent. (MOLYKOTE™ is applied when the metal lift plug is fabricated new)
- 5) Re-install threaded stem, safety shackle and master-link onto lifting device. Be sure to reinstall nut and cotter pin.

HANDLING / STORAGE



- **SAFETY NOTE! NEVER** use an *Aluminum style* lift plug to remove a hot electrode column!
- During normal use, the lifting device should be carefully handled and not dropped or thrown to the floor. Avoid knocking the threads into other objects. This can damage the threads.



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- Store all metal lifting devices in original shipping cradle/crate, or on a flat wooden surface. It is recommended that a rubber pad be used for the storage and protection of threads.
- Set all metal lifting devices down on their bottom with the safety shackle and master link upright. NEVER set the device on its side, the metal threads could sustain damage.
- Metal lifting devices can be heavy and may need to be handled with a crane or more than one person.



- **NEVER** exceed the rated load lifting capacity of any metal lifting device.
- **DO NOT** use lifting device to lift vertically more than 3 1/3 electrode sections (electrode column).
- **DO NOT** use lifting device to lift, from horizontal to vertical or vice versa, more than one electrode section, for example, to lie down or pick up (from horizontal to vertical) when adding or removing entire columns from the furnace.

SAFETY CONSIDERATIONS

- The safety of you and your co-workers depends on the proper use and maintenance of all lifting equipment.
- Wear all required and approved personal protective equipment (safety glasses, gloves, hard hat, safety shoes, respirators and proper clothing) as mandated by your employer when handling and using lifting devices.
- Metal lifting devices can be heavy and may need to be handled by a crane or more than one person.



- **ALWAYS** clear the deck of all personnel during transport of electrode columns from storage racks to the furnace and vice versa.
- **NEVER** allow personnel to be under a suspended load, for example, while an electrode column is being moved to or from the furnace.



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- **DO NOT** modify the lifting assembly from the originally supplied equipment; for example, do not replace the bail with shop chains, slings or cables.
- **DO NOT** repair any cracks, bends or arcs, or attempt to weld anything to the structure of the lifting device.
- Return all damaged metal lifting devices to the manufacturer – CIS Inc. **All modifications and repairs must be performed by the manufacturer.** After repairs & testing, the entire lifting device must be re-certified to meet ANSI/ASME B30.20 “Below-The-Hook” standards.
- **All metal lifting devices need to be inspected prior to each use.** All deficiencies need to be reported by the operator to the supervisor and the plug removed from service for repair by CIS Inc.
- The following are criteria for removal from service:
 - Corrosion or cracks in the metal casting
 - Damaged, chipped, worn or missing threads
 - Any distortion of safety shackle and/or master-link assembly
 - Bent, cracked, corroded or chipped and damaged threads on the “Rotating Threaded Stem”



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Appendix A

PRODUCT USE INSTRUCTION

APPENDIX A – ASME B30.17.3

SECTION 17-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS

17-3.1.1 Operators of Cranes

(a) Cranes shall be operated only by the following qualified personnel:

- (1) designated persons
- (2) trainees under the direct supervision of a designated person
- (3) maintenance and test personnel, when it is necessary in the performance of their duties
- (4) inspectors (crane)

(b) No one other than personnel specified in para. 17-3.1.1(a) shall enter a crane cab or pulpit, with the exception of persons such as oilers and supervisors, whose duties require them to do so, and then only in the performance of their duties and with the knowledge of the operator or other appointed person.

17-3.1.2 Qualifications for Operators of Cab-Operated and Pulpit-Operated Cranes

(a) Operators shall be required by the employer to pass a written or oral examination and a practical operating examination unless they are able to furnish satisfactory evidence of qualifications and experience. Qualification shall be limited to the specific type of equipment for which the operator is examined.

(b) Operators and operator trainees should have normal depth perception, field of vision, reaction time, manual dexterity, coordination, no tendencies to dizziness or similar undesirable characteristics, and shall meet the following physical qualifications:

- (1) vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses
- (2) ability to distinguish colors regardless of position of colors, if color differentiation is required for the operation
- (3) adequate hearing, with or without a hearing aid, for a specific operation
- (4) sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation

(c) Evidence of physical defects or emotional instability that could render the operator a hazard to the operator or others, or that in the opinion of the examiner could interfere with the operator's safe performance may be cause for disqualification. In such cases, specialized clinical or medical judgments and tests may be required.

(d) Evidence that an operator is subject to seizures or loss of physical control shall be reason for disqualification. Specialized medical tests may be required to determine these conditions.

17-3.1.3 Qualifications for Operators of Floor-Operated Cranes

Personnel shall be required by the employer to pass a practical operating examination. Qualification shall be limited to the specific type of equipment for which the operator is examined.

17-3.1.4 Qualifications for Operators of Remote-Operated Cranes

The use of remote control equipment involves such a wide variety of service requirements and conditions that each installation should be carefully analyzed and operation reviewed at least monthly for the first 6 months of operation to determine whether para. 17-3.1.2 or 17-3.1.3 should apply.

17-3.1.5 Conduct of Operators

(a) The operator shall not engage in any practice that will divert the operator's attention while actually engaged in operating the crane.

(b) When physically or otherwise unfit, an operator shall not engage in the operation of the equipment.

(c) The operator shall respond to signals from the person who is directing the lift, or an appointed signal person. When a signal person or a crane follower is not required as part of the crane operation, the operator is then responsible for the lifts. The operator shall obey a stop signal at all times, however, no matter who gives it.

(d) Each operator shall be responsible for those operations under the operator's direct control. Whenever there is any doubt as to safety, the operator shall consult with the supervisor before handling the loads.

(e) Before leaving the cab-operated crane unattended, the operator shall land any attached load, place controllers or master switches in the "OFF" position, and open the main line device of the specific crane.

(f) The operator shall not close the main disconnect device until certain that no worker is on or adjacent to the crane. If there is a warning sign or lock on the device, it shall not be energized until the sign or lock is removed by either the person who placed it thereon or by an authorized person.