



MAZZELLA®

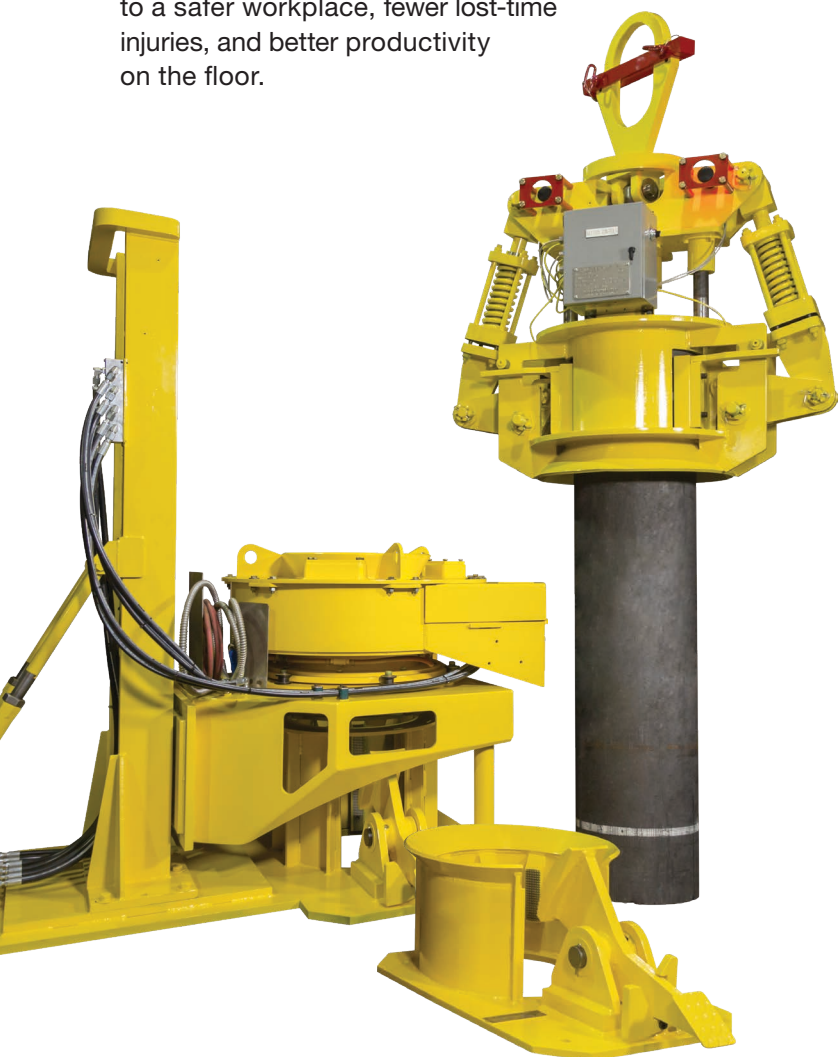
**ELECTRODE
HANDLING
SYSTEMS**



MAZZELLA NO TOUCH® ELECTRODE ADDITION SYSTEM

With its patented No Touch® Electrode Addition System, Mazzella has revolutionized safe and efficient electrode handling operations throughout the steel industry. Mazzella consulted top industry professionals to design this totally touchless system that removes operator risk from the electrode addition equation.

The built-to-order No Touch® Electrode Addition System combines state-of-the-art technology and precision engineering to add and torque electrodes by remote control, protecting your most valuable resource, your employees, while improving efficiency. That adds up to a safer workplace, fewer lost-time injuries, and better productivity on the floor.



MAZZELLA NO TOUCH® ELECTRODE ADDITION SYSTEM COMPONENTS

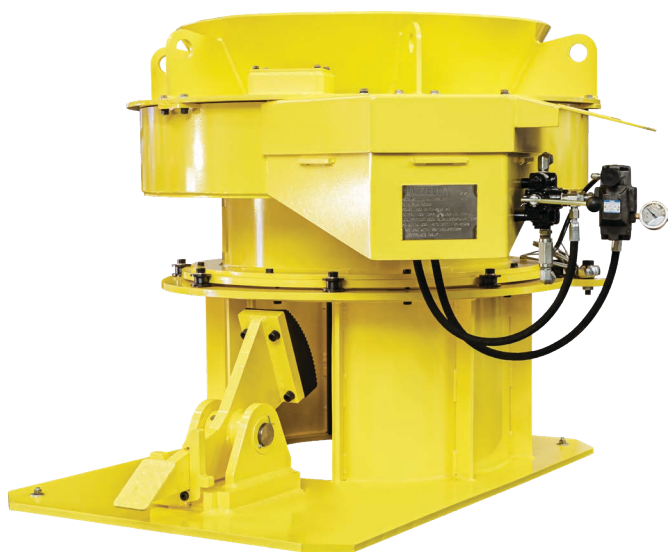
- ▶ Up-ending Table electronically indexes new electrodes into a vertical position, secured with a safety arm.
- ▶ Vertical Automatic Addition Tong (VAAT) uses a custom bale and locking device for easy crane hook engagement of the electrode without operator assistance.
- ▶ VAAT's stem-and-bale assembly provides 360° rotation of a suspended electrode.
- ▶ Spinning Hydraulic Torque Device (SHTD), pre-loaded with an electrode column, receives the new electrode, lowered into place by the VAAT.
- ▶ SHTD clamps and rotates a new electrode, as the column is held in place. The VAAT's thread system is pitched to match the electrode being joined for a perfect fit every time.
- ▶ Trouble-free torquing: the electrode is torqued to specification as the VAAT rotates independently, lowering with the electrode as it is threaded onto the column.
- ▶ After torquing, the VAAT lifts the electrode column from the SHTD and returns the column to the electric arc furnace for operation.



STANDARD ELECTRODE ADDITION PRODUCTS

The Mazzella standard electrode addition product line is designed with the steel mill worker in mind. Safety and efficiency are paramount for workers when producing steel and this system is designed to keep employees off the furnace and to keep the electrodes from being over- or under-torqued. The robust, mill-duty design can withstand the elements within a steel mill while utilizing readily available parts for maintenance. With the addition of the electrode weigh scale, a steel mill can track electrode consumption to better determine cost-per-ton of steel and calculate overall usage.

- ▶ Eliminates user error by ensuring electrodes are torqued to proper specifications
- ▶ Mill-duty construction design
- ▶ Standard system can utilize electrodes ranging from 12”–32” (300–800mm)
- ▶ Design and manufactured in the United States
- ▶ Maintenance-friendly system utilizing readily available, off-the-shelf components



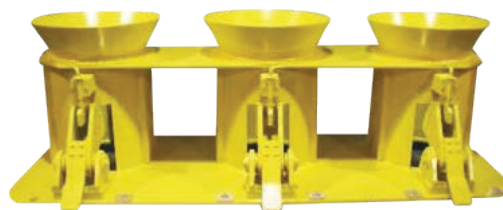
SPINNING HYDRAULIC TORQUE DEVICE – OFF-FURNACE ELECTRODE ADDITION STATION

Complete with a mechanical electrode holder and eccentric locking device to ensure a positive torque reaction point, this unit automatically spins down the electrode and applies the final recommended torque by using one lever.



TORQUE FLANGE INDICATOR

This indicator can be added to most Mazzella electrode addition stations to independently verify what torque is being applied.



MECHANICAL ELECTRODE HOLDER

Electrode column storage racks with eccentric locking devices allow jointing at each station. Mazzella can match existing holders, as well as engineer a custom-designed rack, to meet your specific requirements.





ELECTRODE WEIGH SCALE

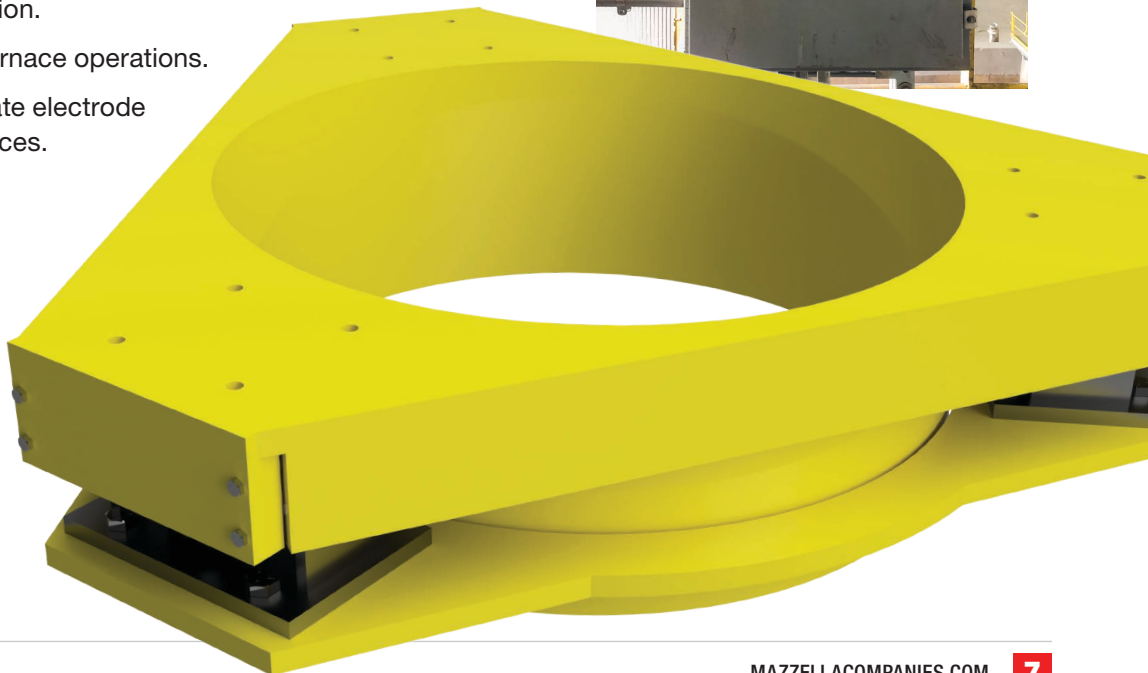
The graphite electrodes that metal arc furnaces use in the steelmaking industry are often large and may weigh several tons. As the electrode columns are consumed within the furnace, they eventually reach a length where they cannot be used independently. Partially-consumed electrodes can be joined with other partially-consumed electrodes, or new electrodes, in an end-to-end configuration, making them long enough again for use.

Until now, there has been no easy way for operators to gather useful information on the spent electrodes, either before or after they are consumed to an unusable length. With the patent-pending Mazzella electrode weigh scale, arc furnace operators now can measure and weigh electrodes to determine the mass of an electrode and how many heats remain in a partially-consumed electrode. This data helps operators understand electrode consumption, determine cost per ton of steel, and calculate how many pounds of electrode material went into a specific output of steel.

The Mazzella electrode weigh scale includes a mounting platform, an electrode holder and clamping assembly, and an electrode weighing assembly with at least one load cell. Using this scale, multiple electrodes can be weighed before and after their use in the furnace to determine the difference in weight, providing concrete information on electrode consumption. Consumption data, together with other information, including furnace output and the number of times and length of time an electrode was used, can help improve the efficiency of electrode consumption in a metal arc furnace.

BY USING THE MAZZELLA ELECTRODE WEIGH SCALE, STEELMAKERS CAN:

- ▶ Track electrode consumption.
- ▶ Reduce inefficiencies in furnace operations.
- ▶ Plan effectively for adequate electrode supplies for their arc furnaces.



ELECTRODE HANDLING PRODUCTS

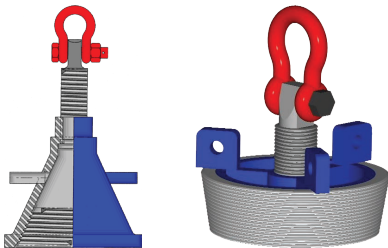
GRAPHITE LIFT PLUGS

Graphite lift plugs are designed for vertical transportation of electrodes to and from the furnace. These devices enable the operator to leave the device on the column during furnace operation.



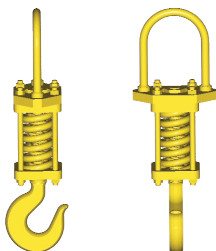
METAL LIFT PLUGS AND STEEL LIFT CAPS

Threaded-stem metal lift plugs and steel caps are used to take an electrode section from horizontal to vertical, and also, to spin down at the same thread pitch as the electrode connecting pins during the jointing process.



CUSHIONED LIFT DEVICE

This device is used for the addition and transfer of electrode columns for off-furnace assembly. Also, it can assist in negating the effects of shock loading that may occur when removing an electrode column from the electric arc furnace. An optional swivel or anti-rotational hook are also available.



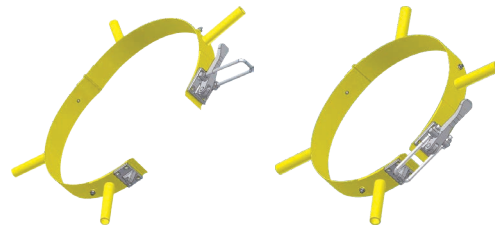
CUSHIONED LIFT DEVICE WITH ELEBIA® AUTO-HOOK: LOW HEADROOM

This low-profile device gives you the benefits of a cushioned lift device and the elebia® Auto-Hook in one device.



MANUAL CLAMPING COLLAR

The manual clamping collar is used to spin an electrode section down into the adjoining electrode and help initiate the tightening process.



RISING STEM LIFTING DEVICE

The rising stem lifting device is used for the transportation of electrode sections, and also, to spin down at the same thread pitch as the electrode connecting pin. These devices are used in conjunction with graphite lift plugs.



TAP HOLE LIFT DEVICE ASSEMBLY

The tap hole lift device assembly is used to install stackable eccentric bottom tap-hole (EBT) refractory end blocks and tap hole sleeves into the base of the furnace. Also, the device assists in negating the effects of minor shock loads that may occur when installing the refractory. The springs of the device offer the crane operator a visual indicator of the load that is being applied.



WISHBONE SPACER

The lightweight, wooden wishbone spacer fits between electrode end faces during the jointing process to prevent damaging graphite threads, and also, to “set the gap” between the electrodes.



ELECTRODE CHAIN WRENCH

This electrode chain wrench allows the operators to safely spin an electrode and tighten the electrode joint.



TORQUE WRENCH

Our torque wrench offers a positive torque indicator by means of an unmistakable signal, ensuring that graphite electrodes are torqued to the manufacturer’s recommended specification.



SLIDE GATE LIFT SYSTEM

This customized cushioned lift device is designed to safely remove slide gates from the bottom of ladles.

ELECTRODE HANDLING SPECIALTY TOOLS

THREAD WEAR POCKET GAUGES

This go / no-go gauge identifies if the threads of a lift plug are considered worn out. There is a 3 threads-per-inch (T3) and 4 threads-per-inch (T4) device to fit your needs.



ELEBIA® AUTO-HOOK

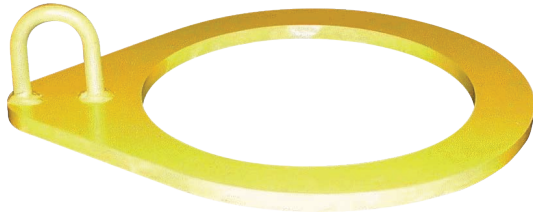
This professionally engineered and patented product is on the forefront of “hands free” safety. Offering a 5-ton, 10-ton, and 20-ton Auto-Hook, Mazzella is proud to be a select distributor of elebia® hooks to the steel industry in the United States.



ELECTRODE HANDLING RECOVERY TOOLS

ELECTRODE RECOVERY RING

The electrode recovery ring is used for recovering broken or damaged electrode sections that are in vertical or semi-vertical positions.



EAF – ELECTRODE RECOVERY TONG

The electrode recovery tong is designed for the recovery of broken electrode sections or columns. This unit features a Heppenstall latch and will grip the electrode from true horizontal to semi-vertical.



LMF – ELECTRODE RECOVERY TONG

Held open by a combustible extension, this LMF tong closes within close proximity of the molten steel bath, securing a broken electrode.



DUAL ARM HEAVY-DUTY EAF ELECTRODE RECOVERY TONG

This heavy-duty tong is designed for the recovery of a broken electrode column. The unit is held open by a bump link and will grip the column from true horizontal to semi-vertical. The unit comes complete with required rigging.



MAZZELLA PATENT INFORMATION

US PATENT 9,850,105

Vertical Automatic Addition Tong (VAAT) Apparatus

An electrode lifting apparatus provides a mechanism for lifting a free electrode in a vertical orientation and moving the free electrode suspended below the lifting apparatus to a location for a joining procedure with another electrode or portion of an electrode. Also, the electrode lifting apparatus supports the free electrode during a joining procedure that includes driven rotation of the free electrode by an electrode torque station. The electrode lifting apparatus includes a bail and a body, the body having a yoke and a housing. First and second arms on the body connect the housing to the yoke. The body may angularly rotate relative to the relatively fixed bail about a reference vertical axis during driven rotation of the free electrode by the torque station. A threaded stem attached to the bail provides a threaded engagement with the yoke allowing such relative angular rotation in some embodiments.

US PATENT 10,077,169

VAAT Apparatus

An electrode lifting apparatus provides a mechanism for lifting a free electrode in a vertical orientation and moving the free electrode suspended below the lifting apparatus to a location for a joining procedure with another electrode or portion of an electrode. Also, the electrode lifting apparatus supports the free electrode during a joining procedure that includes driven rotation of the free electrode by an electrode torque station. The electrode lifting apparatus includes a bail and a body, the body having a yoke and a housing. First and second arms on the body connect the housing to the yoke. The body may angularly rotate relative to the relatively fixed bail about a reference vertical axis during driven rotation of the free electrode by the torque station. A threaded stem attached to the bail provides a threaded engagement with the yoke allowing such relative angular rotation in some embodiments.

US PATENT 9,383,278

Electrode Torque Measuring Device

An electrode joining apparatus for joining a fixed electrode and free electrode including an electrode holder configured to receive the fixed electrode and a torque device positioned above the electrode holder. The torque device is configured to grip and spin the free electrode to join the free electrode to the fixed electrode. A force sensor is coupled to the torque device. The torque device is configured to apply a force on the force sensor when the torque device engages the free electrode. The force sensor is configured to detect a signal representative of the force applied by the torque device on the free electrode. The feedback force signal can be used to determine the torque applied to the free electrode by the torque device to help ensure a proper joint is formed between the free electrode and fixed electrode.

US PATENT 9,841,334

Electrode Torque Measuring Device

An electrode joining apparatus for joining a fixed electrode and free electrode, including an electrode holder configured to receive the fixed electrode and a torque device positioned above the electrode holder. The torque device is configured to grip and spin the free electrode to join the free electrode to the fixed electrode. A force sensor is coupled to the torque device. The torque device is configured to apply a force on the force sensor when the torque device engages the free electrode. The force sensor can detect a feedback force signal representative of the force applied by the torque device on the free electrode. The feedback force signal can be used to determine the torque applied to the free electrode by the torque device to help ensure that a proper joint is formed between the free electrode and fixed electrode.

US PATENT 10,028,338

Electrode Torque Lift

An electrode joining apparatus for joining a first electrode and second electrode includes an electrode holder configured to receive the first electrode and a torque device positioned above the electrode holder. The torque device is configured to engage and rotate the second electrode relative to the first electrode. A lift is disposed on the apparatus to move the torque device relative to the electrode holder. In some embodiments, the lift includes a mechanism such as a powered actuator operable to raise the torque device above the electrode holder. In additional embodiments, the lift includes a carriage that is vertically moveable relative to the electrode holder, and the torque device is attached to the carriage.

US PATENT 9,844,104

Electrode Joining Apparatus

An electrode joining apparatus for joining a free electrode to a fixed electrode, the fixed electrode having a top end. The apparatus can include an electrode holder configured to selectively hold the fixed electrode. A torque device can be positioned above the electrode holder, the torque device configured to grip and spin the free electrode to join the free electrode to the fixed electrode. A blowout jet can be oriented to selectively force a stream of gas toward the top end of the fixed electrode when the fixed electrode is held by the electrode holder. As such, the blowout jet can help remove dust, debris, or graphite residue on the top end of the fixed electrode before joining the free electrode to the fixed electrode. The fixed electrode can include a threaded socket with the blow jet oriented to force the stream of gas toward the threaded socket.

US PATENT 9,930,733

Electrode Joint Spacer

An electrode joining apparatus for joining a free electrode to a fixed electrode. The electrode joining apparatus includes an electrode holder configured to selectively hold the fixed electrode and a torque device positioned above the electrode holder. The torque device is configured to grip and spin the free electrode to join the electrodes. The electrode joining apparatus can include an axial passage defined through the electrode holder and torque device. A retractable spacer can be movably connected to the electrode joining apparatus, the retractable spacer configured to selectively move into the axial passage. The retractable spacer can be used to form a gap between the free electrode and fixed electrode before the joining process is initiated. Also, the electrode joining apparatus can include a spacer drive mechanism coupled to the retractable spacer, the spacer drive mechanism configured to selectively move the retractable spacer into the axial passage.

US PATENT PENDING

Electrode Weigh Station

An apparatus for weighing an electrode. The apparatus is securable to a mounting platform having a platform hole shaped to receive the electrode, the apparatus comprising: an electrode holder, including an electrode clamping assembly, the electrode holder configured to receive and retain the electrode within the electrode holder, and an electrode weighing assembly having at least one load cell positionable between the electrode holder and the mounting platform; wherein when the electrode is retained in the electrode holder and the electrode weighing assembly is positioned between the electrode holder and the mounting platform, the electrode weighing assembly is operable to measure the weight of the electrode.

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