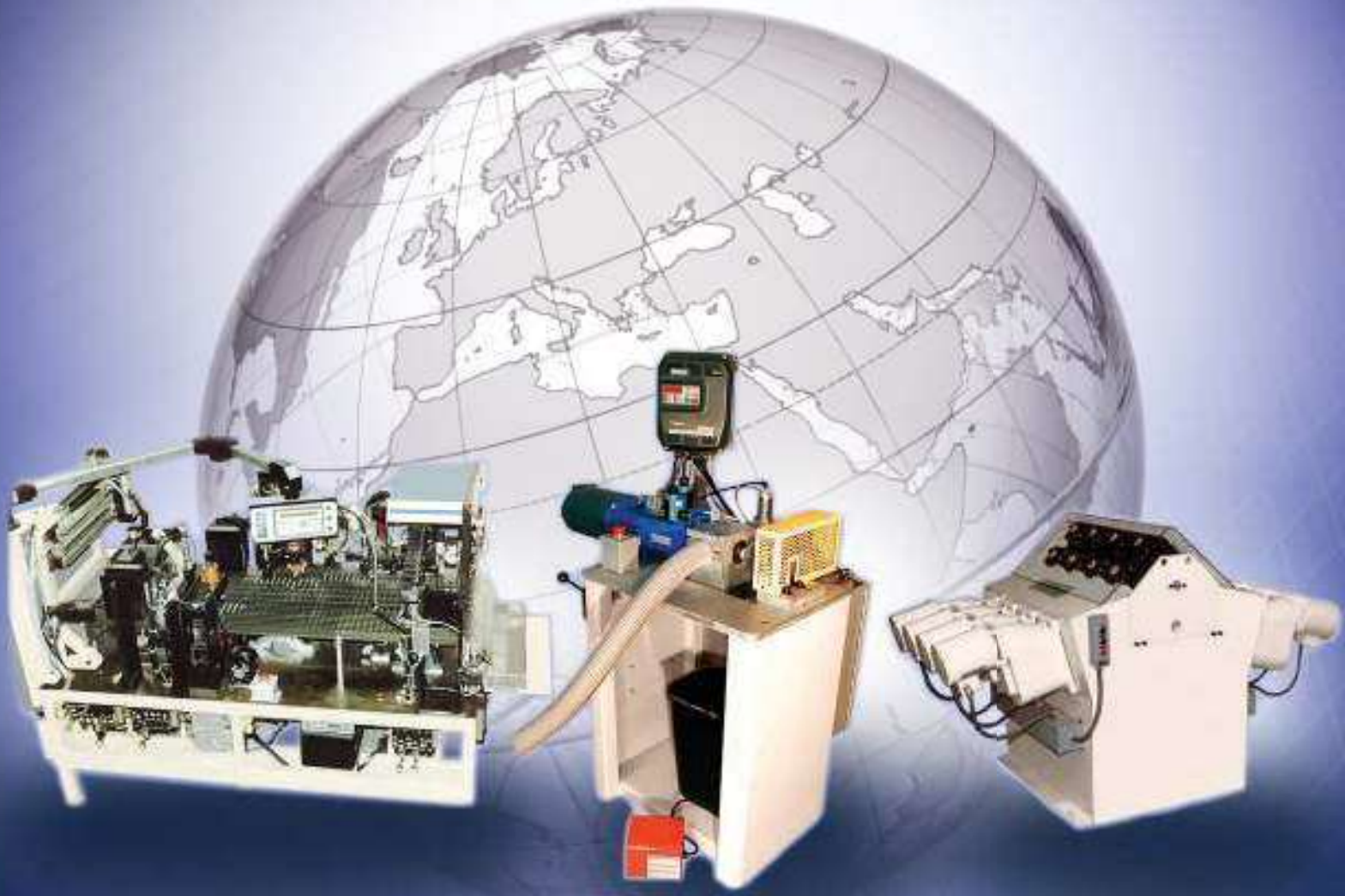
OAKLEY INDUSTRIAL MACHINERY INC.



MACHINERY & AUTOMATION INNOVATION

QUALITY OAKLEY MACHINERY

CSM GROUP

OAKLEY INDUSTRIAL MACHINERY

Oakley Industrial Machinery is a worldwide leader & innovator in the manufacture of heating element production machinery & terminal pins. Our extensive machinery production line offers our customers a start to finish approach in providing to them the equipment they need for the actual production of heating elements for the many types of domestic, commercial, and industrial applications, which are used for in a number of vertical markets including medical, oil & gas, agricultural, transportation, military, refrigeration, power generation, just to name a few.

As we look to the future, we will continue our expansion into building even more diverse machinery & automated systems to help both our potential/current customers become even more efficient, cost-effective

Headquartered in Elk Grove, IL USA

Since it was founded in 1947, Oakley Industrial Machinery has continued to evolve from a small family operation to now becoming part of a larger organization with over 200 employees worldwide. We now have the ability to offer our customers a wide assortment of machinery, terminal pins and tubing across all seven continents.

Made in USA- Worldwide In Use

Oakley machinery & terminal pins have come to enjoy an extremely high-quality reputation thanks to our consistent focus on both market & customer specific requirements-regionally, nationally and internationally. We have set the standard for our customers in producing exceptional high quality items that our customers have come to depend on us for over 75+ years, and will continue well into the future.

OAKLEY INDUSTRIAL MACHINERY

Reliable

Reliability can only arise where issues are reliability thought through carefully and acted upon in a prompt manner. Reliable professional and motivated work is a requirement in order to compete as a producer of high-quality products. This starts with development and building and continues via actual production, consultation and sales and service.

Customer Focused

Product and service quality must both be communicated on a consistent basis. That is why we assemble the wishes, needs and expectations of our customers on a regular basis and transfer them into products, services and interactive processes. Our customer is our most important asset to our company, and we take each and every one of them seriously and value all of their questions, concerns and comments by which we can continue to build an even better company.

Flexible

Our world continues to change at an ever faster rate, and the intervals by which it changes are getting even shorter. Due to the high stability of our base, we are able to respond to an ever changing set of conditions, and also to recognize them before they become critical to our business. Our ability to act quickly is a very vital part of our success.

Oakley Heating Element Production Machines

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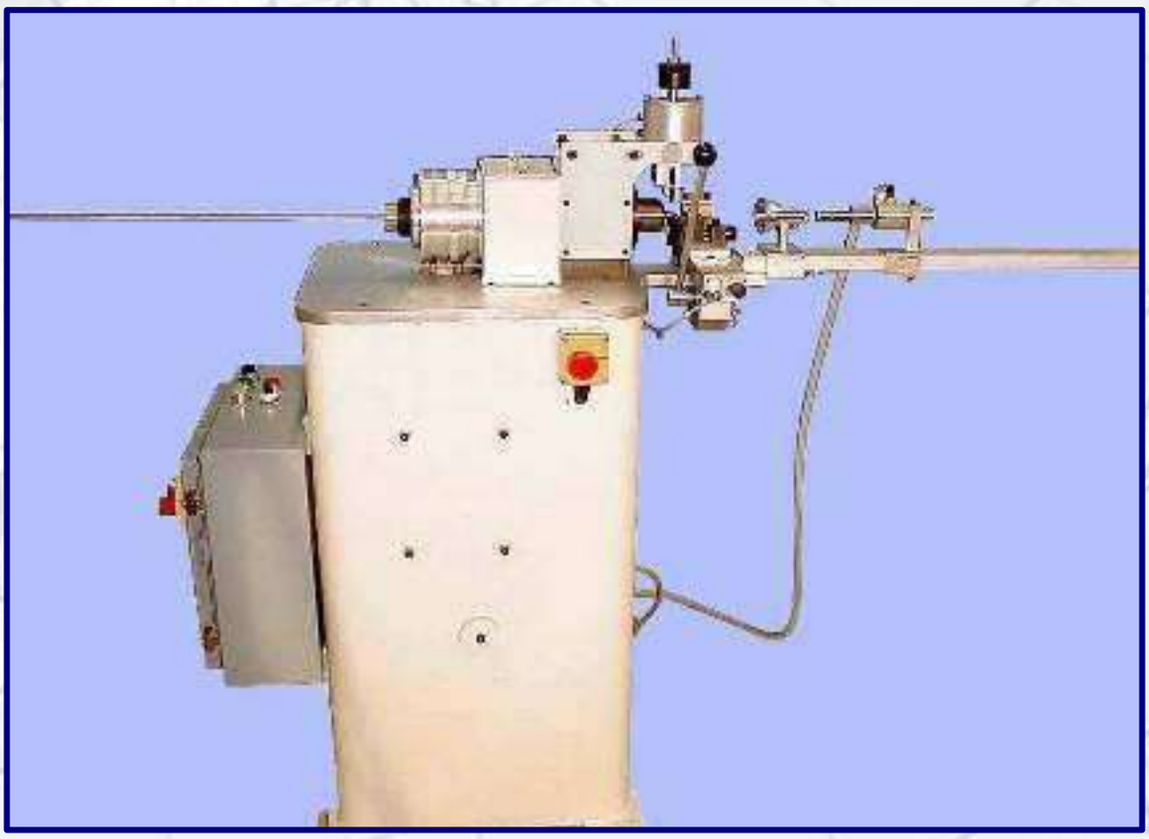
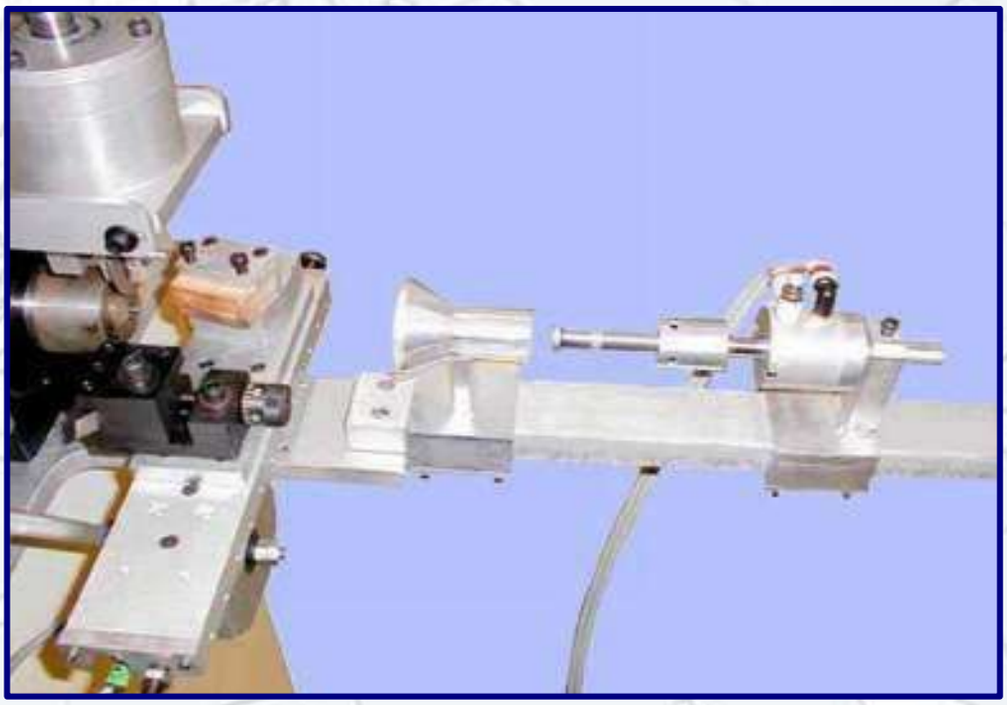
Score and Break Tube Cutoff Machine



Machine Features

- BURR FREE ENDS—NO ADDITIONAL FINISHING REQUIRED
- HIGHLY ACCURATE CUT LENGTHS
- NO INTERNAL TUBE CONTAMINATION FROM CHIPS, GREASE, OR OIL
- SIMPLE CHANGEOVER FOR DIFFERENT LENGTHS AND/OR DIAMETERS
- EASY AND FAST REPLACEMENT OF CUTTING TOOL
- HIGH PRODUCTION CAPACITY

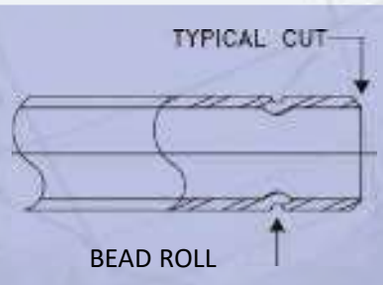


The **Oakley Score and Break Tube Cutoff** provides an efficient and inexpensive method for cutting straight lengths of tubing into exact finished lengths without producing a burr on the O.D. or the I.D. of the tube. Originally designed to meet our own in-plant production requirements, this unit has now been made available to meet customer demand. It will cut stainless steel, incoloy, copper and mild steel tubing. Standard collets are used to clamp the tubing, and this makes changing diameters very simple and fast. The cutoff length is also easily adjustable. The production rate will vary according to the tube length being cut and operator efficiency, but a rate of up to 1500 cut pieces per hour is possible for cut lengths up to 1000mm (40”). The production rate will decrease as the cut length of the tubes increases. Our standard model cuts lengths up to 2438mm (96”), but longer run-out tables can be optionally provided. As quoted, the machine is not equipped with a feed table as most customers find it easier and less expensive to provide this.

We also offer a Bead Roll Attachment for this machine. This device rolls a groove into the tube that can be used to position and retain the lower sealing washer. The position of the bead roll on the tube is adjustable from a minimum of 3.2mm (.125”) to a maximum of 44.4mm (1.75”). The depth of the groove is also adjustable. The groove is rolled into the tube while the tube is being cut, so production with this attachment is only slightly less that for cutting alone.

Machine Specifications

Length:	3000mm (118”)
Width:	610mm (24”)
Height:	1092mm (43”)
Weight:	272 kg. (600 lbs.)
Electric Supply:	115/220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Tube Diameter.	4.75mm (.187”)
Max. Tube Diameter:	25.4mm (1.0”)
Min. Cut Length:	with special stop 150mm (6”) or 50mm (2”)



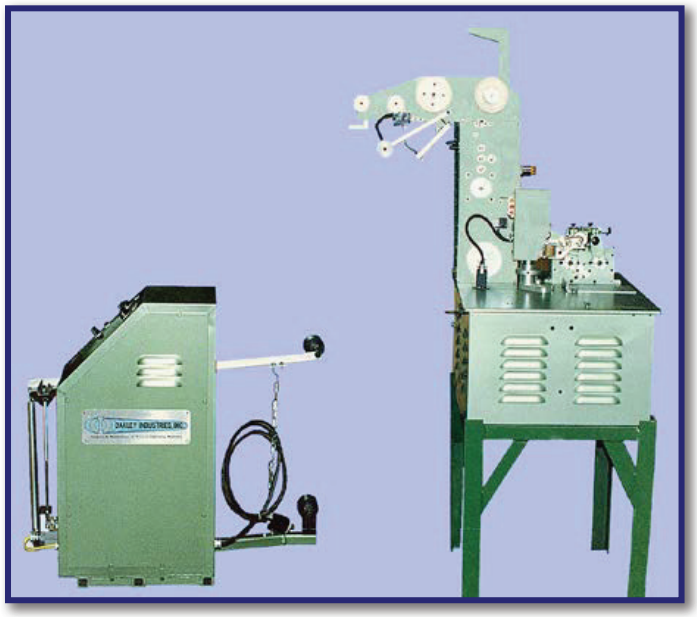
Machine Features

- HIGHLY RELIABLE AUTOMATIC COIL WINDING
- HIGH SPEED WINDING WITH 0-8000rpm VARIABLE SPEED DRIVE
- ACCURATE OHMS CONTROL (+/- 1%)
- CONSISTENT CLEAN-CUT ENDS ON THE COILS
- CAN WIND WIRE DIAMETERS FROM 0.1mm TO 1.4mm (.004" to 055")
- SINGLE OR 2-WIRE (TANDEM) COILS

The **Oakley Coil Winding Machine** can make spiral coils from wire diameters from 0.1mm to 1.4mm (.004" to .055"). The inside diameter of the coils can range from 0.75mm to 12.7mm (.030" to .500"). With proper setup and maintenance, the machine will produce coils with very consistent resistance values and with open inside diameters for easy assembly to the terminal pins. Because these machines are fully automatic, no operator is required.

The standard model is equipped with an electronic wire metering system, a programmable parts counter, a variable hi-speed drive, and our standard cutoff mechanism. As supplied, it will accommodate spools of wire DIN 80, 100, or 125. These spool sizes will normally handle up to 3.0 kg. (6.6 lbs.) of wire. The tooling supplied with the machine varies according to each customer's specific coil requirements.

The standard cutoff accommodates single wire coils with a maximum O.D. of 6mm (.240") and a maximum wire diameter of 0.55mm (.022"). The electronic metering system uses an encoder to measure the length of the wire as it is being spiraled into the coil and then triggers the cutoff when the desired preset length is reached. This system holds an accuracy of +/- 1% of the desired ohmic value. The standard hi-speed drive adjusts the spindle speed from 0 to 8000 rpm. This variable drive is extremely helpful for setting up the machine and also for maximizing the production for each specific coil.



Coil Pickup and Feed Station

The following are the main options available for this machine:

- **Tandem Winding Attachment**—This is required for producing 2 wire coils.

Coil Winder with Tandem Winding Attachment

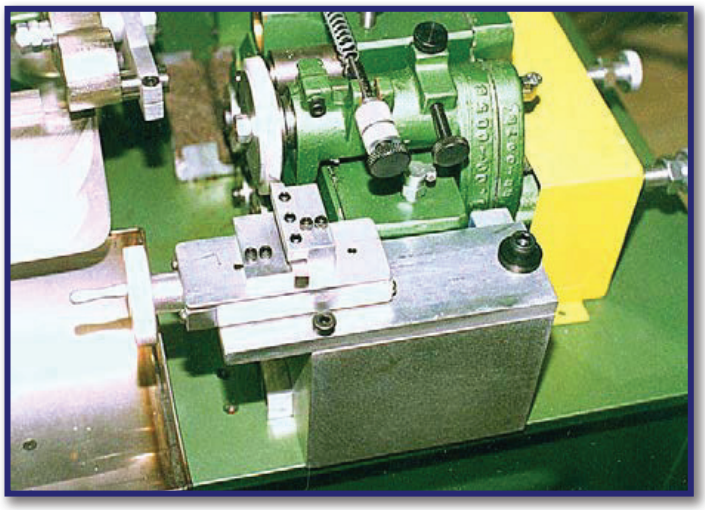
- **Heavy Duty Cutoff**—This unit is required to cut all tandem wire coils (2 wires); all single wire coils with outer diameters over 6mm (.240"); and all single wire coils made from wire diameters larger than 0.55mm (.022"). **Both the standard and the heavy duty cutoffs are required if you wish to run the entire wire range on this machine.** The cutoffs are easily interchangeable.

- **Pail Pack Attachment**—For customers who wish to use large pails or barrels of wire instead of spools, we supply this attachment to help unwind the wire as it is being fed from the pail. If the machine has our tandem winding attachment, then 2 pail pack attachments are required.

- **Despooler**—For customers who wish to use very large spools of wire such as DIN 250 or DIN 355, we offer our automatic despooler. These spools of wire hold 20 kg. or 50 kg. (44 lbs. or 110 lbs.) respectively. Using these large spools of wire eliminates the need for frequently replacing spools when producing a large quantity of coils. The despooler has a combination drive/brake motor with adjustable brake tensioning. When the coil winder is started, the drive motor turns the spool of wire to overcome inertia and prevent the wire from breaking.

Almost immediately, the brake engages and slows the dereeling process to match the rate at which the wire is being removed. A smooth and even dereeling of the wire is attained by simply adjusting the brake tension. When the coil winder is stopped, the brake prevents any further unreeling of the wire. If the machine is equipped with the tandem winding attachment, 2 of these despoolers would be required.

• **Roll Resurfacing Fixture**—This fixture is a portable device that can directly be clamped to the gearbox on the machine. It is equipped with a miniature cross slide to enable you to cut the plastic form rolls while they are in place on the machine. This eliminates the need to remove the spindle and take it to the tool room or send it to a supplier for re-facing. Because it is portable, one fixture can service all of your machines.



Roll Resurfacing Fixture

The following parts comprise the tooling that is required to run particular types of coils.

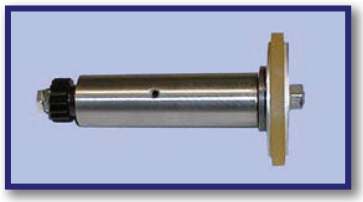
Mandrel Spindle Assemblies—Two assemblies are available to hold the mandrels. The small 5/32" spindle accommodates mandrels from 0.75mm to 2.8mm (.030" to .110"). The larger 3/16" spindle accommodates mandrels from 2.8mm to 12.7mm (.110" to .500").

Small 5/32" Spindle with Small Mandrel
0.75mm to 2.8mm (.030" to .110")

Large 3/16" Spindle with Large Mandrel
2.8mm to 12.7mm (.111" to .500")

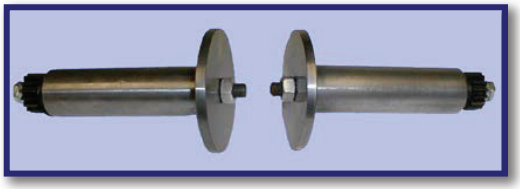
• **Tungsten Carbide Mandrels**—These mandrels must be ordered to fit the proper spindle: either the 5/32" or the 3/16" spindle. They must also be ordered for the proper diameter to produce the coil I.D. that you desire. When selecting this mandrel diameter, you should make an allowance for springback in the wire as it is wound. While this will vary depending upon the hardness of your wire, a minimum allowance for springback would be 0.025mm to 0.05mm (.001" to .002")

• **Form Roll Assemblies**—Three different form roll assemblies are available. Our soft plastic form roll is used to wind fine gauge wires from 0.976mm to 0.25mm (.003" to .010"). Our hard plastic form roll is used to wind medium gauge wires from 0.26mm to 0.5mm (.011" to 020"). For all wire gauges heavier than 0.5mm (.020") and for all tandem wound (2 wire) coils, we recommend the use of 2 carbide form rolls.

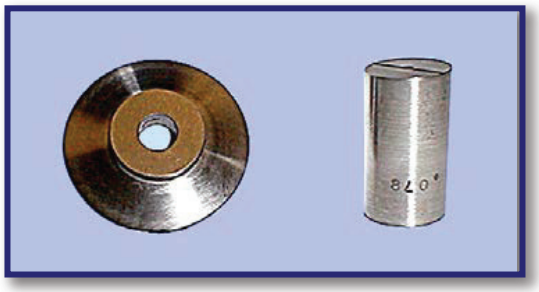


Soft Plastic Form Roll Assembly for Fine Wiren
Diameters from 0.075mm to 0.25mm (.003" to.010")

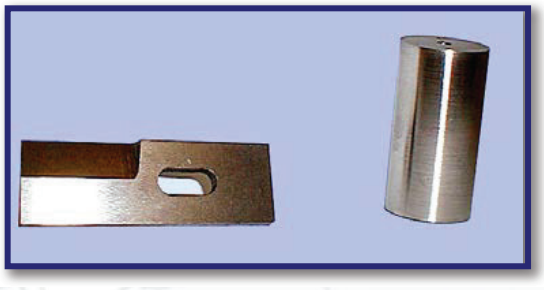
Hard Plastic Form Roll Assembly for Medium Wire
Diameters from 0.26mm to 0.58mm (.011" to .023")



Front and Rear Carbide Form Roll Assemblies for Heavy
Wire diameters 0.59mm to 1.4mm (.0235" to .055")



Standard Cutoff Blade and Bushing



Heavy Duty Cutoff Blade and Bushing

All of these form roll assemblies are available in 2 sizes. The standard size roll is used to make coils with outer diameters up to 6mm (.240”). Whenever the coil outer diameter exceeds 6mm (.240”), you must use the special large form roll assemblies.

Cutoff Blades and Cutoff Bushings—The standard cutoff requires the use of circular cutoff blades and 14.3mm (9/16”) O.D. cutoff bushings. The I.D. of these bushings should be approximately 0.25mm (.010”) larger than the actual O.D. of the coil. This clearance is especially critical when running medium and light gauge wires. If the clearance is too great, it is difficult to obtain consistently clean-cut ends on your coils.

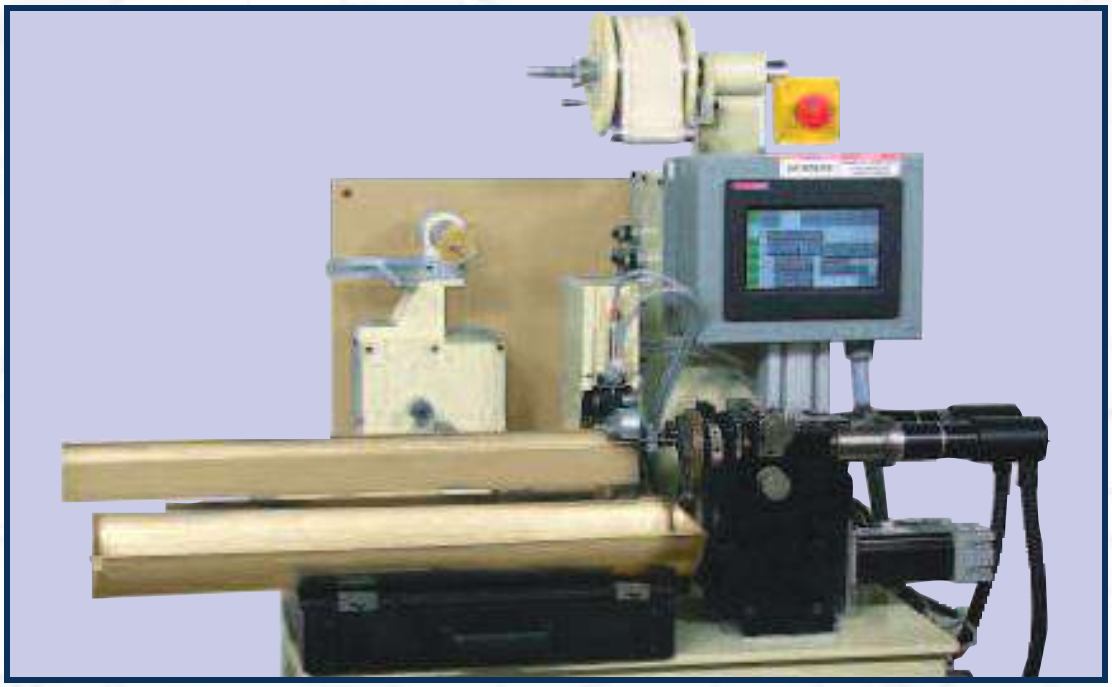
The heavy duty cutoff requires the use of straight cutoff blades and larger 19mm (3/4”) cutoff bushings. For the heavier wire gauges and tandem coils, the clearance in the I.D. of these bushings is not quite as critical. We recommend that it should be 0.25mm to 0.5mm (.010” to .020”) larger than the O.D. of the coil.

Both the cutoff blades and the cutoff bushings can be reground many times before they become unusable.

The cutoff blades must be kept sharp to produce consistently clean-cut ends on the coils. It is also extremely important that the cutting edge of the blade is smaller in thickness than the wire diameter being run. Otherwise, the blade will not be able to fit into the space between the turns of the coil and will force down one or more turns as it attempts to cut the wire. For this reason, it is necessary to stone or grind the blade edge to ensure it will suit the particular wire being run.

Coil Winder Specifications
Despooler Specifications

Length:	610mm (24”)
Width:	812mm (32”)
Height:	914mm (36”)
Weight:	91 kg. (200 lbs.)
Electric Supply:	220v—1ph—50/60hz
Min. Wire Diameter:	0.35mm (.014”)
Max. Wire Diameter:	1.4mm (.055”)
Spool Sizes:	DIN 250 or DIN 355
Max. Spool Weight:	50 kg. (110 lbs.)
Max. Wire Diameter:	1.4mm (.055”)
Max. Coiling Speed:	8000 rpm



Machine Features

- HIGHLY RELIABLE AUTOMATIC COIL WINDING
- HIGH SPEED WINDING WITH VARIABLE SPEED DRIVE
- ACCURATE OHMS CONTROL (+/- 1%)
- CONSISTENT CLEAN-CUT ENDS ON THE COILS
- CAN WIND WIRE DIAMETERS FROM 0.1mm TO 1.4mm (.004" to 055")
- SINGLE OR 2-WIRE (TANDEM) COILS

Our newest **Oakley Coil Winding Machine** can make spiral coils from wire diameters from 0.1mm to 1.4mm (.004" to .055"). The inside diameter of the coils can range from 0.75mm to 12.7mm (.030" to .500"). With proper setup and maintenance, the machine will produce coils with very consistent resistance values and with open inside diameters for easy assembly to the terminal pins. Because these machines are fully automatic, no operator is required.

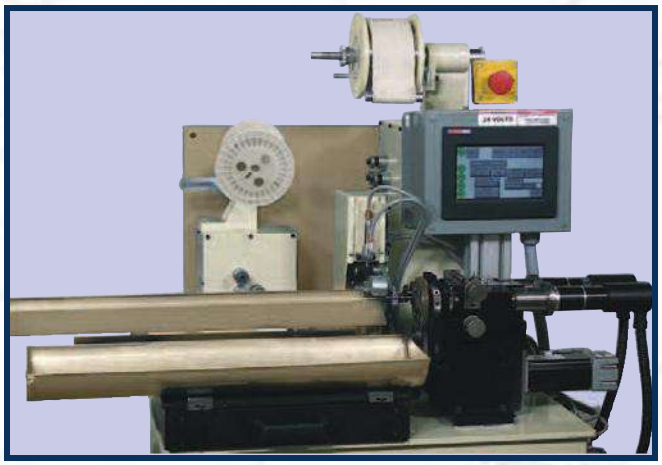
Our new model is equipped with a touchscreen control, three servo motor system & variable hi-speed drives, a quick change collet system, and a standard cutoff mechanism. As supplied, it will accommodate spools of wire DIN 80, 100, or 125. These spool sizes will normally handle up to 3.0 kg. (6.6 lbs.) of wire. The tooling supplied with the machine varies according to each customer's specific coil requirements.

The standard cutoff accommodates single wire coils with a maximum O.D. of 6mm (.240") and a maximum wire diameter of 0.55mm (.022"). The electronic meter-ing system uses an encoder to measure the length of the wire as it is being spiraled into the coil and then triggers the cutoff when the desired preset length is reached. This system holds an accuracy of +/- 1% of the desired ohmic value. The drive system allows the spindle speed to be adjusted. This variable drive is extremely helpful for setting up the machine and also for maximizing the production for each specific coil.

Despooler

The following are the main options available for this machine:

- **Tandem Winding Attachment** – This is required for producing 2 wire coils. **Heavy Duty Cutoff** – This unit is required to cut all tandem wire coils (2 wires); all single wire coils with outer diameters over 6mm (.240"); and all single wire coils made from wire diameters larger than 0.55mm (.022"). **Both the standard and the heavy duty cutoffs are required if you wish to run the entire wire range on this machine.** The cutoffs are easily interchangeable.



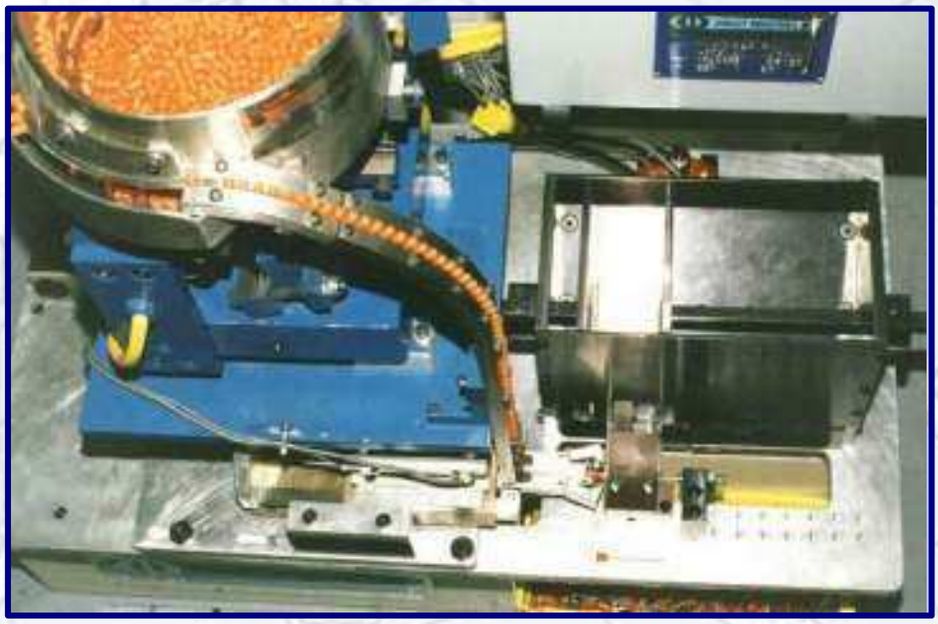
Coil Winder with Tandem Winding Attachment

- **Pail Pack Attachment** – For customers who wish to use large pails or barrels of wire instead of spools, we supply this attachment to help unwind the wire as it is being fed from the pail. If the machine has our tandem winding attachment, then 2 pail pack attachments are required.

- **Despooler** – For customers who wish to use very large spools of wire such as DIN 250 or DIN 355, we offer our automatic despooler. These spools of wire hold 20 kg. or 50 kg. (44 lbs. or 110 lbs.) respectively. Using these large spools of wire eliminates the need for frequently replacing spools when producing a large quantity of coils. The despooler has a combination drive/brake motor with adjustable brake tensioning. When the coil winder is started, the drive motor turns the spool of wire to overcome inertia and prevent the wire from breaking.

Machine Features

- VERY FAST--1800 PER HOUR
- ACCURATE POSITIONING OF PLUG
- EASY TO ADJUST FOR PIN LENGTHS
- ELIMINATES LABOR
- CAN BE SUPPLIED FOR DIFFERENT PIN DIAMETERS AND PLUG SIZES



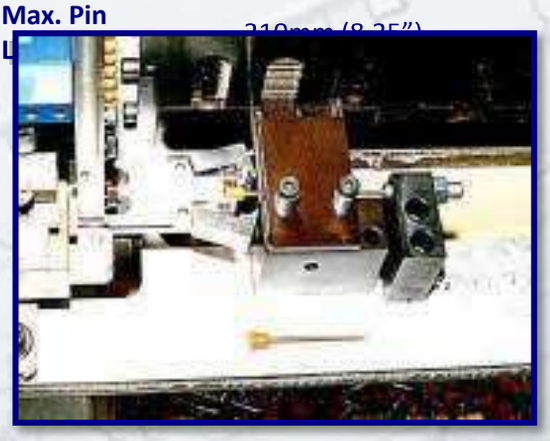
The Oakley Plug to Pin Assembly Machine rapidly assembles the plug that is normally used to seal the lower end of the elements prior to the filling operation to the lower terminal pin. An adjustable hopper feeds the terminal pins into the assembly location where an air cylinder drives the plug to the proper location on the pin. The assembly is then automatically dropped into a container located beneath the assembly area. The production rate for this machine is approximately 1800 assemblies per hour. While the machine is normally priced and supplied for one pin diameter and one plug size, for an additional charge it can be altered to accommodate different pin diameters and plug sizes.

Changeover for different pin lengths and plug locations takes only a few minutes. Changeover time for different diameter pins or different size plugs can be up to an hour.

The use of this machine eliminates the labor required for this tedious and sometimes difficult job.

Machine Specifications

Length:	813mm (32”)
Width:	584mm (23”)
Height:	737mm (29”)
Weight:	181kg. (400 lbs.)
Electric Supply:	115/220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Pin Length:	50mm (2.0”)
Max. Pin L	210mm (8.25”)



Machine Features

- SPOT WELDER HAS UNIQUE 4 ELECTRODE DESIGN FOR STRONGER AND MORE RELIABLE WELDS
- SPOT WELDER FEATURES INDEXABLE ROUND COIL ELECTRODES
- THE WELD CONTROL ENSURES RELIABILITY OF EITHER THE SPOT OR FUSION WELD
- FUSION WELDER IS ESPECIALLY GOOD FOR WELDING VERY LIGHT OR VERY HEAVY WIRE GAUGES
- FUSION WELDER MELTS A SECTION OF THE COIL AND FUSES IT TO THE TERMINAL PIN PROVIDING VERY STRONG WELDS

Spot Weld Head with 4 Electrode Design

Portable Programmable Weld Control
Supplied with Both the Spot and Fusion Models

The **Oakley Pin to Coil Welder** is available either as a spot welder or a fusion welder.

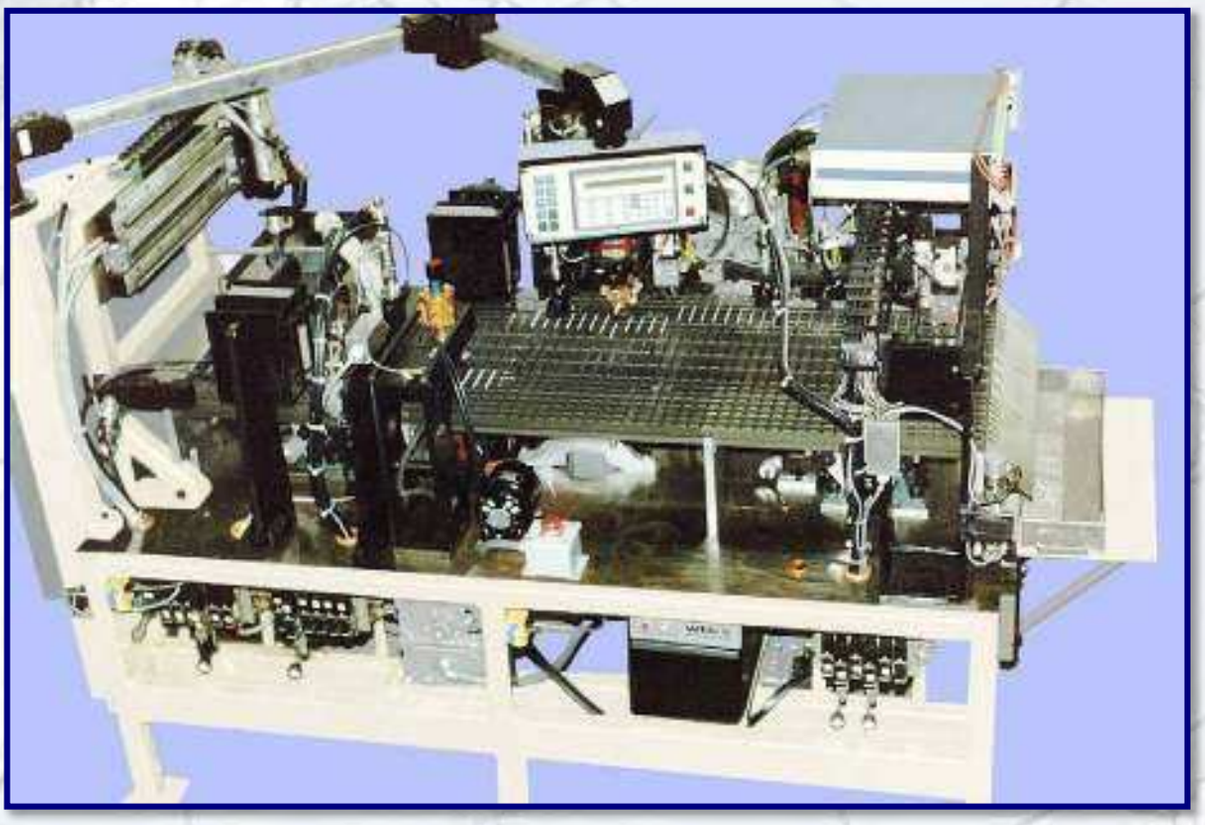
The **Spot Welder** is supplied with our special 4 electrode design that provides for greater weld integrity and more consistent welds. The coil electrode is round and can easily be indexed when a portion becomes worn. The machine is standardly equipped with a 10 kva weld transformer and a programmable weld control. This control allows you to regulate both the time and current for the following parameters: Squeeze, Weld, Hold, PreHeat, Upslope, Cool, Downslope, Quench, and Temper. The monitor emits a signal whenever the current exceeds the established parameter, thus warning the operator of possible weld failures. It also features voltage compensation to correct the output voltage whenever variations occur in the incoming line voltage. The unit also supplies diagnostic messages and keeps count of parts welded. It is capable of storing 7 different weld schedules for various pin/coil combinations. A water supply is required for cooling the electrodes. Production will be well over 2000 welds per hour.

The **Fusion Welder** is equipped with the same weld control and a 5 kva weld transformer. A different weld head is used on this machine with completely different electrodes. With a fusion weld, any portion of the coil that is located between the electrodes is melted and fused to the terminal pin, thus providing an exceedingly strong and reliable weld.

Fusion welding is not suitable for iron/chrome/aluminum (Fe/Cr/Al) wire, for stainless steel terminal pins or for pins with tapered pilot ends. It provides an excellent method, however, for welding very fine or very heavy gauges of wire that are difficult to spot weld on a consistent basis. The fusion welder requires a water supply for cooling the electrodes and an argon supply to provide the atmosphere for the weld. Production for this model is about 1200 welds per hour.

Machine Specifications

Length:	1067mm (42”)
Width:	762mm (30”)
Height:	1778mm (70”)
Weight:	386 kg. (850 lbs.)
Electric Supply:	220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Water Supply:	5.7 liters/min. (1.5 gal./min.)
Pin Diameter:	Any
Coil Diameter:	Any



Machine Features

- HIGH PRODUCTION—900 TO 1400 COMPLETE ASSEMBLIES PER HOUR
- RESISTANCE TEST ENSURES ALL PIN/COIL ASSEMBLIES ARE IN TOLERANCE
- PROVIDES CONSISTENCY FOR BOTH THE ASSEMBLY AND THE WELD
- HIGHLY RELIABLE MACHINE WITH LITTLE DOWNTIME
- WILL ACCOMMODATE WIRE DIAMETERS FROM 0.2 TO 0.6mm (.008” TO .023”)
- FLEXIBLE DESIGN ALLOWS YOU TO SELECT FEATURES TO MEET YOUR REQUIREMENTS

Coil Pickup and Feed Station

The **Oakley Automatic Pin to Coil Welder** is a high production machine for assembling and welding pins and coils. Our small appliance model accommodates coil lengths from 50 to 330mm (2" to 13") and terminal pin lengths from 47 to 100mm (1.875" to 4"). Our major appliance model accommodates coil lengths from 50 to 800mm (2" to 31.5") and pin lengths from 47 to 200mm (1.875" to 8"). Both models accommodate wire diameters from 0.2 to 0.6mm (.008" to .023").

The machine uses a walking beam to transfer the parts. Stations can be added or subtracted to customize the machine to meet individual requirements. The standard stations normally supplied are: 1) Coil Hopper; 2) Upper Pin Hopper; 3) Upper Pin Assembly; 4) Upper Pin Weld; 5) Cross Transfer; 6) Lower Pin Hopper; 7) Lower Pin Assembly; 8) Lower Pin Weld; 9) Lower Pin Plug Insert; 10) Resistance Test Station; and 11) Sorting Device to Remove Bad Parts.

The machine is equipped with a programmable controller, solid state welding controls, a weld monitor, and a message center that provides production statistics and machine diagnostics to aid in problem-solving. An optional laptop computer can be used to program the machine, trouble shoot problems, and download production information.

Pin/Coil Assemblies After Stretching

The following optional stations are also available:

- A second plug insert system for different diameter plugs
- A "Bump" station which flattens a section of the terminal pin to position and hold the plug
- A flexible "Stretch" device to place "Stretched" sections in the coils. Many small appliance elements require sections with a lower watt density. This device reduces the watt density by stretching a section or sections of the coil so they have a greater pitch than the normal close wound coil. This device can place a stretched section in the middle of the coils or can place a stretched section at both ends of the coils
- Both models may be supplied with either a **spot weld** or a **fusion weld**.

The production rate of these machines varies according to the stations being used and the length of the coil, but the normal rate is from 900 to 1400 assemblies per hour.

These machines are extremely reliable and will run consistently and efficiently with little maintenance or down time. Average production on our machine is higher than on similar machines. The consistency and quality of the welded assemblies produced is also superior to that produced by other available machines.

Machine Specifications

	Small Appliances	Large Appliances
Length:	2563mm (101")	Same
Width:	838mm (33")	1725mm (68")
Height:	1650mm (65")	Same
Weight:	907 kg. (2000 lbs.)	1248 kg. (2750 lbs.)
Electric Supply:	220v—1ph—50/60hz	Same
Air Supply:	5.6 bar (80 psi)	Same
Production Rate:	900 to 1400/hour	Same
Pin Lengths:	47 to 100mm (1.87" to 4")	47mm to 200mm (1.87" to 8")
Coil Lengths:	50 to 300mm (2" to 13")	50 to 800mm (2" to 31.5")
Wire Diameters:	0.2mm to 0.6mm (.008" to .023")	Same

Machine Features

- DESIGNED TO TEST MgO SAMPLES TO ASTM STANDARD D 3347
- TESTS MgO FOR DENSITY AND FLOW RATE
- USE OF THIS TESTER IS RECOMMENDED BY MOST MAJOR MgO PRODUCERS
- TEST UNITS ARE INDIVIDUALLY CALIBRATED TO PROVIDE A HIGH DEGREE OF ACCURACY

The **Oakley MgO Test unit** is designed to test samples of MgO for flow rate and for density according to ASTM standard D 3347.

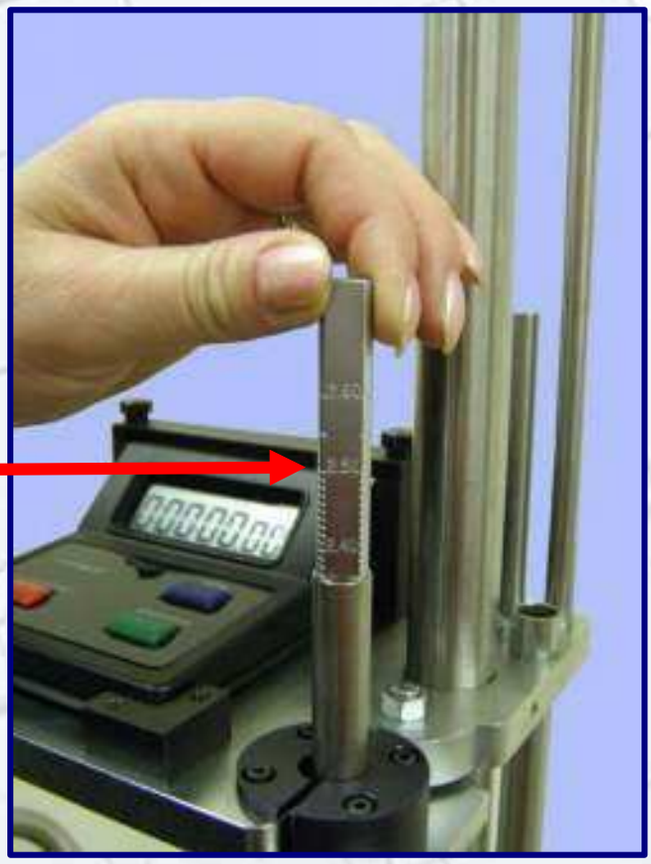
A sample of MgO weighing 100.00 +/- 0.02 g. is obtained according to ASTM standard D 2755. The test unit is then activated, and the calibrated test tube is agitated by a tapping motion. The MgO sample is placed in the test hopper. At the moment when the MgO begins to flow through the calibrated orifice, the operator starts the provided stopwatch. As soon as the flow ceases, the operator stops the stopwatch and turns off the machine. The flow time is then recorded to the nearest second.

The operator then manually taps the hopper to dislodge any powder that may adhere to the inside. The operator inserts the calibrated plug into the test tube and restarts the machine allowing the test tube to be tapped an additional 5 times and then once again stops the machine. The operator reads the tap density from the scale on the plug at the top of the test tube to the nearest 0.01g/cm³.

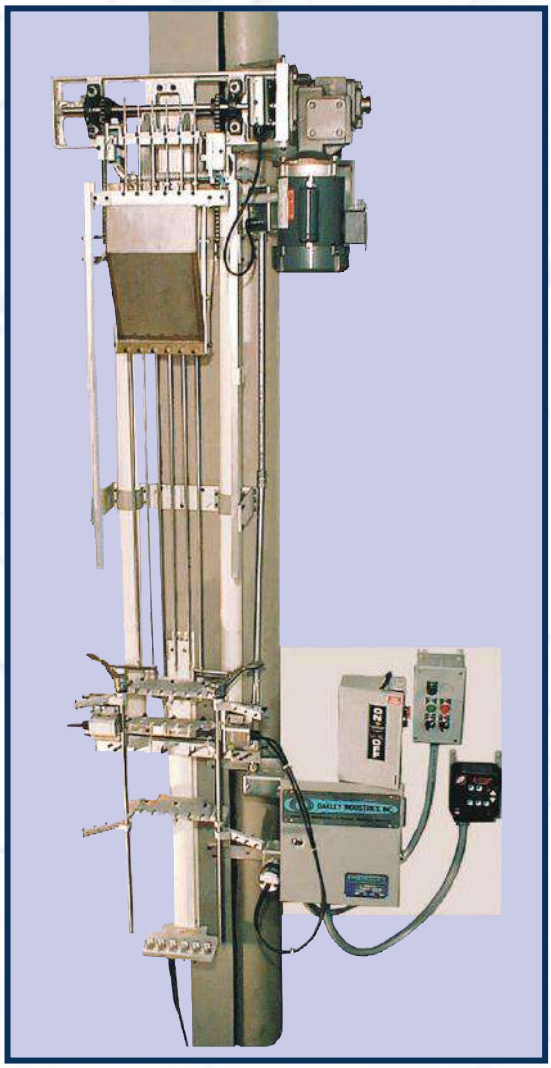
The operator repeats the procedure with two additional samples of MgO and then averages the results.

Under laboratory conditions, with trained personnel, it is expected that triplicate determinations on a single sample of material with a single piece of equipment should agree to within +/- 2% on flow rate and +/-0.01g/cm³.

This simple test unit can help assure that the MgO you are using meets the specifications provided by the MgO manufacturer.



6 Position Jetted Fill Machine



Machine Features

- MOST FLEXIBLE AND BASIC MACHINE
- IDEAL FOR SMALL TO MODERATE RUNS, OR SAMPLING ELEMENTS
- MOST MgO SUPPLIERS USE THIS MACHINE TO TEST MgO
- AVAILABLE FOR MAXIMUM ELEMENT LENGTHS UP TO 9.144 METERS (30 FT.)
- CAN ACCOMMODATE TUBE DIAMETERS FROM 7.92mm TO 22.2mm (.312” TO .875”)
- SUPPLIED WITH A MECHANICAL VIBRATOR AND VARIABLE SPEED FILL RATE

The **Oakley 6 Position Jetted Filling Machine** is designed for small production runs, for test runs of new elements, or for testing and qualifying MgO. Most customers have at least one of these machines in their plants to use for these purposes. To keep the cost of this very basic machine as low as possible, we have not incorporated many of the special features that are now standard on our other fill machines. As a result, this machine involves much more manual operation than our other filling machines.

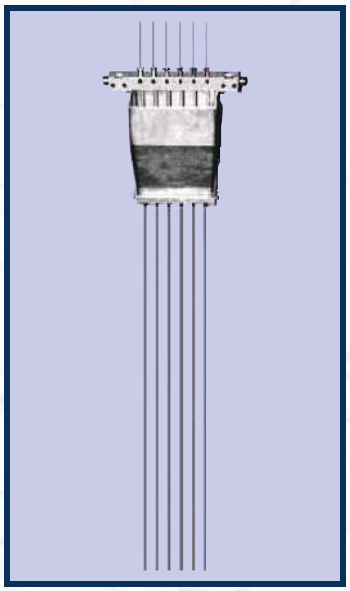
The machine is available for maximum element lengths up to 10.7 meters (30 ft.) and for element diameters up to 22.2mm (.875"). Because of these parameters, it is very popular with producers of industrial heating elements who often make larger diameter elements with very long lengths in small quantities.

We now supply the machine with our mechanical vibrator and a variable speed drive for the fill motor. This greatly simplifies the setting of both the frequency and amplitude of vibration.

The variable speed drive allows you to optimize production by filling at the best rate for your elements.

To enhance the versatility of this machine, we also offer quick-change, interchangeable hopper assemblies. Use of these hopper assemblies eliminates the need to individually remove the outer tube, inner tube and hook rods from the machine and then replace them with a new set. Instead, the hook rod bar is loosened and lowered onto the top of the hopper. The hopper is then removed from the machine with all of the tooling intact. A second hopper, with the proper fill tooling pre-installed, can then be mounted in the machine. These quick-change hoppers save considerable time in making the changeover for a different element diameter.

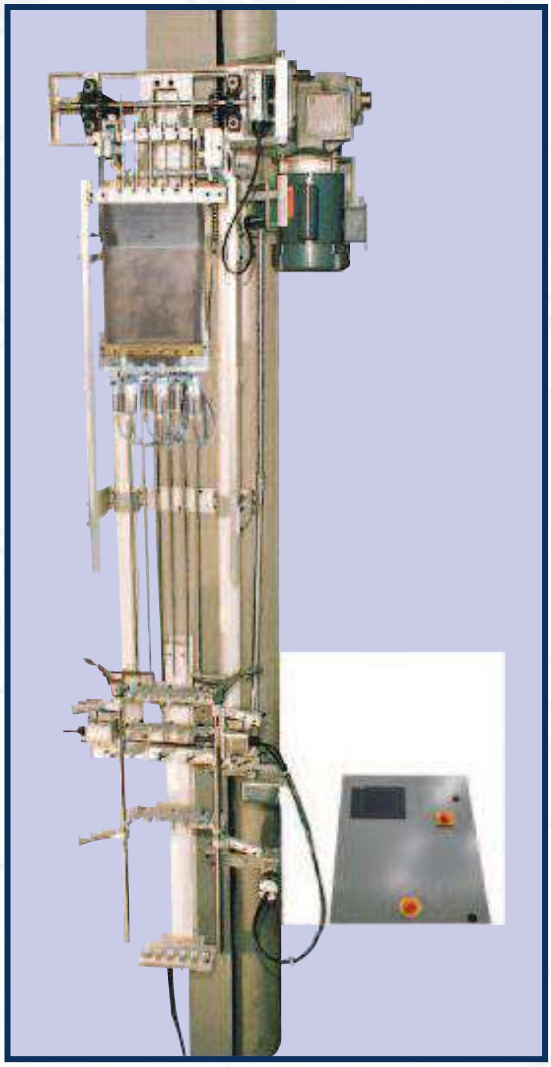
A multiple vibrator system is used on these machines. The number of vibrators is determined by the maximum length of the element for which the machine is supplied.



Quick Change Hopper

Machine Specifications:

Width:	1220mm (48”)
Depth:	610mm (24”)
Height:	2 Times maximum element length +761mm (30”)
Weight: 1.8 Meter (6 ft.)	225 kg. (496 lbs.) [Add 3.2 kg. (7 lbs.) for each 300mm (12”) for longer machines.]
Electric Supply:	115/220v—1ph—50/60hz
Min. Diameter:	6.0mm (.236”)
Max. Diameter:	22.2mm (.875”)
Min. Element Length:	610mm (24”)
Max. Element Length:	9.14 Meters (30 ft.)



Machine Features

- MOST FLEXIBLE AND BASIC MACHINE
- IDEAL FOR SMALL TO MODERATE RUNS, OR SAMPLING ELEMENTS
- NEW JET-LESS TECHNOLOGY DRAMATICALLY INCREASES FILL SPEED & MgO FLOW CONSITENCY
- AVAILABLE FOR MAXIMUM ELEMENT LENGTHS UP TO 9.144 METERS (30 FT.)
- CAN ACCOMMODATE TUBE DIAMETERS FROM 7.92mm TO 22.2mm (.312” TO .875”)
- SUPPLIED WITH A MECHANICAL VIBRATOR AND VARIABLE SPEED FILL RATE

The **Oakley 6 Position Jetless Filling Machine** is designed for small to moderate production runs and for test runs of new elements. Most customers have at least one of these machines in their plants to use for these purposes.

The most important features of our new Jetless Fill System are the ability to dramatically increase fill speeds, greater consistency in MgO fill and a substantial reduction in the loss of MgO. The use of a mechanical vibration system also contributes to the consistency in fill density amongst the filled elements.

The machine is available for maximum element lengths up to 9.144 meters (30 ft.) and for element diameters up to 22.2mm (.875"). Because of these parameters, it is very popular with producers of industrial heating elements who often make larger diameter elements with very long lengths in small to medium quantities.

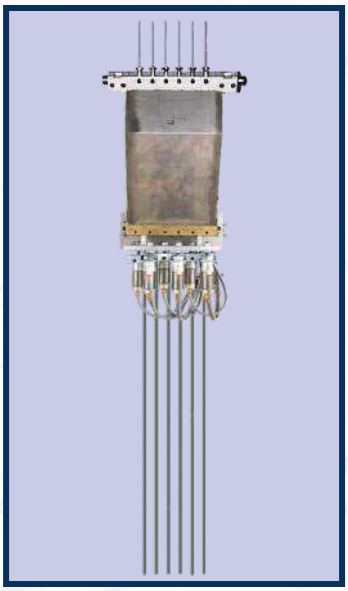
Our machine produces a very consistent fill level in all of the tubes being filled. This level is also adjustable so that you can create the proper cavity in the tube for your particular upper plug without having to either empty or add some MgO.

The machine is supplied with a programmable logic controller (PLC) and a touch screen operator interface. The operator can set all of the machine parameters with this interface, such as the stations to be operated, and the vibration speed

Another important feature of this machine is the ability to individually program the positions on the machine that you wish to use for filling. No element tubes have to be placed in the stations that are not being used. With this feature you can run any quantity of elements you desire from 1 to the maximum number of stations on the machine.

To also enhance the versatility of this machine, we also offer quick-change, interchangeable hopper assemblies. Use of these hopper assemblies eliminates the need to individually remove the outer tube, inner tube and hook rods from the machine and then replace them with a new set. Instead, the hook rod bar is loosened and lowered onto the top of the hopper. The hopper is then removed from the machine with all of the tooling intact. A second hopper, with the proper fill tooling pre-installed, can then be mounted in the machine. These quick-change hoppers save considerable time in making the changeover for a different element diameter.

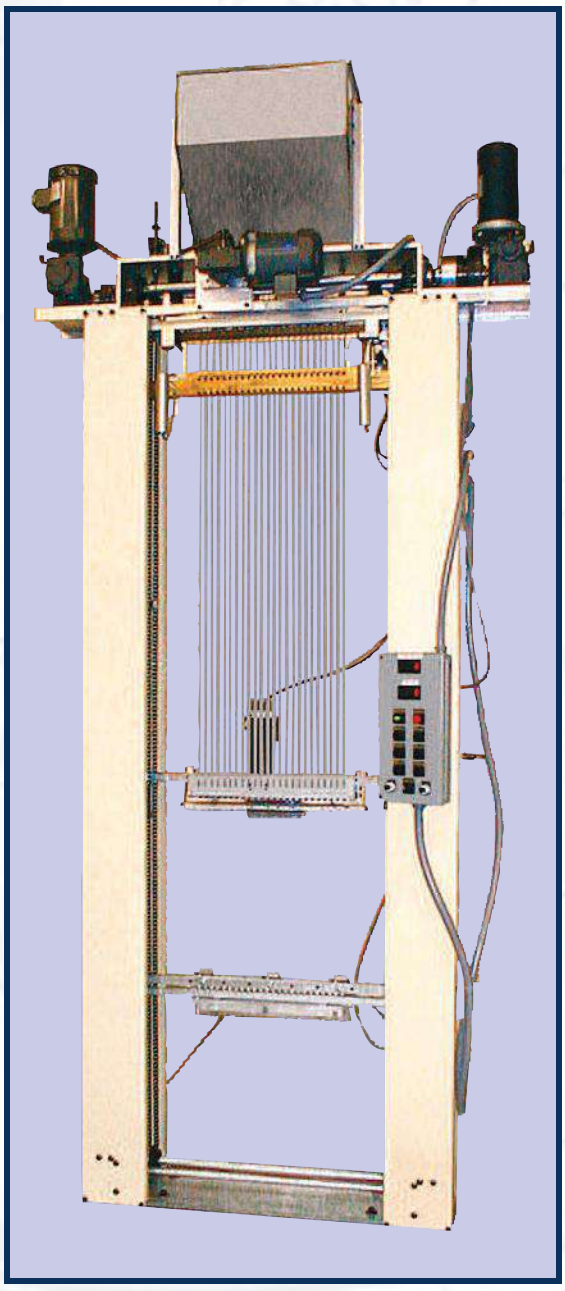
We can also supply this machine to fill one diameter across all six stations, or as many as six different diameters across the six stations of the machine.



Quick Change Hopper

Machine Specifications:

Width:	1220mm (48”)
Depth:	610mm (24”)
Height:	2 Times maximum element length +915mm (36”)
Weight: 1.8 Meter (6 ft.)	225 kg. (496 lbs.) [Add 3.2 kg. (7 lbs.) for each 300mm (12”) for longer machines.]
Electric Supply:	115/220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Diameter:	7.92mm (.312”)
Max. Diameter:	22.2mm (.875”)
Min. Element Length:	610mm (24”)
Max. Element Length:	9.14 Meters (30 ft.)



Machine Features

- FILL SPEEDS TO 760mm (30”) PER MINUTE
- ELEMENT DIAMETERS UP TO 10mm (.394”)
- ELEMENT LENGTHS UP TO 1000mm (40”)
- VERY SIMPLE SETUP AND OPERATION
- CAN BE LOADED AND UNLOADED WITH PNEUMATIC RACK
- HORIZONTAL ASSEMBLIES RIDE ON HARDENED SHAFTS FOR RELIABILITY AND ACCURACY
- MECHANICAL VIBRATOR AND ELECTRICAL CONTROL FOR THE UPPER PIN EXTENSION ARE NOW STANDARD FEATURES ON THIS MACHINE
- CAN BE COMBINED WITH OUR TUBE HOPPER AND OUR ROTARY PLUG INSERT MACHINE TO PROVIDE A HIGHLY AUTOMATED PRODUCTION SYSTEM

Loading Magazine and Pneumatic Rack

The Oakley Small Appliance Element Fast Fill Machine has an adjustable fill rate from 150mm to 760mm (6" to 30") per minute. Tests have proven that for most elements no density loss occurs, and in many cases, the density actually increases. The exact fill speed that will best suit each customer's application is determined by the element diameter, the grade of MgO, and the fill density required.

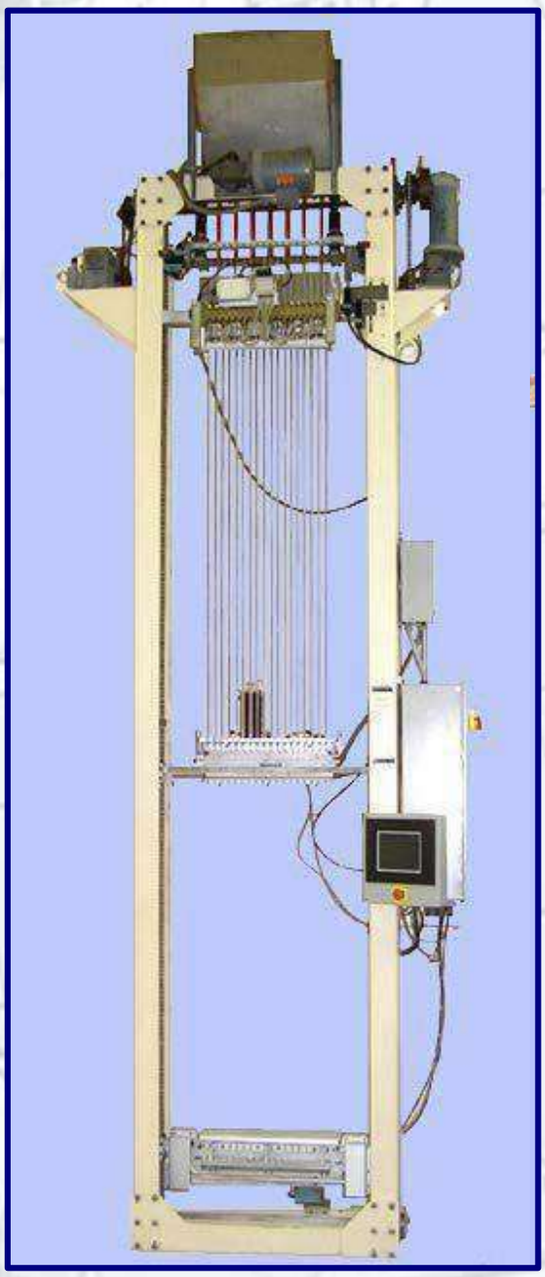
This machine is extremely simple to setup, operate, and maintain. It features complete pushbutton control. All of the various horizontal components are mounted to hardened shafts. This provides stability for these components and also automatically ensures the proper alignment of these devices. We now also supply this machine with our **mechanical vibrator** and with our **electrical upper pin adjustment.**

We offer two models of this machine depending upon the maximum desired tube length: either 620mm (24.5") or 1 meter (40"). Both models will accommodate elements with diameters up to a maximum of 10mm (.394").

We also offer various optional pieces of equipment that can greatly enhance the productivity of this machine. The **Oakley Pneumatic Rack** can be used to load and unload 24 elements at a time. A **Loading Magazine** is available to prepare the tubes for insertion into the machine, and a similar **Unloading Magazine** is available to hold the filled elements after they are removed from the machine. With the use of these devices and one Small Appliance Fast Fill Machine, an operator can fill and seal up to 500 elements per hour [based upon a length of 400mm (16")].

Machine Specifications

Max. Element Length:	620mm (24.5")	1 meter (40")
Width:	1522mm (60")	Same
Depth:	559mm (22")	Same
Height:	3277mm (129")	3680mm (145")
Weight:	341 kg. (750 lbs.)	408 kg. (900 lbs.)
Electric Supply:	220/380/440v—3ph—50/60hz	Same
Air Supply:	5.6 bar (80 psi)	Same
Min. Diameter:	6.0mm (.238")	Same
Max. Diameter:	10.0mm (.394")	Same
Fill Rate:	150 to760mm (6" to 30") per min.	Same
Min. Element Length:	82.5mm (3.25") without rack or 216mm (8.5") with rack	



Machine Features

- VERY FAST FILL SPEEDS
  8.0mm (.312”) = 380mm (15”) PER MINUTE
  9.5mm (.375”) = 508mm (20”) PER MINUTE
  12.7mm (.500”) = 635mm (25”) PER MINUTE
- FILL LEVEL IS EXTREMELY CONSISTENT AND ALSO ADJUSTABLE
- ALMOST ZERO MGO LOSS
- ABILITY TO TURN FILL SPINDLES ON AND OFF INDIVIDUALY BY MEANS OF THE TOUCH SCREEN
- TOUCH SCREEN CAN BE SUPPLIED IN VARIOUS LANGUAGES
- PLC CONTROL AND TOUCH SCREEN INTERFACE MAKE MACHINE OPERATION VERY SIMPLE
- TRAVELING MECHANICAL VIBRATOR PROVIDES CONSISTENT VIBRATION RESULTING IN UNIFORM DENSITY AND VERY QUIET OPERATION
- FULLY AUTOMATIC LENGTH ADJUSTMENT
- OPTIMUM CENTERING OF THE COIL IN THE ELEMENT
- CAN BE LOADED AND UNLOADED WITH PNEUMATIC RACK
- 12, 18, 24, 36, AND 48 POSITION MACHINES ARE AVAILABLE TO SUIT CUSTOMER’S PRODUCTION REQUIREMENTS
- ELECTRICAL ADJUSTMENT OF THE UPPER TERMINAL PIN EXTENSION
- CAN BE SUPPLIED FOR ELEMENT LENGTHS UP TO 9.145 METERS (30 FT.)
- CONVERSIONS ARE AVAILABLE TO RETROFIT EXISTING MACHINES

The most important feature of our new Jetless fill system is the ability to dramatically increase fill speeds. For example, 5/16" (8.0mm) tubes are typically filled at speeds of 15" (380mm) per minute; 3/8" (9.5mm) tubes are filled at speeds of 20" (500mm) per minute; and ½" (12.7mm) tubes are filled at speeds of 25" (635mm) per minute.

The machine produces a very consistent fill level in all of the tubes being filled. This level is also adjustable so that you can create the proper cavity in the tube for your particular upper plug without having to either spill or add MgO.

The machine also reduces the amount of MgO spillage or loss to a bare minimum. The cost savings in MgO can be considerable.

Another important feature of the machine is the ability to individually program the positions on the machine that you wish to use for filling. No element tubes have to be placed in the stations that are not being used. With this feature you can run any quantity of elements you desire from 1 to the maximum number of stations on the machine.

We can also supply any of these machines tooled to fill 2 or more tube diameters without having to change any tooling. For example, on an 18 position machine, we could supply 9 positions tooled for 9.5mm (3/8") and 9 positions tooled for 12.7mm (1/2"), or we could supply 6 positions tooled for 3/8" (9.5mm); 6 positions tooled for 7/16" (11.0mm); and 6 positions tooled for ½" (12.7mm). While this would limit the production of any one diameter on the machine, it would eliminate the need to change the tooling on the machine each time you wish to fill tubes of a different diameter. For customers who are making small quantities of different element diameters, this can be a huge time-saving feature.

The machine also incorporates all of the major features of our standard fast fill machine including a traveling mechanical vibrator, automatic length control, electrical adjustment of the upper terminal pin extension, and the capability for rack loading and unloading. The hand wheel for lowering the clutch has also been eliminated.

The machine is supplied with a programmable logic controller (PLC) and with a touch screen operator interface. The operator can set all of the machine parameters with this interface such as the element length, the fill speed, the stations to be operated, and the vibration speed. The interface also simplifies the operation of the machine by supplying step by step instructions for the operator to follow. We can also provide the touch screen interface in various languages. Currently we offer it in English, Spanish, French, Chinese, Czech, and Japanese.

Main Menu Touch Screen in Chinese

The mechanical vibrator has two simple adjustments to control vibration. An eccentric cam determines the travel of the vibrator bar or the amplitude of vibration. The second adjustment is a variable-speed motor that controls the rotational speed of the cam or the vibration frequency. The speed of the vibrator is programmed on the touch screen. You can obtain a precise degree of vibration to best suit any particular element. By providing better control and regulation of the vibration level, customers can achieve more consistency in fill levels as well as improved density.

Mechanical Vibrator

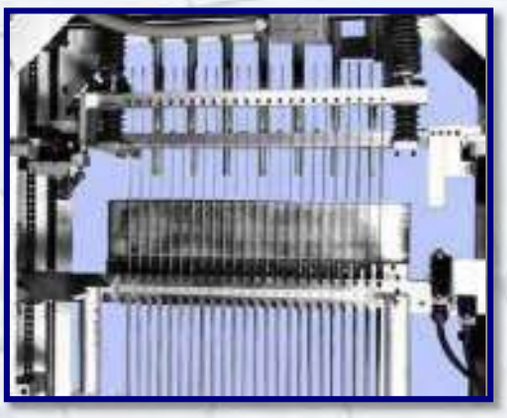
Fully Automatic Length Adjustment

The machine can be reset for a new element length by simply programming the desired length on the touch screen and then pressing the Adjust Length button on the screen. The length can be programmed in millimeters, or inches. For elements up to 2.5 meters (78.75”), the entire process takes less than 30 seconds and guarantees the accuracy and repeatability of length setups. This is a great advantage for customers who must change lengths frequently on their machines. To accomplish this automatic length adjustment, we have combined the older clamp and anvil bars into a single assembly. The anvil bar now has its own chain drive and pivots below the clamp mechanism when not in use.

Combined Clamp & Anvil Assembly

Electrical Upper Pin Extension Adjustment

The hook rod bar is motorized and allows you to adjust the hook position on all of the stations on the machine at one time. Raise and Lower Hook Rod pushbuttons on the touch screen are used to make this adjustment. The hook rods move up or down slowly allowing you to easily set the upper pin extension exactly where desired. This feature is very valuable if you change the pin extension of your upper terminal pin on a fairly frequent basis.



Hook Rod Bar with Acme Screws

Rack Loading and Unloading

The addition of the disappearing clip retainer bar has made it possible to use our Pneumatic Rack to load and unload all previously mentioned fill machine models. Either 18 or 24 tubes can be simultaneously loaded with the pneumatic rack by simply snapping the tubes into the retaining clips. After the tubes have been loaded into the machine and raised enough so that they engage the special centering tip, the spring clip retainer bar is retracted so it will not interfere with the remaining sequence of the machine. At the end of the fill cycle, when the filled elements have been removed, the spring clip bar is brought to the forward position so it will be ready to receive the next load. Use of the pneumatic rack reduces handling times and thus increases the productivity of the machine. Please note, however, that the use of the spring clip feature and the pneumatic rack for loading require that your element tubes have consistently open and burr-free inner diameters so that all of the tubes can be simultaneously raised over the centering tips.

Pneumatic Rack Being Used to Insert 24 Tubes into Spring Clip Retainer Bar

Three 24 Position Fast Fill Machines shown installed in a pit with a catwalk around the machines to facilitate loading MgO into the bulk hoppers and to provide access to the machine for changeover and maintenance. Also pictured are our pneumatic racks and our loading and unloading magazines.

Machine Specifications

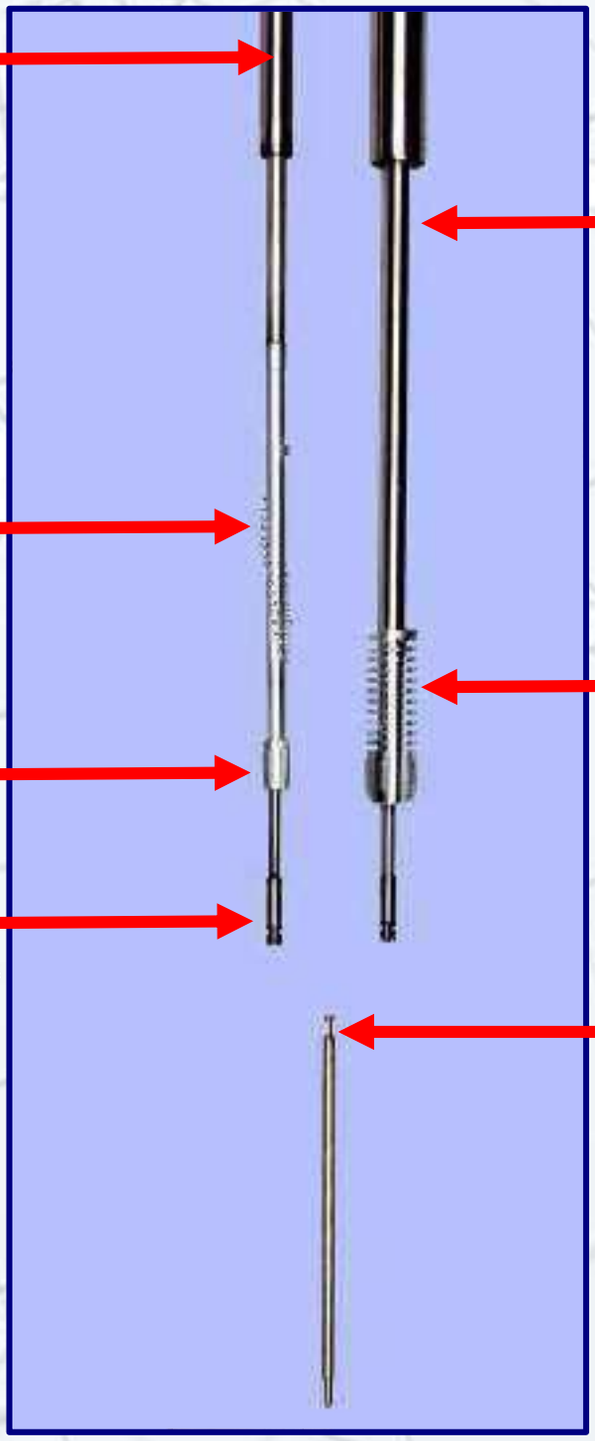
Model:	12 Pos.	18 Pos.	24 Pos.	36 Pos.	48 Pos.
Length:	1524mm (60”)	1524mm (60”)	1524mm (60”)	1981mm (78”)	1981mm (78”)
Width:	All Models: 724mm (28.5”)				
Height:	All Models: 2 times Maximum Element Length & 1422mm (56”)				
Weight: 1830mm (6 ft.) Per 300mm (12”) add:	794 kg. (1750 lbs.) 34 kg. (75 lbs.)	794 kg. (1750 lbs.) 34 kg. (75 lbs.)	794 kg. (1750 lbs.) 34 kg. (75 lbs.)	1057 kg. (2330lbs.) 41 kg. (90 lbs.)	1057 kg. (2330lbs.) 41 kg. (90 lbs.)
Electric Supply:	All Models: 220/380/440v—3ph—50/60hz				
Air Supply:	All Models: 5.6 bar (80 psi)				
Min. Tube Diameter.	All Models: 5.5mm (.216”)				
Max. Tube Diameter:	22mm (.875”)	16mm (.625”)	12.7mm (.500”)	16mm (.625”)	10mm (.394”)
Min. Tube Length:	All Models: 216mm (8.5”)				
Max. Tube Length:	9144mm (30 ft.)	9144mm (30 ft.)	9144mm (30 ft.)	3962mm (13 ft.)	3962mm (13 ft.)
Fill Rate:	All Models: 0-900mm (0-35.4”) per minute				
Avg. Handling Time:	2 minutes	2.5 minutes	2.5 minutes	3.5 minutes	3.5 minutes
Hourly Production:	180 pcs.	240 pcs.	320 pcs.	392 pcs.	523 pcs.

Note: 1: Hourly production figures above are based upon filling a 9.5mm (.375”) diameter element with a length of 1000mm (40”) and presuming the operator will be using the pneumatic rack for loading and unloading the machine.

Note 2: ***When using the pneumatic rack, the minimum element length is increased to 250mm (10”).***

Outer Tube

(We need to know the element O.D. and wall thickness.)



Inner Tube

(We need to know the largest coil outer diameter and terminal pin diameter.)

Welded Jet Nozzle

(Supplied for most element diameters)

Caterpillar Machined Centralizer

(Supplied for large element diameters)

Nozzle Tip

(Now available in standard material or in hardened steel.)

Hook

(We currently manufacture 35 different hooks.)

Terminal Pin "Knob"

We need to know the diameter of this knob to select the proper hook for your pins.)

- **HIGHEST QUALITY AND CONSISTENCY**
- **VERY COMPETITIVE PRICES**
- **QUICK DELIVERY**

We can supply fill tooling for your Oakley, Kanthal/Oakley, or other model filling machines. Because we weld and draw our own tubing for this tooling, the quality and consistency is superior to that supplied by any competitor. Also, because we manufacture both the tubing and the nozzles in our own plant, we can almost always deliver this tooling faster than other suppliers.

The fill tooling should always be selected to provide the best possible centering of the coil in your elements while at the same time providing for the maximum MgO flow. If you would like an offer from us for replacement tooling and if you are satisfied with the results currently being obtained on your filling machine, then simply supply us with the following information.

Outer Tube Dimensions
- Outer diameter
- Inner diameter
- Length
- Collar outer diameter

Inner Tube Dimensions
- Outer diameter
- Inner diameter
- Length

Other Information Required
- Hole diameter in the nozzle tip
- Knob diameter of your terminal pins
- Hook rod diameter
- Hook rod length

If you are **not** satisfied with the results obtained on your filling machine and would like us to re-evaluate the tooling you are using, then we require the following information.
- The **Element** outer diameter and wall thickness
- The minimum and maximum coil outer diameters used in the element and the terminal pin diameter
- The terminal pin knob diameter
- The **maximum** element length for your machine

The drawing below shows the 6 critical dimensions for all centralizer nozzles. Proper selection of these dimensions ensures good centralization of the coil in your elements, provides the best possible MgO flow, and guarantees that the nozzles will fit onto your existing fill tubes. If you wish to purchase nozzles from us, please supply the dimensions shown for each size nozzle that you require.

D1 Diameter of the hole in the tip of the nozzle—This is normally your maximum coil diameter + 0.25mm (.010”). This must have sufficient clearance so your largest coil, the terminal pins, the hook rod, and the
hook can all pass through.

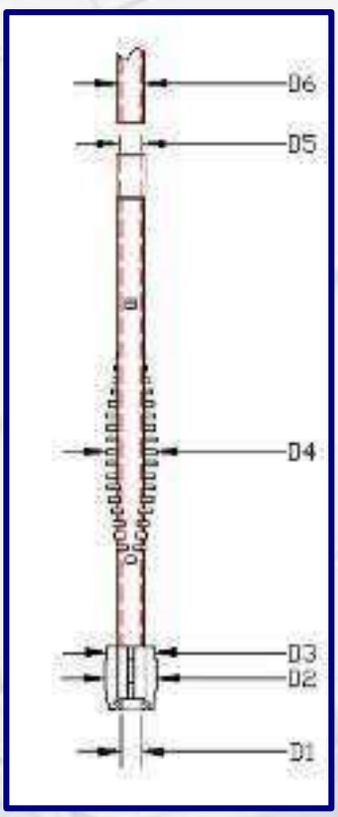
D2 Outer diameter of the tip—This should normally be the inner diameter of your element minus 0.5mm to 0.75mm (.020” to .030”) depending on the quality of your element tubes.

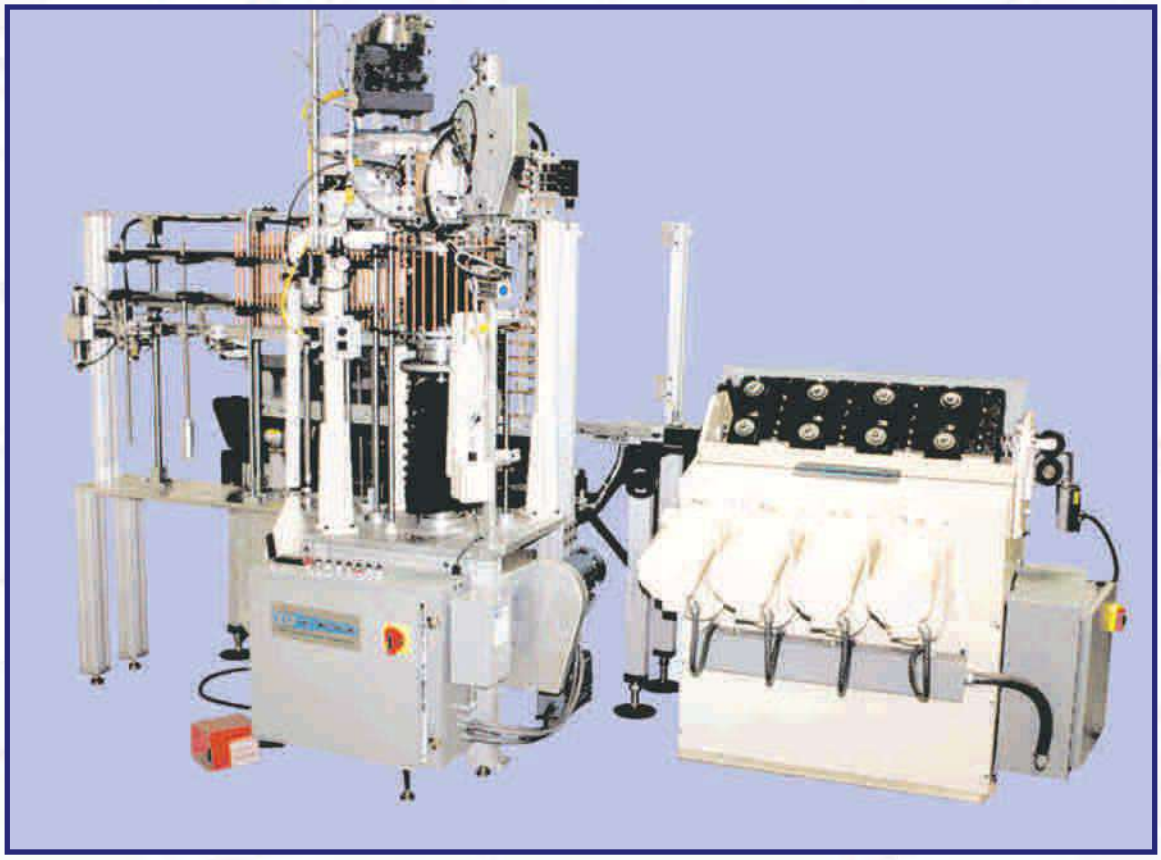
D3 Diameter of the step on the tip of the nozzle on which the outer tube fits—Please supply the inner diameter of your outer tube.

D4 Outer diameter of the welded spiral or machined portion of the nozzle—We make this dimension to suit your outer tube.

D5 Inner diameter of the expansion placed in the nozzle to allow the inner tube to be assembled and soldered in place—We make this dimension to suit your inner tube.

D6 Outer diameter of your inner fill tube





Machine Features

- AUTOMATIC HIGH PRODUCTION SYSTEM FOR SMALL APPLIANCE ELEMENTS
- ENABLES ONE OPERATOR TO FILL, SEAL, AND REDUCE ELEMENTS
- PNEUMATIC RACK LOADS FILLED ELEMENTS DIRECTLY INTO MACHINE
- PLUGS ARE INSERTED TO A CONSISTENT LEVEL
- ELEMENTS WITHOUT PLUGS ARE AUTOMATICALLY REMOVED
- SEALED ELEMENTS ARE FED DIRECTLY INTO ROLL REDUCER
- CAN BE SUPPLIED FOR ELEMENT LENGTHS UP TO 1 METER
- PRODUCTION UP TO 1200 PIECES PER HOUR

The **Oakley Rotary Plug Insert Machine** has been designed to enable one operator to fill, seal, and roll reduce tubular elements at a high production rate.

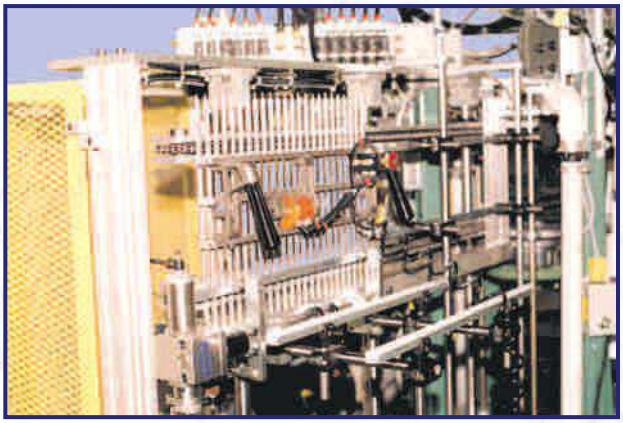
The filled elements are removed from the filling machine with the **Oakley Pneumatic Rack** and then inserted into the Rotary Plug Insert Machine. Once inserted, a rapid traverse system is used to move the elements forward to the feed station where they are individually fed into the index table. A small amount of MgO is removed from the elements to create a cavity for the sealing washer or plug. The plug is fed by a vibratory bowl system and inserted into the element against the MgO. Next, each element is checked to ensure that a plug has been inserted and any which lack a plug are automatically removed from the machine.

We can also provide a station to close the tube around the plug to ensure that it will not move or slip out during the reducing operation. A robotic device then removes the sealed element from the turntable, simultaneously turns it from the vertical to a horizontal position, and then lays it onto a chain index unit. This chain index lowers the elements onto a conveyor system that feeds the elements directly into the roll reducer.

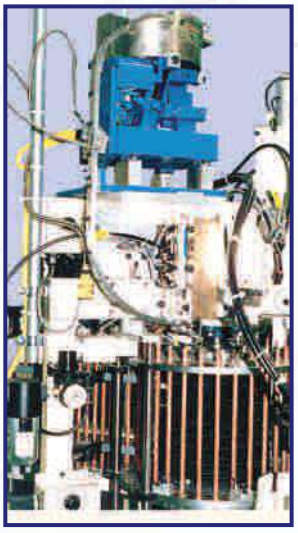
The cycle time for this machine is approximately 2.8 seconds so the production level is a theoretical maximum of 1285 pieces per hour. Actual production depends upon the capacity of the filling machine or machines used to feed this unit. It is very possible for one operator to produce 800 to 1000 elements per hour using this system.

Two standard models of this machine are available depending upon the maximum element length. The first model accommodates maximum lengths up to 620mm (24") while the second model accommodates elements up to 1000mm (40") in length.

We also offer an optional hipot (leakage current) test station for this machine. Any elements that fail the test are automatically removed prior to being fed into the roll reducer.



Elements Inserted with Pneumatic Rack

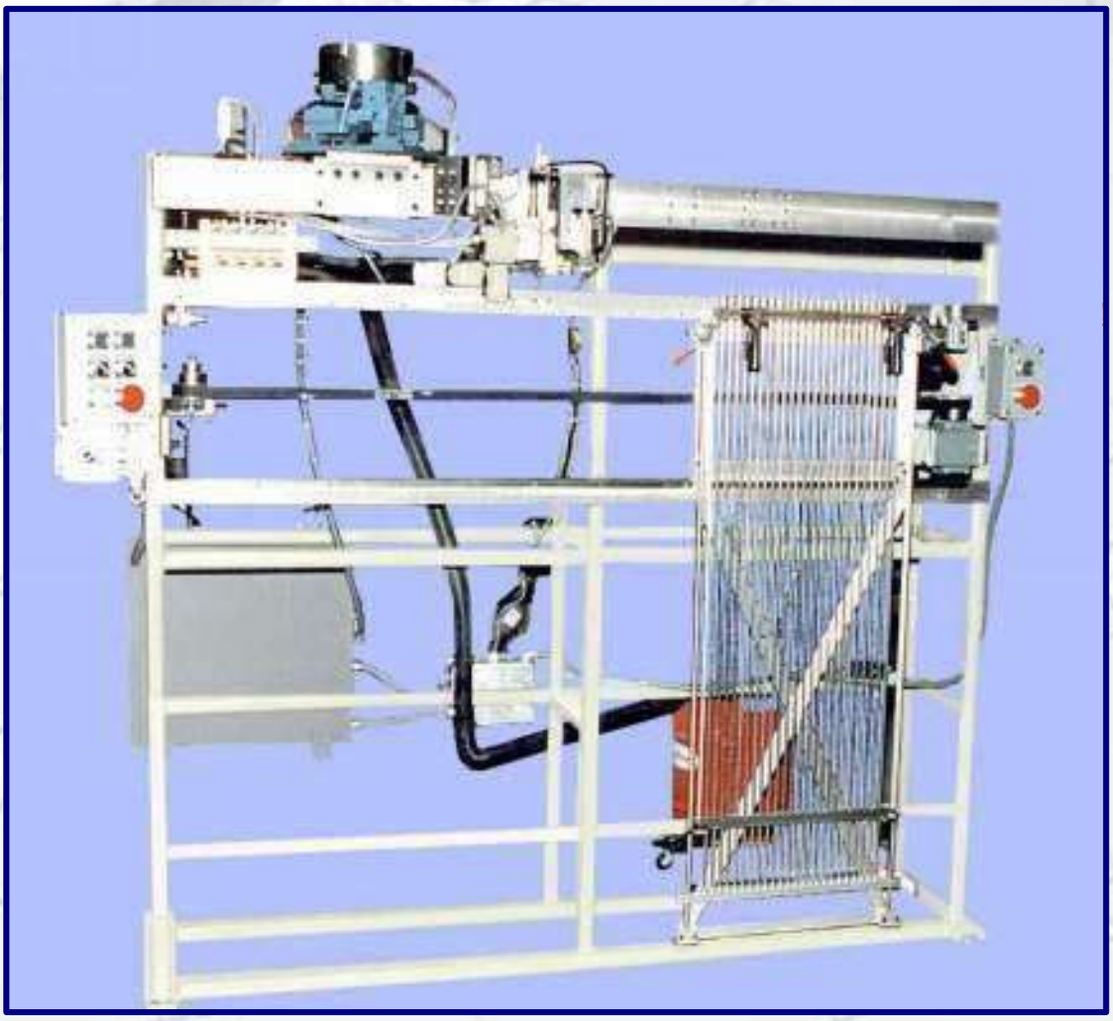


Plug Insert

Elements lowered Onto conveyor

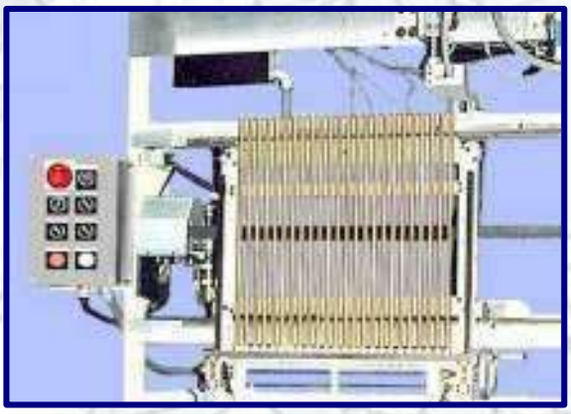
Machine Specifications

Max. Tube Length:	620mm (24.5")	1000mm (40")
Length:	1905mm (75")	Same
Width:	1397mm (55")	Same
Height:	2108mm (83")	2502mm (98.5")
Weight:	544 kg. (1200 lbs.)	680 kg. (1500 lbs.)
Electric Supply:	115/220/v—1ph—50/60hz	
Air Supply:	5.6 bar (80 psi)	Same
Min. Diameter:	6mm (.238")	Same
Max. Diameter:	10mm (.394")	Same
Min. Element Length:	216mm (8.5")	Same



Machine Features

- FAST INSERTION OF PLUGS INTO THE UPPER END OF THE ELEMENTS
- PNEUMATIC RACK IS USED TO LOAD FILLED ELEMENTS DIRECTLY INTO
  MACHINE
- PRODUCTION UP TO 1000 PIECES PER HOUR
- WITH 2 FEEDER SYSTEMS CHANGEOVER FOR A DIFFERENT DIAMETER
  TAKES ONLY SECONDS
- PLUGS ARE INSERTED TO A CONSISTENT LEVEL
- ELEMENTS WITHOUT PLUGS ARE AUTOMATICALLY REMOVED
- CAN BE SUPPLIED FOR ELEMENT LENGTHS UP TO 1.83 METERS (6 FT.)
- HIPOT (LEAKAGE CURRENT) TEST IS PERFORMED ON ALL ELEMENTS



24 Elements in Start Position
Hand wheel Length Adjustment Shown at Lower Right.

Vacuum/Blowoff Station, Plug Insert Station, and Plug Inspect Station

The **Oakley In-Line Plug Insert Machine** can be loaded and unloaded manually or with the Oakley pneumatic rack. Either 18 or 24 elements are processed as a time. A stepper motor precisely moves the elements from station to station. A vacuum/blowoff device removes a pre-determined amount of MgO to create a cavity for the sealing plug. The plug is then inserted onto the terminal pin. A sensor is used to check for the physical presence of the plug. Any elements lacking a plug are automatically removed from the machine. The plug is then pressed into the element, and if required the element tube is constricted around the plug to hold it securely in place. The machine can be programmed so that the elements may be removed at either end. The machine provides for a highly consistent depth of the plug in the elements.

As standardly supplied, the machine is tooled for 1 element diameter with a maximum length of 1.83 meters (6 ft.). By adding an optional second vibratory feed system, for a different plug size, the changeover from 1 element diameter to another is reduced to a few seconds. In this case, the operator merely must turn a selector switch to convert the machine.

Length changeover is accomplished quickly by means of a hand wheel that drives a rack and pinion to move the clamping mechanism up or down to accommodate the new element length.

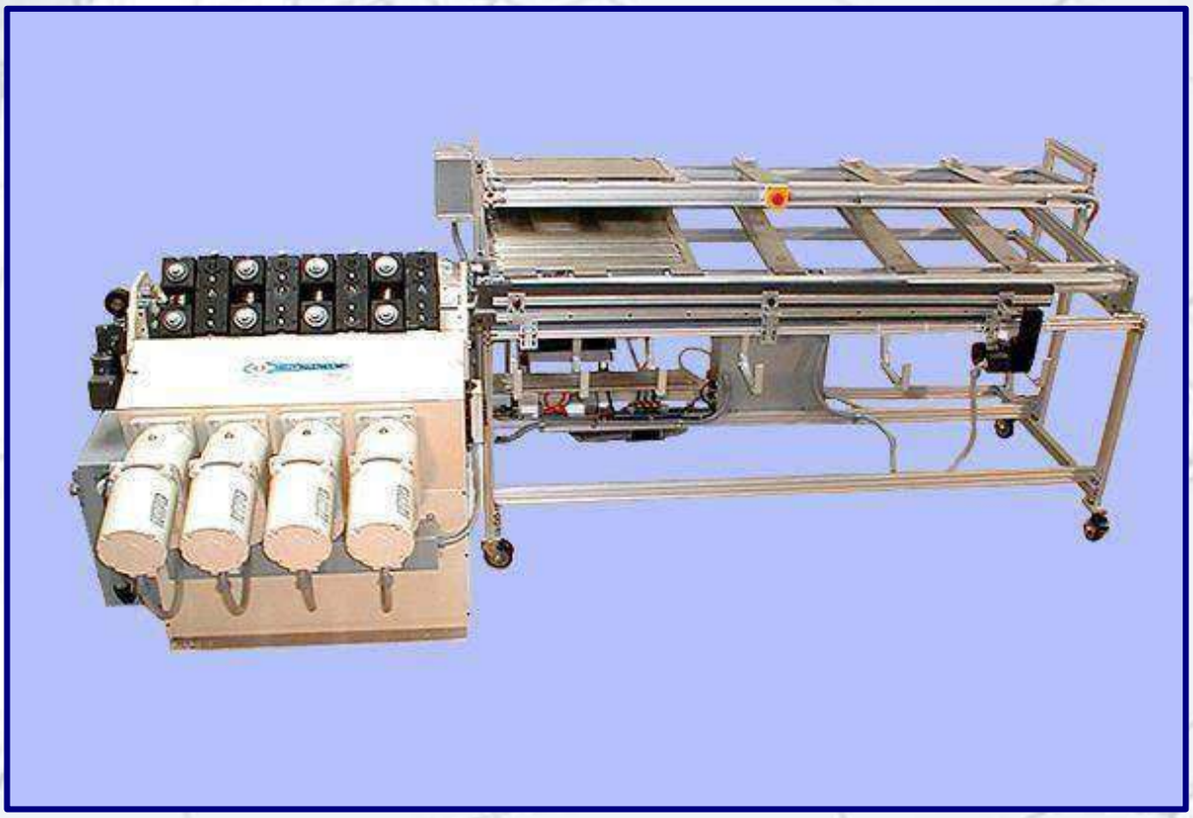
We also offer an optional hi-pot (leakage current) test station for this machine. Any elements failing the test are automatically removed from the machine.

Typical production is about 1000 pieces per hour when using our pneumatic rack and approximately 600 pieces per hour when manually loading and unloading the elements.

Machine Specifications

Length:	2665mm (105”)
Width:	914mm (36”)
Height:	2108mm (83”)
Weight:	408 kg. (900 lbs.)
Electric Supply:	115/220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Diameter.	6mm (.238”)
Max. Diameter:	10mm (.394”)
Min. Element Length:	216mm (8.5”)
Max. Element Length:	1830mm (6 ft.)

Tray-Type Element Feeder Machine



Machine Features

- INEXPENSIVE FEEDING SYSTEM
- REDUCES LABOR AND PREVENTS JAM-UPS
- SIMPLE TO CHANGE FOR DIFFERENT ELEMENT DIAMETERS AND LENGTHS
- OPTIONAL TESTING OF ELEMENTS FOR DIELECTRICAL STRENGTH OR LEAKAGE CURRENT WITH AUTOMATIC REMOVAL OF FAILURES

Feeder Controls and Hipot Test Unit

The Oakley Tray-Type Element Feeder is designed to economically feed elements into the roll reducer. Two models are available. The basic model holds a single layer of elements and will hold a maximum of 78 elements with a 9.5mm (.375") diameter. The model shown has a second tier of elements above the first to enable the feeder to hold more elements. With this option, the feeder is capable of holding as many as 130 elements with a 9.5mm (.375") diameter.

An option available for either model is a hipot test station. With the inclusion of this device, the elements are tested for dielectric strength or leakage current, and any elements that fail are automatically removed into a separate compartment before they are reduced. No adjustments are required for different element lengths, and the machine can be supplied to suit any desired maximum length up to 3658mm (12 ft.). The Tray-Type Element Feeder does not require any adjustments when changing element diameters whose difference in diameter is not very large, for example when changing from 9.5 to 8.0mm (.375" to .315") elements. When the difference in diameter is greater, the adjustments required take less than 10 minutes. The feeder is mounted on wheels so it can be easily moved away from the reducer to make possible the hand-feeding of very long elements or to enable you to perform maintenance on either machine.

These feeders optimize production on the roll reducer while at the same time preventing jam ups that are sometimes caused by operators who feed the elements into the reducer without an adequate gap between them. These feeders are a cost effective way to eliminate labor and also to reduce scrap.

Machine Specifications

Length:	Max. Element Length + 336.5mm (13.25")
Width:	1117.6mm (44")
Height:	1244.6mm (49")
Weight:	209 kg. (460 lbs.) for 2000mm (78.75") length
Electric Supply:	220—1ph—50/60hz—5 amp with tester
Air Supply:	5.6 bar (80 psi)
Element Diameters:	6mm to 12.7mm (.238" to .500")
Min. Element Length:	190.5mm (7.5")
Max. Element Length:	3658mm (12 ft.)

Test Specifications

Voltage Test Range:	0 -5000VAC
Failure Trip Point:	0.1 – 12.0 mA
Test Time:	0 – 999.9 seconds

NOW SUPPLIED WITH VARIABLE SPEED DRIVES ON ALL STATIONS

Machine Features

- 3-7% GREATER ELEMENT ELONGATION
- STRAIGHTER ELEMENTS
- LONGER ROLL LIFE
- FASTER REDUCING SPEEDS
- TROUBLE-FREE OPERATION
- ACCURATE AND CONSISTENT DIAMETERS

12 Station Interchangeable Roll Reducer

8 Station Interchangeable Vee Insert

The **Oakley 8 and 12 Station Interchangeable Roll Reducers** are now equipped with our variable speed drives which allows each station to run progressively faster than the previous station. As a result, the elements are pulled through the machine and this causes 3 to 7% greater element elongation. This can result in considerable cost savings in both tubing and MgO. Because the elements are not work-hardened as much as in traditional reducers, it is easier to obtain straight elements and there is less wear on the rolls.

These machines feature interchangeable "Vee" inserts that have the roll stands and rolls pre-mounted and set for a particular reduction. This provides for very fast changeover times.

The maximum recommended reduction for the 8 station machine is 16% of the starting diameter, and for the 12 station machine, this is increased to 21%. For both machines the maximum starting tube diameter is 12.7mm (.500") when using carbide rolls and 16mm (.625") when using tool steel rolls.

Carbide rolls are slightly more expensive than tool steel rolls but their life expectancy is 7-10 times longer.

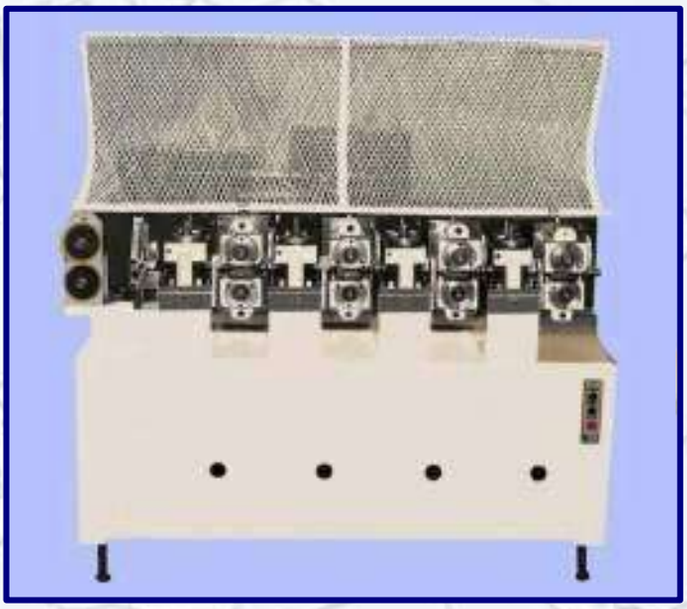
The standard speed of these machines is approximately 23 meters/min (75 ft./min.)

Machine Specifications

	8 Station	12 Station:
Length:	1132mm (44.625")	1700mm (67")
Width:	1810mm (71.25")	Same
Height:	1105mm (43.5")	Same
Weight:	1088 kg. (2400 lbs.)	1633 kg. (3600 lbs.)
Electric Supply:	220/380/440v—3ph—50/60hz	
Rolled Dia. Tolerance:	+/-0.05mm (.002")	Same
Min. Tube Diameter.	5mm (.200")	Same
Max. Tube Dia.: (Steel):	16mm (.625")	Same
Max. Tube Dia.: (Carbide):	12.7mm (.500")	Same
Min. Tube Length:	165mm (6.5")	Same
Max. Reduction:	16%	21%

Machine Features

- 25mm (1.0”) STARTING ELEMENT DIAMETER CAPACITY
- REDUCTIONS OF 25% OR MORE
- QUICK CHANGE CAPABILITY—ROLLS AND GUIDE BUSHINGS CAN BE CHANGED IN 1 to 2 HOURS
- HEAVY DUTY SHAFTS, ROLLS, STANDS, AND BASE
- 2 H.P. MOTORS FOR EACH STATION
- ROLLS CAN BE PROVIDED WITH PROGRESSIVELY LARGER DIAMETERS TO INCREASE ELEMENT ELONGATION



8 Station XLO Reducer

The **Oakley XLO Heavy Duty Roll Reducers** are the most powerful element reducers available in the world. They are designed to accommodate the larger element diameters, heavier wall thicknesses, and greater reductions that are normally associated with industrial heating elements. Whereas our standard reducers are equipped with 3/4 horsepower motors, these XLO machines have 2 horsepower motors and correspondingly heavier duty roll stands, shafts, and frame to withstand the greater pressures required.

The machines are supplied with one set of guide bushings, a turks-head straightener, and a driven ejector mechanism. While reducing rolls are available in both hardened tool steel and tungsten carbide, experience has shown that tool steel rolls are normally sufficient for the smaller production requirements associated with industrial type heaters. These machines have a reducing speed of 18 meters/min. (60 ft./min.) at 60 hz and can be changed quickly and simply for different element reductions.

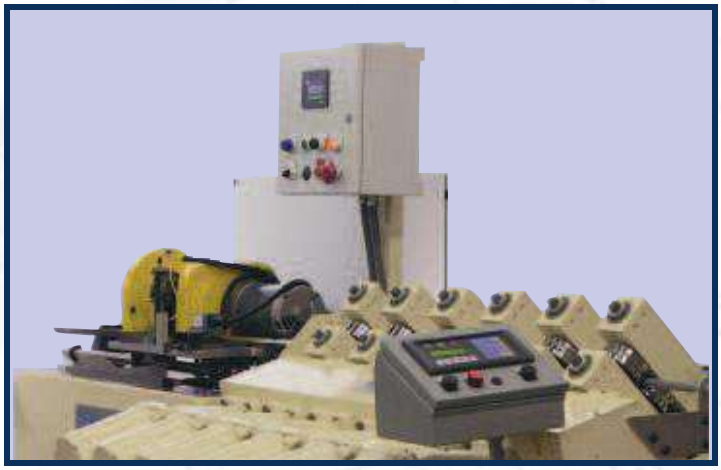
Machine Specifications

	XLO-8	XLO-12
Length:	1650mm (65”)	2340mm (92”)
Width:	1070mm (42”)	Same
Height:	1290mm (51”)	Same
Weight:	1818 kg. (4000 lbs.)	2727 kg. (6000 lbs.
Electric Supply:	220/380/440v—3ph—50/60hz	
Rolled Dia. Tolerance:	+/- 0.05mm (.002”)	Same
Min. Tube Dia.:	6.0mm (.238”)	Same
Min. Tube Length:	165mm (6.5”)	Same
Max. Reduction:	21%	25%

SUPPLIED WITH VARIABLE SPEED DRIVES ON ALL STATIONS

Machine Features

- TAKES ROUND TUBING FROM A SPOOL OR ROUND TUBULAR HEATING ELEMENTS AND RESHAPES THEM INTO DIFFERENT OVAL FORMS
- TAKES ROUND SOLID ROD FROM A SPOOL & STRAIGHTENS IT
- OFFERS A STANDARD CUTOFF SYSTEM THAT CUTS TO A DESIRED LENGTH
- INTERCHANGEABLE VEE INSERTS FOR VARIOUS DIAMETERS OR FORMS
- PLC & TOUCHSCREEN CONTROLS FOR EASY OPERATION OF MACHINE



Tube Reshaping/Rod Straightener Machine & Cutoff System

Vee Insert

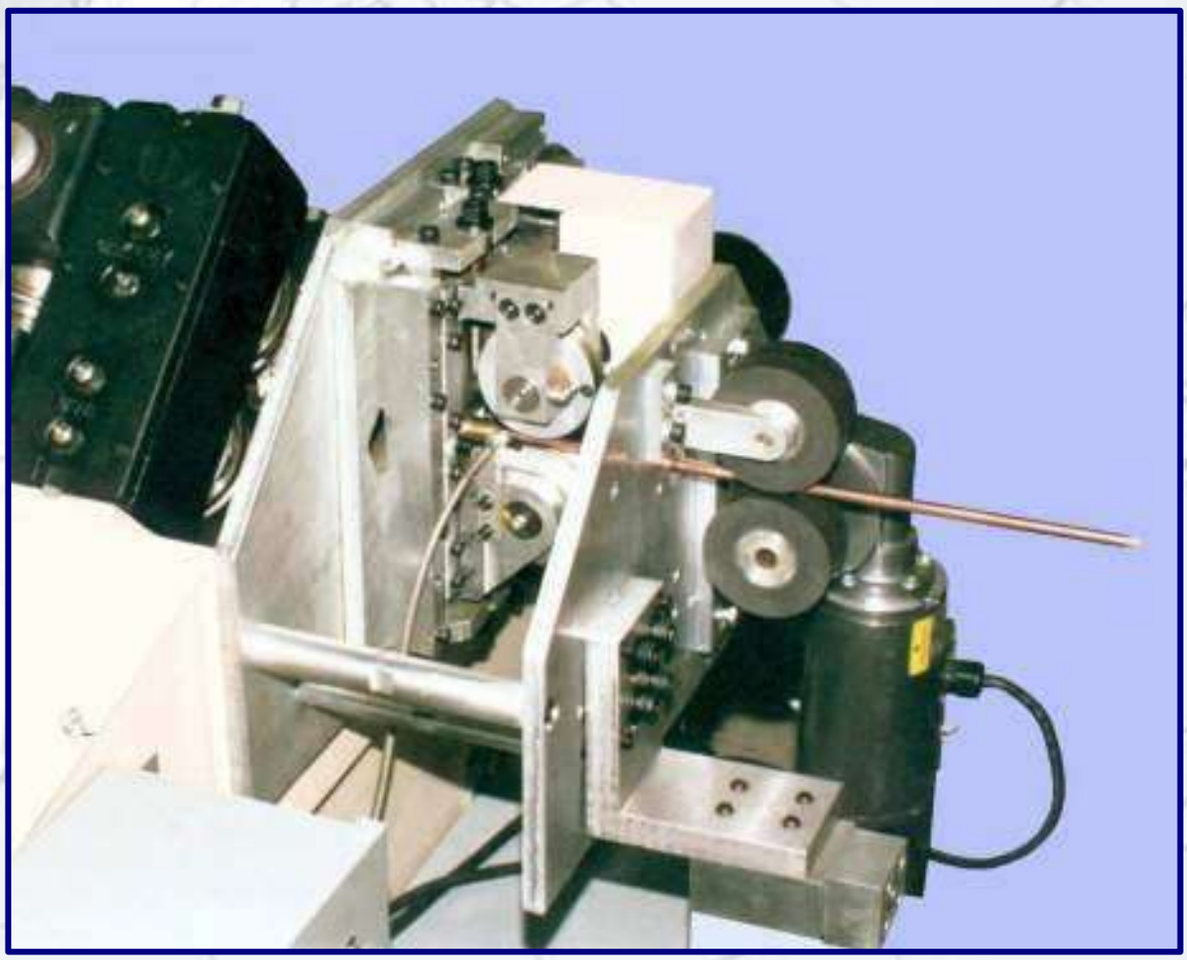
The **Oakley Tube Reshaping/Rod Straightener & Cutoff System** is designed to offer two different capabilities: First, our machine can take round tubing from a spool or round individual tubular heating elements and reshapes them into different oval forms. When tubing is reformed, the tubes are then transferred automatically to the cutoff system where they are cut to the desired length. Second, our machine can also take round solid rod from a spool, straighten it, and it is transferred automatically to the cutoff system where it is cut to the desired length.

The reshaping and rod straightening machine comes with a touchscreen control and six variable frequency speed drives controlling either the four or six motors for each of the roll stands. The touchscreen allows the operator to adjust the motor speed for each station independently or globally to ensure the ratios of the product speed passing through the machine matches the roll speed. This global speed change allows our machine to achieve an optimum production rate.

Our cutting system is an abrasive type that is supplied with a vacuum to catch the debris from the blade when the material is cut. The cutoff is supplied with a PLC and touchscreen controls in which the cut length can be entered or changed. The product length is measured at the entrance of the cutoff and it is cut to the designated product length once the preset cut length is reached. The touchscreen also provides diagnostic tools for troubleshooting the cutoff system.

Machine Specifications

	4 Station	6 Station	Tube Reshaping/Rod Straightener Machine & Cutoff System
Length:	1132mm (44.625”)	1700mm (67”)	4852mm (191”) – 4 Station 5385mm (212”) – 6 Station
Width:	1810mm (71.25”)	Same	2438mm (96”)
Height:	1105mm (43.5”)	Same	1702mm (67”)
Weight:	816 kg. (1800 lbs.)	1134 kg. (2500 lbs.)	2177kg. (4800 lbs.) – 4 Station 2495kg. (5500 lbs.) – 6 Station
Electric Supply:	220/380/440v – 3ph – 50/60hz		220/380/440v – 3ph – 50/60hz



Machine Features

- EFFICIENT AND INEXPENSIVE METHOD FOR IDENTIFYING YOUR ELEMENTS
- INTERCHANGEABLE STAMP ROLLS MAKE CHANGEOVER QUICK AND EASY
- MINIMUM ELEMENT LENGTH: 345mm (13.625”)
- MARK IS MADE LONGITUDINALLY ALONG THE ELEMENT
- A DIGITAL COUNTER ACCURATELY POSITIONS THE MARK ON THE ELEMENTS
- STAMP ROLLS ARE AVAILABLE IN EITHER 32 OR 48 CHARACTER MODELS

Interchangeable Stamp Roll with Characters Installed

The **Oakley Marking Attachment** is used to mark tubular heating elements as they exit from the roll reducer. The mark is rolled onto the element sheath in a longitudinal fashion. The position of the mark is adjustable from approximately 12.7mm (.500") from the leading edge of the element to any point along the entire sheath. A quick-change roll-type stamp holder is provided to hold the individual characters. Characters supplied are 1.5mm (.062") in height. The roll type stamp holder is available to hold either 32 or 48 characters depending upon customer requirements. Blank spacers are available individually or in blocks that are equal to either 5 or 10 individual spacers. The use of the larger spacers can save time when changing the individual stamps in the holder.

We also recommend that you purchase an additional stamp holder. This allows you to preset this additional holder with the proper identifying characters for the next group of elements to be run. Then you can simply remove the stamp holder on the machine and replace it with the one you have preset. This reduces the changeover time to a matter of minutes.

The minimum element length that can be run through the roll reducer with the marking attachment is 345mm (13.625"). If the marking attachment is used together with our element straightener on a roll reducer, this minimum length is increased to 362mm (14.25").

This unit adds 460mm (18") to the length of the roll reducer.

As normally quoted, the marking attachment is equipped with 1 roll type stamp holder, 10 blank spacers and 36 individual characters (numbers or letters) of your choice.

The Marking Attachment is very complicated to change for different element diameters. For this reason, we strongly recommend that customers who use interchangeable vee inserts on their roll reducer for various element reductions purchase a separate marking attachment for each vee insert.

Machine Specifications

Length:	380mm (15")
Width:	460mm (18")
Height:	304mm (12")
Weight:	27 kg. (60 lbs.
Electric Supply:	Transformer supplied for connection to your reducer
Max. No. of Characters:	32 or 48
Min. Element Length:	345mm (13.625")
Max. Element Length:	Any

Machine Features

- VERY VERSATILE MACHINE FOR MANUALLY MARKING HEATING ELEMENTS OR ROUND OR FLAT PARTS
- ADJUSTABLE FOR DIFFERENT DIAMETERS OR FLAT OR ROUND PARTS WITH DIFFERENT HEIGHTS
- STAMP ROLL CAN BE PROVIDED TO HOLD 32 OR 48 CHARACTERS (SPECIAL HOLDER CAN HOLD 60 CHARACTERS)
- WILL STAMP ANY LENGTH ELEMENT OR OTHER PARTS
- KNURLED CHARACTERS WITH A RADIUS MUST BE USED FOR ELEMENTS AND ROUND PIECES; STRAIGHT CHARACTERS ARE USED FOR FLAT PIECES.
- STAMPING ROLL IS STANDARDLY SUPPLIED WITH 1.5MM (.062”) CHARACTERS

Interchangeable Stamp Roll with Characters Installed

The **Oakley Manual Marking Machine** can be used to stamp identifying characters onto heating elements or onto any round or flat pieces. The element or other part is manually inserted into the machine against an adjustable stop that is used to determine the starting position of the stamp. A foot pedal is then pressed to begin the cycle. The stamp roll is brought down vertically against the element or other part and then moved horizontally along the length of the piece as it stamps it. The characters can be stamped at any point beginning approximately 12.7mm (1/2") from the leading edge of the material to be stamped.

This unit is very easy and very fast to change for different element diameters or for different round or flat pieces. It is also possible to stamp elements or round or flat parts made from any material.

A quick-change roll-type stamp holder is provided to hold the individual characters. Characters supplied are 1.5mm (.062") in height. The roll type stamp holder is available to hold either 32 or 48 characters depending upon customer requirements. (A special holder can also be supplied that will hold up to 60 characters) All spaces in the character holder must be filled so any spaces that are not being used for a character must be filled with a blank spacer.

We recommend that customers purchase an additional stamp holder. This allows you to preset this additional holder with the proper identifying characters for the next group of parts to be run. Then you can simply remove the stamp holder on the machine and replace it with the one you have preset. This reduces the changeover time to a matter of minutes.

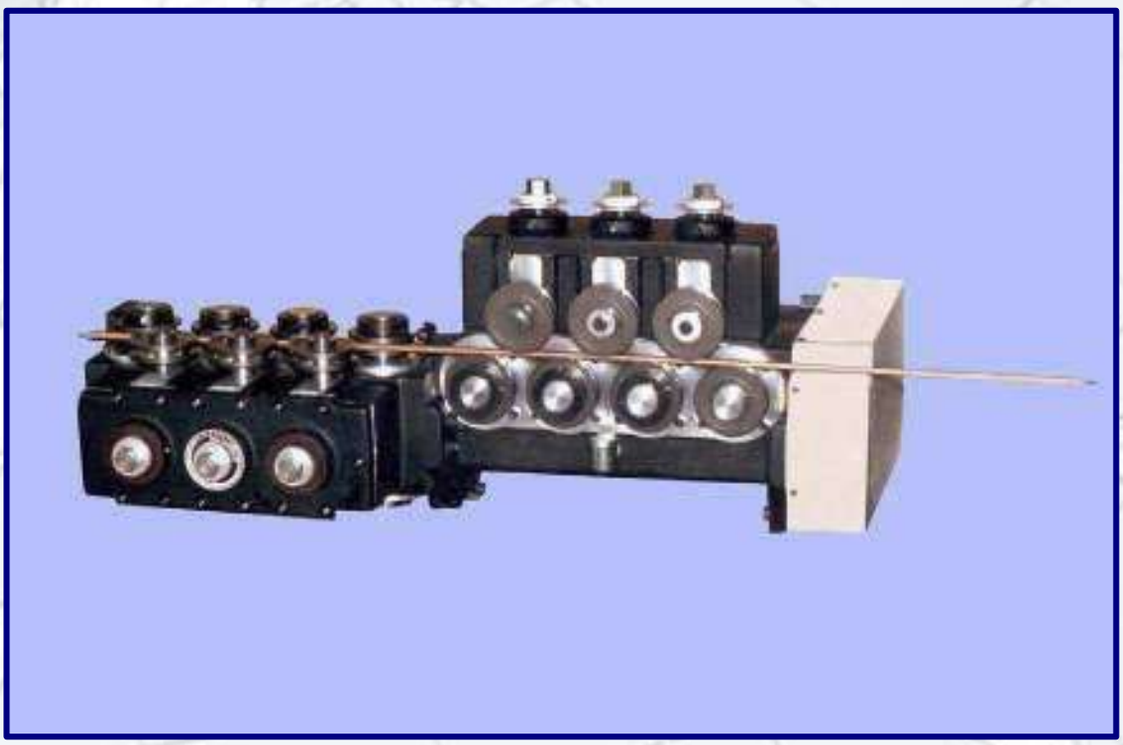
When stamping heating elements or other round pieces, knurled stamps with a radius are used. When stamping flat pieces, straight stamps are used. Therefore, if you wish to use this machine to stamp both types of materials, you will require two different sets of characters. If you intend to do this, you should also have a separate stamping roll for each type to help reduce the changeover time.

As normally quoted, the Manual Marking Machine is supplied with 1 roll type stamp holder, 10 blank spacers and 36 individual characters (numbers or letters) of your choice.

This is a totally pneumatic machine and requires no electrical controls.

Machine Specifications

Length:	610mm (24")
Width:	610mm (24")
Height:	1650mm (65")
Weight:	170kg. (375 lbs.)
Air Supply Required:	5.6 Bar (80PSI)
Max. No. of Characters:	32 or 48 (60 special)
Min. Element or Part Length:	Any
Max. Element or Part Length:	Any



Machine Features

- PROVIDES STRAIGHTER ELEMENTS WHICH GREATLY FACILITATES AUTOMATED PROCESSES
- CAN BE SUPPLIED FOR ELEMENT DIAMETERS FROM 6.35mm TO 11.0mm (.250” TO .437”)
- A DIFFERENT SET OF ROLLS IS REQUIRED FOR EACH ELEMENT DIAMETER
- VARIABLE SPEED MOTOR IS SUPPLIED TO ENABLE YOU TO MATCH THE SPEED OF YOUR REDUCER OR ROLL TO LENGTH MACHINE
- CAN BE MOUNTED TO A ROLL REDUCER, A ROLL TO LENGTH MACHINE OR CAN BE USED AS A STAND ALONE UNIT
- QUICK AND EASY SETUP

Bench Model for Straightening after Annealing

The **Oakley Element Straightener** consists of 14 straightening rolls arranged in two planes. There are 7 rolls in each plane. The lower 4 rolls are driven while the upper 3 rolls are adjustable to provide the required straightening offset.

The machine features a variable speed drive that can be adjusted to coincide with the speed of a roll reducer or roll to length machine. Rolls are made from hardened D-2 tool steel and are ground to suit a specific element radius. For this reason a different set of rolls is required for each element diameter.

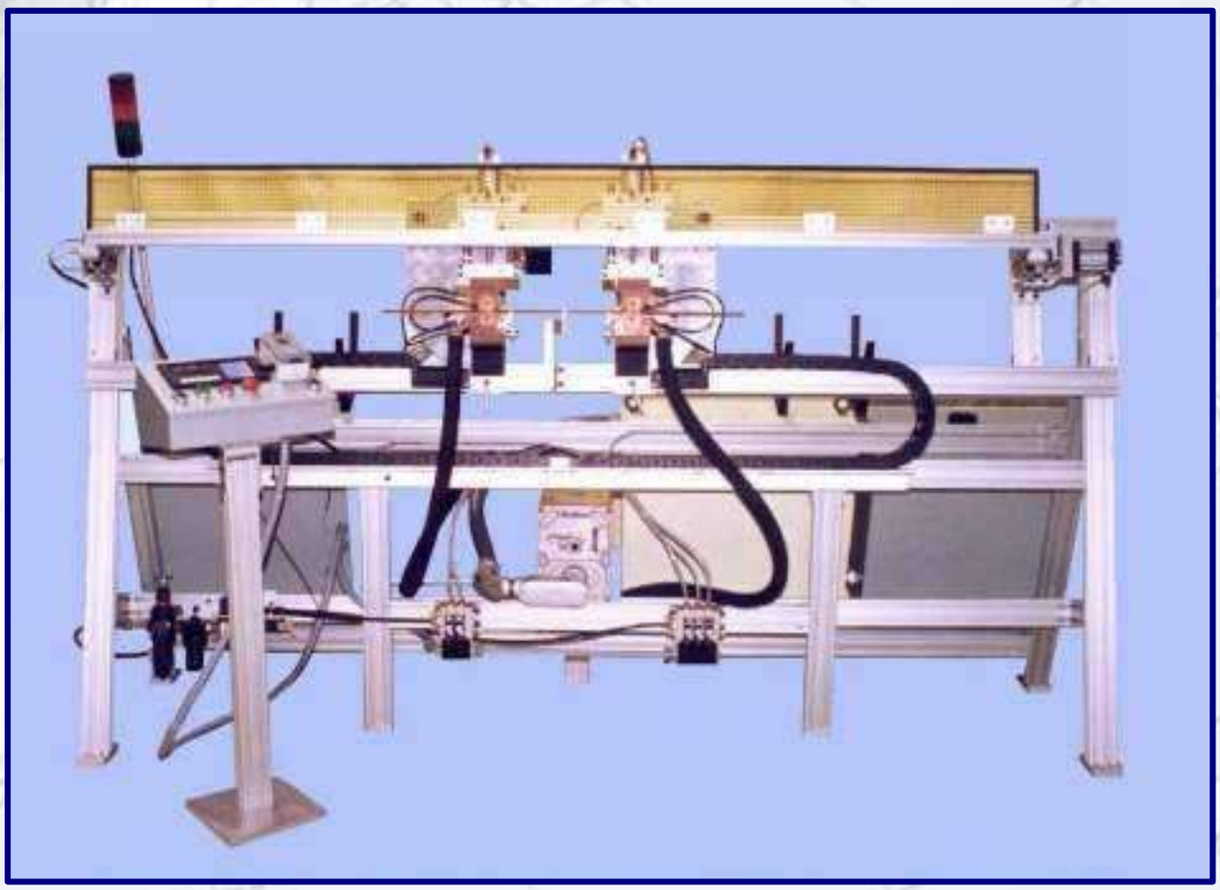
For customers who require straight elements prior to annealing or elements that will not be annealed, we offer a model that can be directly mounted to a roll reducer or a roll to length machine. We also offer a bench model that is intended for straightening elements after annealing.

Because of the many variables involved, it is impossible to guarantee any absolute degree of straightness that can be obtained when using this device. However, one customer who manufactures short length, small appliance elements has been able to hold a tolerance of +/- 0.25mm (.010") on the total indicator readout of the elements. Because they are running the same elements day in and day out, they have not had to adjust the straightener for several years.

When straightening annealed elements, the result will not be as perfect. However, the elements will be significantly straighter and will certainly be straight enough to be fed through automated systems.

Machine Specifications

	Machine-Mounted Model	Bench Model
Element Diameters:	6.35mm to 11.0mm (.250"to .437")	Same
Element Length:	Any	Same
Electrical Supply:	220/380/440v—3ph—50/60hz	Same
Length:	940mm (37")	991mm (39")
Width :	533mm (21")	533mm (21")
Height:	406mm (16")	813mm (32")
Weight:	177 kg. (390 lbs.)	197 kg. (435 lbs.)



Machine Features

- FAST AND INEXPENSIVE METHOD FOR ANNEALING YOUR ELEMENTS
- ELEMENT LENGTH OR DIAMETER CHANGE TAKES LESS THAN 5 MINUTES
- INFRARED SENSOR IS USED TO ACCURATELY CONTROL THE ANNEALING TEMPERATURE
- CAN BE USED TO ANNEAL PORTIONS OF THE ELEMENT OR THE ENTIRE LENGTH
- TRANSFORMER, CABLES, AND ELECTRODES ARE WATER-COOLED
- MESSAGE CENTER PROVIDES MACHINE DIAGNOSTICS TO ASSIST IN TROUBLESHOOTING THE MACHINE
- SAFETY GUARD AUTOMATICALLY COVERS THE MACHINE

The **Oakley Spot Annealing Machine** is designed to quickly and efficiently anneal either particular sections of elements or their entire length after the elements have been reduced. Our system includes a weld transformer with a solid state weld control. The key to the system is an Infra-Red sensor system that measures the actual temperature of the elements as they are being annealed and then turns off the transformer when the appropriate temperature is reached.

Unlike annealing machines that use time-based controls, our machine is not affected by fluctuations in plant voltage or by variations in tube materials or tube wall thickness. The preset temperature can be changed quickly using the operator interface, and the machine allows the operator to program the preset temperature in Celsius or Farenheit. To reduce the changeover time for different element diameters, four-sided indexable blocks are used as the clamping electrode, and each side can be supplied for a different diameter. The machine can accommodate different element lengths by manually moving the carriages and the eject hangers. A combined diameter change and length change can be completed in less then 5 minutes. While the machine is available in either 1 or 2 meter models, longer elements can be annealed in 1 or 2 meter sections.

The elements are hand-loaded into the machine and automatically unloaded if the element length is short enough to be ejected. If the element length is over the eject length, the element must be manually unloaded. The overall cycle time will depend upon the material and diameter of the element and also the length of the element or section being annealed. However, because we use a weld transformer that is considerably over-sized, annealing times are extremely fast.

The following chart gives some typical annealing times for specific elements.

Material	Element diameter	Annealed length	Temperature	Time
Incoloy 840	8mm (.315”)	1 meter (39.4”)	1200° C (2200° F)	21 seconds
Incoloy 840	6.6mm (.260”)	900mm (35.4”)	1200° C (2200° F)	20 seconds
Incoloy 840	11mm (.433”)	152mm (6.0”)	1200° C (2200° F)	8 seconds
Copper	8mm (.315”)	430mm (16.9”)	659° C (1200° F)	10 seconds

Machine Specifications

Element Diameters:	5mm to 16mm (.200”to .625”)
Infra Red Accuracy:	+/- 1% of Reading
Infra Red Repeatability:	+/- 1% of Reading
Maximum Annealed Length:	Two models are available. One will accommodate an element length up to 1 meter (39.4”)and the other accommodates an element length up to 2 meters (78.75”).Longer elements may be annealed in 1 or 2 meter sections respectively.
Minimum Annealed Length:	150mm (6”)
Recommended Temperatures:	760° C (1400° F) for Copper—1200° C (2200° F) for stainless/Incoloy
Maximum Temperature:	The Infra-Red system is capable of reading temperatures up to 1370° C (2500° F)
Electrical Supply:	440/380v—1ph—50/60hz (100 amps)
Power Consumption:	at 380v—60 amps; at 440v—45 amps
Pneumatic Supply:	5.6 bar (80 Psi)
Water Supply:	7.6 liters/min.(2.0 gal./min.)
Length:	1745mm (68.7”) for 1 meter machine; 2745mm (108”) for 2 meter machine
Width:	1575mm (62”)
Height:	1625 mm (64”)
Weight:	544 kg. (1200 lbs.) for 1 meter machine; 635 kg. (1400 lbs.) for 2 meter machine

Machine Features

- CONTINUOUS PROCESS FOR LENGTH CONTROL ELIMINATES SECONDARY OPERATIONS
- CLOSE LENGTH TOLERANCE: +/- 1.5mm (.062”) FOR MOST ELEMENTS
- LENGTH CHANGE IN LESS THAN 30 SECONDS
- CAN ACCOMODATE ELEMENTS AS SHORT AS 400mm (15.75”)
- PROVIDES A MAJOR COST SAVING IN BOTH MATERIAL AND LABOR
- SPECIAL DESIGN ELIMINATES THE NEED FOR COSTLY AND MESSY HYDRAULICS

The **Oakley Roll to Length Machine** is designed to produce elements of a consistent length. The length of each element is precisely measured as it exits from the roll reducer, and then the elements are elongated in the Roll to Length Machine to the preset length.

Elongation is accomplished by additionally reducing the diameter of the elements from 0.05mm to 0.18mm (.002" to .007"). The Roll to Length reducing rolls close on the element approximately 229mm (9") from the leading edge and then remain in contact with the element until the desired length is achieved. However, the rolls are always released at least 150mm (6") from the trailing end of the element. The section that is additionally reduced will vary from element to element depending upon the elongation required.

Both the transfer system and the Roll to Length Machine are mounted on tracks so they can easily be rolled away from the reducer. This allows for independent operation of either the reducer or the Roll to Length Machine.

Our control system features a standard programmable controller that aids in trouble-shooting and simplifies the replacement of parts. The desired length and the upper and lower acceptable limits are programmed into a message center that can store up to 20 different programs. This eliminates the need to reprogram the machine for every new element. Diagnostic information is also provided to further simplify trouble-shooting.

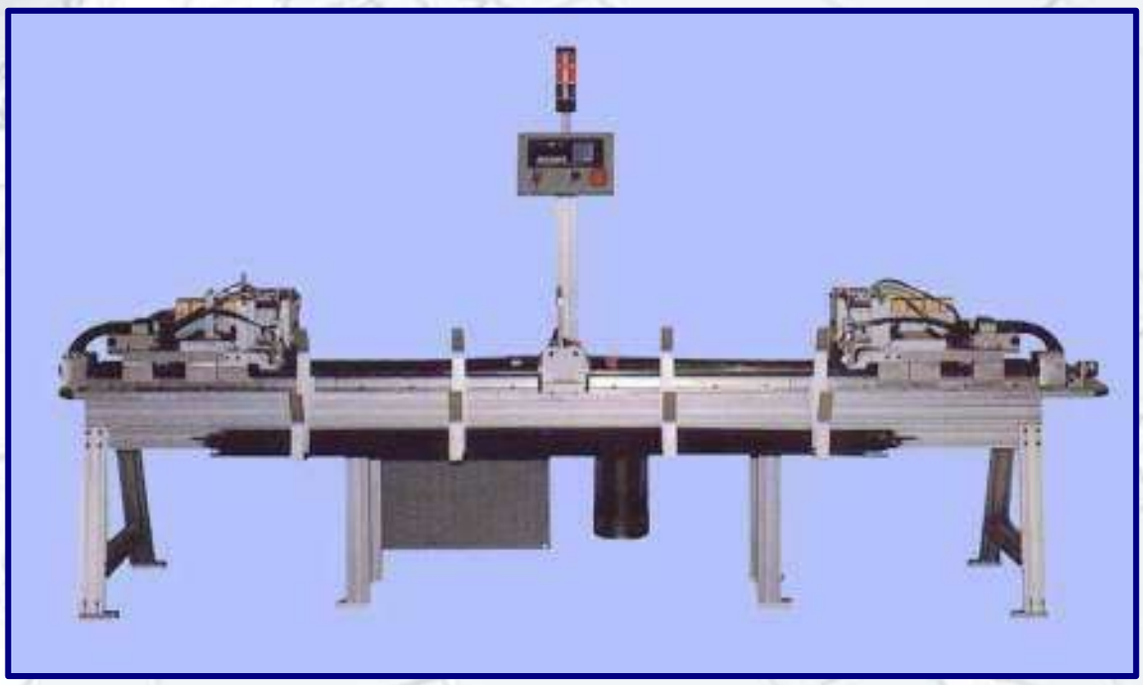
Signals are provided to indicate any elements that exit from the reducer already too long or any elements that cannot be elongated to the preset minimum length. An alarm is supplied to signal either of these conditions.

These signals can also be used to operate an optional sorting device. There are two major cost advantages to the use of this machine. Costly operations such as re-rolling short elements and trimming back long elements are eliminated. Secondly, because the starting tube length for elements used with the Roll to Length Machine must be shortened to ensure all the elements will be shorter than the targeted rolled length, there is a considerable savings in material as well.

The length tolerance held by the Roll to Length Machine is normally +/- 1.5mm (.062") for most elements. For the best results, a new set of rolls should be installed on the roll reducer when the Roll to Length Machine is installed.

Machine Specifications

Length:	Max. Element Length +1168mm (46") from the exit end of the reducer to the exit end of the RTL
Width:	2159mm (85")
Height:	1104mm (43.5")
Weight:	545 kg. (1200 lbs.)
Electric Supply:	220/380/440v—3ph 50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Diameter.	6mm (.238")
Max. Diameter:	12.7mm (.500")
Min. Length:	400mm (15.75")
Max. Length:	4500mm (15 ft.)



Machine Features

- WILL HOLD CLOSE LENGTH TOLERANCE +/- 0.8mm (.032”))
- LENGTH CHANGE IN LESS THAN 60 SECONDS
- DIAMETER CHANGE IN LESS THAN 15 MINUTES
- CAN BE SUPPLIED FOR ELEMENT LENGTHS UP TO 6 METERS (240”) IN 1 METER INCREMENTS
- TYPICAL CYCLE TIME IS 6 SECONDS
- CAN ACCOMMODATE ELEMENT DIAMETERS FROM 6.35mm TO 14.25mm (.250” TO .562”)
- ELEMENTS MUST BE FULLY ANNEALED
- ELONGATION IS PROGRAMMABLE ACCORDING TO CUSTOMER REQUIREMENTS
- PLC STORES UP TO 20 STRETCH PROGRAMS

The **Oakley Stretch to Length Machine** has been designed to eliminate many of the problems associated with the process of stretching elements to length. It incorporates a photo sensor system for measuring the length of the elements and utilizes a ball screw for providing the stretching power and accuracy. As a result, the machine can hold tolerances of +/- 0.8mm (.032") on the stretched length of your elements.

Unlike similar machines supplied by our competitors, our machine does not require the incoming elements to be perfect in diameter. It can accommodate elements with diameters that vary by as much as +/- 0.1mm (.004") without having to change the clamp blocks. Length changes can be programmed on the machine in less than 1 minute. The controller can store up to 20 different stretching programs for frequently produced elements. It is only necessary to change a few parts on the machine to accommodate new element diameters, and this changeover takes less than 15 minutes. All of the electrical controls are readily available as standard purchase items.

While we recommend stretching the elements 2-3% of their rolled length, the machine is capable of stretching the elements an unlimited amount or until they fracture. This allows each customer to determine the most desirable stretched distance. We can also incorporate pin cropping into this machine.

The machine is manually loaded but automatically unloaded. The typical production rate is between 500 and 600 pieces per hour.

Machine Specifications

Element Diameters:	6.35mm to 14.25mm (.250" to .562")
Rolled Diameter Tolerance:	+/- 0.1mm (.004")
Tolerance on Stretched Length:	+/- 0.8mm (.039")
Maximum Pin Extension:	102mm (4.0")
Element Length:	The machine is supplied in 1 meter increments. The maximum capacity is 6 meters (240"). The minimum element length is directly related to the maximum length. The longer the maximum element length, the longer the minimum length. For machines with maximum element lengths up to 3 meters (120"), the minimum element length would be 381mm (15").
Recommended Elongation:	2% of rolled element length
Maximum Elongation:	The machine is capable of stretching the elements an unlimited amount. It can stretch the elements until they fracture.
Electrical Supply:	115/230v—1ph—50/60hz—20 amps
Pneumatic Supply:	5.6 bar (80 Psi)
Length:	Maximum element length plus 1220mm (48")
Width:	800mm (31.5")
Height:	2200mm (86.5")
Weight:	365 kg. (1200 lbs.) for a 2 meter (78.75") machine
Note:	Elements must be fully annealed prior to stretching.

Machine Features

- ALL PNEUMATIC – NO ELECTRICS REQUIRED
- CLEAN AND FAST METHOD FOR CUTTING ELEMENTS – NO MGO DUST CREATED
- ELEMENTS TO BE CUT CAN BE EITHER FRONT OR BACK GAGED.
- FLEXIBLE FOR DIFFERENT DIAMETERS AND SHEATH MATERIALS
- ROUND CUTOFF BLADE PROVIDES FOR VERY LONG TOOL LIFE.
- CONTAINER BENEATH MACHINE CATCHES CUT ENDS

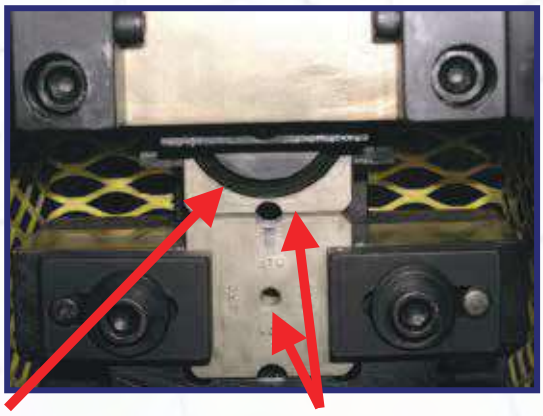
The Oakley Single End Crop Machine is designed to economically cut elements to their final length. The machine which is entirely pneumatic, uses an air over oil system to develop the power necessary for cutting through the elements. A round blade is used to perform the cutting action, and it can be rotated when a section becomes worn. This provides for very long life for the cutter. The blade cuts through the tubular sheath, the MgO and the terminal pin leaving a flat face on the elements with a very minimum burr. As the name of this machine implies, it cuts one end of the element at a time.

Four-sided blocks are used to clamp the elements, and the blade shears off the element against these blocks. Radii for four different element diameters can be placed in these blocks. To change the machine for a different element diameter you merely rotate the blocks to the appropriate side.

The use of this machine eliminates the need for using a saw to cut the elements. The machine is safer, quieter and much cleaner in operation than a saw. No MgO dust and no chips are created. The end of the element that is cut off falls into a receptacle located beneath the machine.

The cycle time of the machine, not including loading and unloading the element, is less than 3 seconds.

Customers may choose to gage the elements from the rear or we can provide a gage within the unit itself so that the elements are gaged from the front prior to the cutting operation.



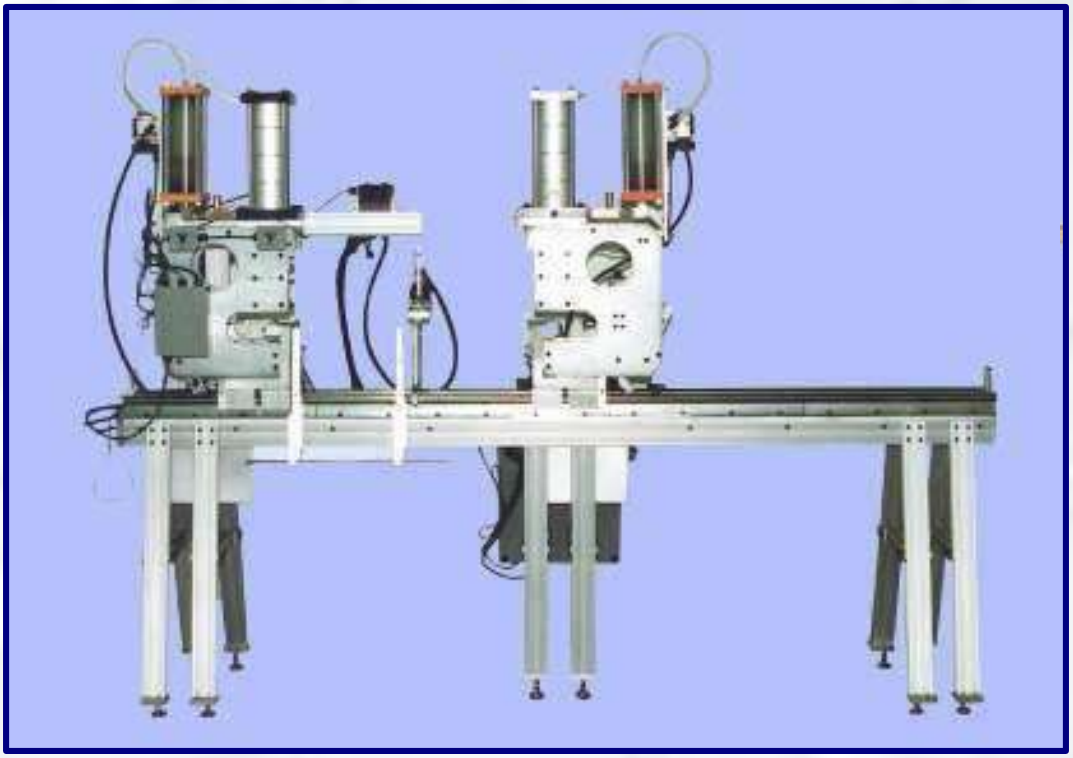
Circular Blade

Four-Sided Clamp Blocks with 8 cutting edges per block

Sheared Elements with cropped end

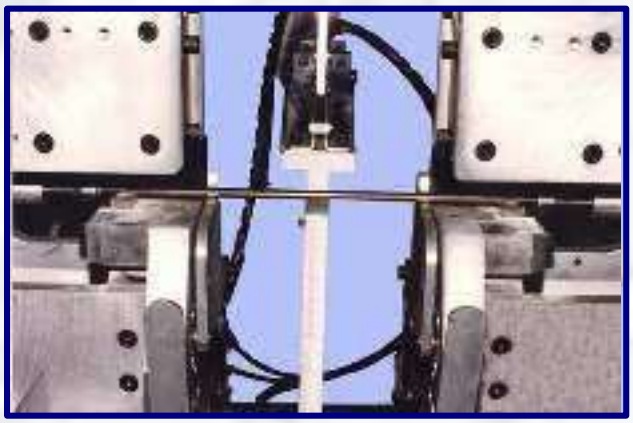
Machine Specifications

Length:	1066.8mm (42”)
Width:	914.4mm (36”)
Height:	1727.2mm (68”)
Weight:	226.8 kg. (500 lbs.)
Air Supply:	6.2 bar (90 psi)
Air Consumption:	9.9 liters/sec. (21 CFM)
Element Diameters:	5mm to 12.7mm (.197” .500”)
Length of Min. Cut End:	9.5mm (.375”)
Min. Element Length:	101mm (4.0”)
Max. Element Length:	None
Cycle Time:	3 seconds per end



Machine Features

- CLEAN, FAST, AND ACCURATE METHOD FOR LENGTH CONTROL
- VERY CLOSE LENGTH TOLERANCE: +/- 0.25mm (+/- .010”)
- CAN ACCOMMODATE DIAMETERS FROM 5mm TO 12.7mm (.200” TO .500”)
- CAN BE SUPPLIED FOR ANY MAXIMUM ELEMENT LENGTH UP TO 9 METERS (30 FT.)
- QUICK LENGTH ADJUSTMENT AND DIAMETER CHANGE
- OPTIONAL DIGITAL LENGTH READOUT AVAILABLE



Centering Device

The **Oakley Center and Cut to Length Machine** is designed to cut elements to an exact predetermined length. The elements are manually loaded and unloaded. The elements are automatically centered so the same amount will be cut from each end, thus ensuring that the desired pin length inside the elements will be maintained. The elements are then sheared to the desired length and automatically ejected from the machine.

The cycle time of the machine is 3-4 seconds. Production will usually range from 300 to 900 pieces per hour depending upon the element length. Because they are easier to handle, shorter elements will have much higher production rates. The machine can be supplied for maximum element lengths from 206mm to 9 meters (8.125" to 30 ft.) and for element diameters from 5mm to 12.7mm (.200" to 500").

Special power-boost cylinders are used to eliminate the need for a more costly and messy hydraulic system. Removable trays are located beneath the machine to catch the cut ends of the elements. A newly designed round cutoff blade provides for clean-cut ends and longer life. When the blade becomes dull or worn, it can easily be indexed to a new cutting position. Also, because of the tooling design, the roundness of the element ends is not deformed and little or no burr is left on the face of the element end. A handwheel is mounted to the moveable cutting head to provide for fine adjustment of the finished element length.

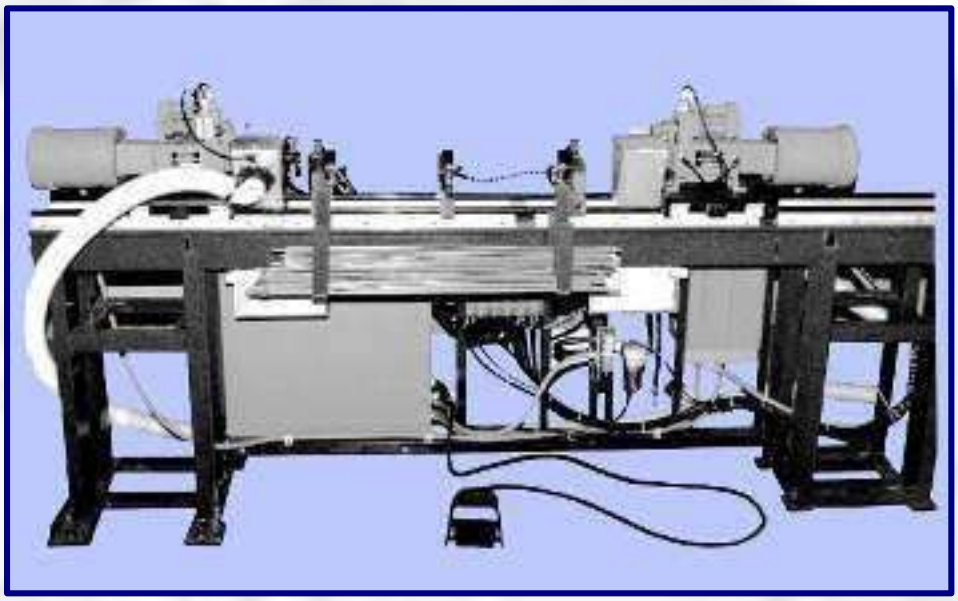
Optional Digital Readout with Handwheel for Fine Adjustment

Machine Specifications

Length:	Max. Element Length +1220mm (48")
Width:	660mm (26")
Height:	1980mm (78")
Weight:	545 kg. (1200 lbs.)
Electric Supply:	220v—1ph—50/60hz
Air Supply:	5.6 bar (80 psi)
Min. Diameter.	5mm (.200")
Max. Diameter:	12.7mm (.500")
Max. Wall Thickness:	10% of element diameter
Min. Element Length:	206mm (8.125")
Max. Element Length:	9 meters (30 ft.)

Machine Features

- INEXPENSIVE END FINISHING
- ADJUSTABLE FEED RATE
- SIMPLE ADJUSTMENT FOR BOTH ELEMENT AND TRIM LENGTH
- VACUUM PROVIDED FOR CLEAN OPERATION
- VARIABLE CUTTER SPEED
- SPECIAL DESIGN CUTTER HEAD PROVIDES FOR FAST AND SIMPLE SETUP
- FLEXIBLE FOR DIFFERENT DIAMETERS AND SHEATH MATERIALS



Double End Trim Machine

The **Oakley Single End Trim Machine** is a hand-loaded unit that clamps the element and then strips back the MgO and the tubular sheath to expose the predetermined terminal pin length. It trims one end of the element at a time, and the trimmed elements are then manually removed from the machine. This unit is intended for medium to small production levels, but is very versatile and can easily be changed for different element diameters, materials, or lengths. Production will vary according to the length of the sheath to be removed and by operator efficiency, but typical production should range between 500 and 800 trimmed ends per hour.

The **Oakley Double End Trim Machine** is similar in operation, but because both ends of the element are trimmed simultaneously and also because the elements are automatically ejected, it has a higher production rate. The operator loads the element into guide blocks and pushes it against a disappearing stop. The element is then clamped, the gage disappears, the element is trimmed at both ends, and then it is automatically ejected. This machine can be supplied for maximum element lengths from 600mm to 3650mm (2 to 12 feet) The trim heads are mounted on rails for simple and fast length adjustments. The production rate depends upon the length of the sheath to be trimmed, but should average between 500 and 800 complete elements per hour.

On both machines the cutter heads are enclosed and connected to a dust collector to prevent contamination. This enclosure has a quick clamp removal feature. Our special cutter head design makes cutter tool removal and setup exceedingly simple and fast.

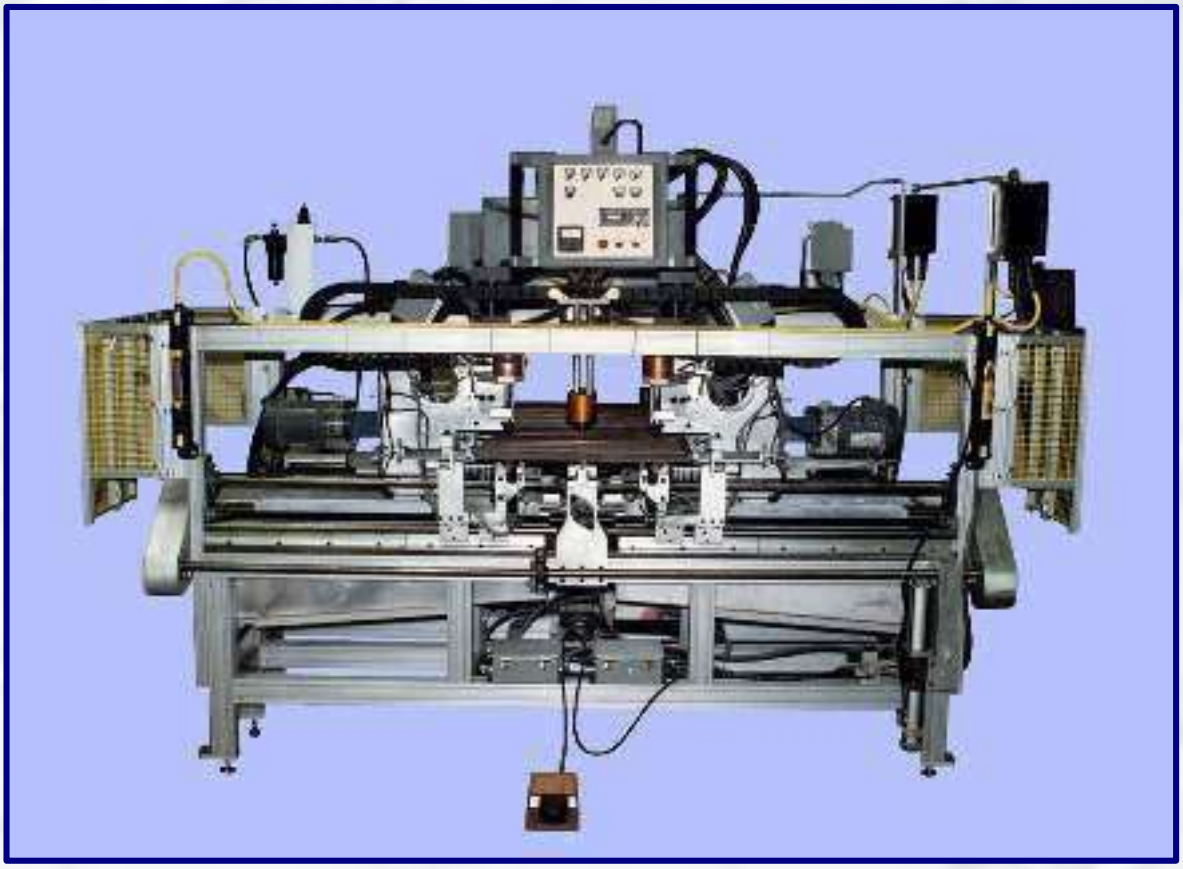
Element after Roll Reducing

Element after Cut to Length

Element after Sheath Trim

Machine Specifications

	SINGLE END	DOUBLE END
Length:	914mm (3 ft.)	4700mm (15.5 ft.)
Width:	600mm (2 ft.)	Same
Height:	1100mm (3.5 ft.)	Same
Weight:	250 kg. (550 lbs.)	500 kg. (1100 lbs.)
Electric Supply:	220/380/440v—3ph—50/60hz	
Air Supply:	5.6 bar (80 psi)	Same
Element Diameters:	5mm to 12.7mm (.200" to .500")	
Max. Trim Length:	38mm (2.0")	Same
Min. Element Length:	100mm (4")	267mm (4.5")
Max. Element Length:	Any	3650mm (12 ft.)



Machine Features

- HIGH PRODUCTION CAPACITY
- SEMI-AUTOMATIC OR FULLY AUTOMATIC MODELS AVAILABLE
- QUICK CHANGE TOOLING FOR DIFFERENT ELEMENT DIAMETERS
- WALKING BEAM TRANSFER SYSTEM
- AUTOMATIC LENGTH ADJUSTMENT
- MACHINE DIAGNOSTICS FOR TROUBLE-SHOOTING
- MODULAR CONSTRUCTION ALLOWS SELECTION OF OPERATIONS AS REQUIRED

Stake/Stamp Station, Trim Station, and Cut to Length Station

Independent Micro-Adjustment Mechanism

The **Oakley Semi-Automatic Element End Finishing Machine** is designed to automate various selected operations on reduced diameter elements. The machine uses a walking beam transfer system to move the elements from station to station, and as a result, the elements must be reasonably straight.

The particular model shown was equipped with a length centering station, a cut to length station, a sheath trim station, and a combined stamp and stake station. However, because of the modular design of this machine, we can customize it to perform many other functions including electrical testing, pin cropping, chamfering, etc.

The machine features fully automatic length adjustment. The operator merely programs the desired element length, and the machine automatically resets itself to the new length in less than 2 minutes.

Each station is also equipped with an independent dial adjustment that allows for quick positioning and very accurate settings.

Quick change tooling has been incorporated wherever possible to reduce the time required to change the machine for different element diameters. Typically, a diameter change is less than 15 minutes.

The production level on this machine obviously depends upon the specific operations being performed, but rates of 700 to 1200 pieces per hour would be normal.

The control system features machine diagnostics to aid in setting up and trouble-shooting the machine.

An element hopper can be added to make the machine fully automatic.

Machine Specifications

Length:	3556mm (140”)
Width:	1524mm (60”)
Height:	2032mm (80”)
Weight:	953 kg. (2100 lbs.)
Electric Supply:	220v—1ph—50/60hz (3ph if hydraulics are required)
Air Supply:	5.6 bar (80 psi)
Min. Diameter.	6mm (.238”)
Max. Diameter:	11mm (.437”)
Min. Element Length:	330mm (13”)
Max. Element Length:	2 meters (78.75”)

Note: The above size dimensions do not include a hydraulic unit that may be required for certain applications.

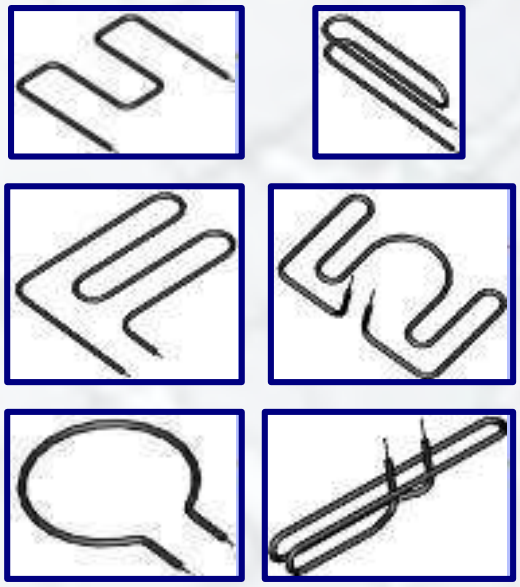
Machine Features

- COMPUTER-CONTROLLED
- STORES MORE THAN 100,000 BEND PROGRAMS
- WINDOWS 2000 PROFESSIONAL BASED OPERATING SYSTEM
- BENDS 1 TO 3 ELEMENTS AT A TIME, DEPENDING UPON ELEMENT DIAMETER AND BEND RADIUS
- DATA ACQUISITION VIA ETHERNET
- CAPABILITY TO GENERATE LARGE RADII
- CAPABILITY TO FORM ELEMENTS WITH BENDS IN A SECOND PLANE
- ELEMENT LENGTHS FROM 400mm TO 6 METERS (16” TO 20 FT.) (MACHINE SUPPLIED IN 3 METER OR 6 METER MODELS)
- IF ELEMENTS ARE CUT TO LENGTH, THEN ELEMENTS UP TO 12 METERS LONG CAN BE BENT

The **Oakley Universal Bender** is designed to form tubular heating elements into a variety of shapes in a single plane in one continuous operation or in multiple planes in several consecutive operations. When bending elements in more than one plane, the operator must remove the element and reposition it prior to bending in another plane. A unique feature of the machine is that each element can be measured for length, and any length variation can be programmed to be distributed over any desired area of the formed element. When the length equalizer is being used or when bending elements in more than one plane, only one element can be formed at a time. If the elements already have a constant length, up to 4 elements can be bent at a time depending upon the element diameter and the bend radius. However, when bending more than 1 element at a time, slightly more variation in the final shape of the elements is to be expected.

The machine is adjustable for various diameters and lengths. The Bending, Feeding, and Head positions are achieved using a 3-axis servo system. An industrial computer, featuring a flat panel touch screen, is used for programming and uses a Microsoft Windows 2000 Professional based operating system. The operator selects a bend program by scrolling through a graphical representation of the parts stored in the database. The operator can make adjustments to any of these programs and then save the part as a new bend program. More than 100,000 bend programs can be stored in separate folders for easy retrieval. In addition to the data required for bending, customer data, production data and part history are stored in the Industrial PC. A standard Ethernet 10/100 card is supplied to enable you to remotely write bending programs and then download them to the machine. The part, material, and tooling data are stored in Microsoft Excel format.

The machine can accommodate element diameters from 5mm to 12mm (.200" to .475") with a maximum length of 6 meters (236") and a minimum length of 400mm (16") and a single bend diameter between 12.7mm and 63.5mm (.500" and 2.50"). The machine also features the ability to generate large radii. If the elements are cut to length and do not require measuring, then longer elements can be run on the machine. One customer has run 12 meter elements on our 6 meter machine. The maximum number of bends that can be programmed in one element is 50.

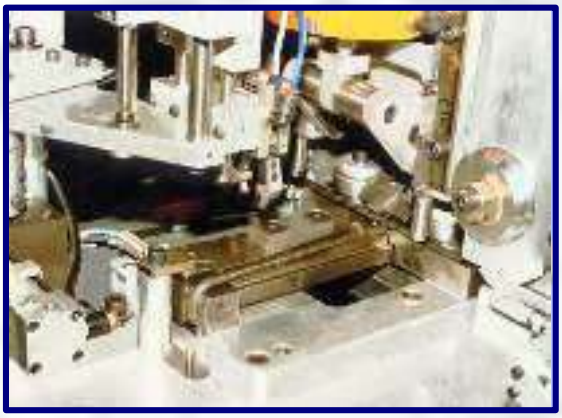


Machine Specifications

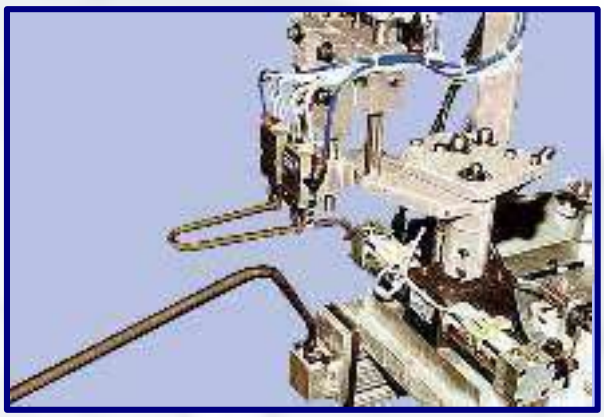
Element Diameters:	5.0mm to 12mm (.200" to .475")
Element Length:	The machine is supplied in 1 meter increments to accommodate each customer's maximum desired element length. The maximum capacity would be 6 meters (236"). The minimum element length is 400mm (16").
Minimum Bend Dia.:	2 times element diameter
Maximum Bend Dia.:	63.5mm (2.500")
Feed Speed:	61 meters (200 ft.) per minute
Bend Speed:	60 rpm
Electrical Supply:	230v—3ph—50/60hz
Pneumatic Supply:	5.6 bar (80 psi)
Length:	maximum element length plus 1300mm (51.18")
Width:	1200mm (48")
Height:	1143mm (45")
Weight:	925 kg. (2,039 lbs.)

Machine Features

- CONSISTENT AND ACCURATE FORMING
- HIGH PRODUCTION -- 1000+ PER HOUR
- INTERCHANGEABLE TOOLING FOR DIFFERENT ELEMENT FORMS
- FULLY AUTOMATIC AND SEMIAUTOMATIC MODELS AVAILABLE
- HYDRAULIC POWER PROVIDES CONSISTENCY OF FORMS



Forming Station



Pick and Place Removal Device

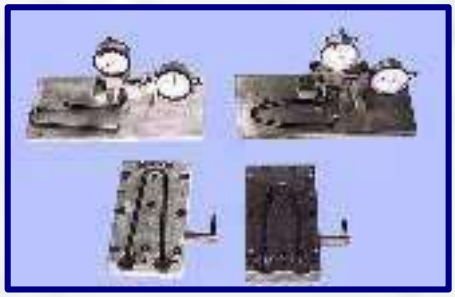
The **Oakley Iron Form Machine** can be supplied as either a fully automatic or a semi-automatic machine.

The fully automatic machine has a hopper with a capacity for more than 1000 elements. This hopper feeds the elements into a slide that transfers them into the forming station. A hydraulically powered punch then forms the element into the "vee" shape. Wipers are used to bend the element legs to the desired angular degree, and this degree is adjustable. The punch retracts with the element attached and returns to its normal position where a robotic "pick and place" device removes the formed element and drops it onto an inclined rail where a large number can be accumulated. The production rate for this model is approximately 1000 pieces per hour depending upon the exact form and specifications.

The semi-automatic model is exactly the same except that it does not have an element hopper feed system, so an operator must manually place the elements into the slide mechanism which then feeds them into the forming station. The production on this model is about 750 pieces per hour

Interchangeable tooling can be supplied for a wide range of iron element forms. The hopper as well as other portions of the machine are adjustable form different element diameters and lengths.

The use of hydraulics on this machine provides consistency and accuracy of the formed part and enables it to hold close tolerances. We can also supply gages to check the form, leg height , leg angle, and other dimensions as required.



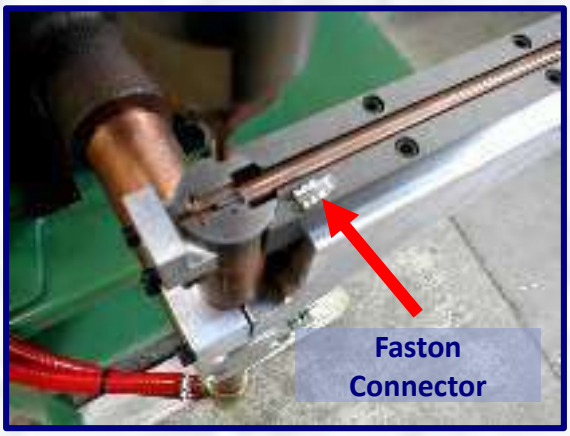
Optional Inspection Gages

Machine Specifications

	Form Machine	Hydraulic Unit
Length:	1118mm (44")	965mm (38")
Width:	1118mm (44")	813mm (32")
Height:	1499mm (59")	889mm (35")
Weight:	545 kg. (1000 lbs.)	227 kg. (500 lbs.)
Electric Supply:	220/380/440v—3ph—50/60hz	
Air Supply:	5.6 bar (80 psi)	
Min. Diameter.	6mm (.238")	
Max. Diameter:	10mm (.394")	
Min. Element Length:	254mm (10")	
Max. Element Length:	346mm (13.62") with hopper 381mm (15") without hopper	
Production:	1000 per hour	

Machine Features

- EASY AND INEXPENSIVE METHOD FOR WELDING CONNECTORS TOTERMINAL PINS
- CAN WELD CONNECTORS TO STRAIGHT LENGTH ELEMENTS OR TO FORMED ELEMENTS
- CHANGE OF ELEMENT DIAMETER OR FASTON CONNECTOR TAKES LESS THAN 5 MINUTES
- PROGRAMMABLE SOLID STATE WELD CONTROL



Element inserted into welding fixture

Element with 180 degree bend inserted into welding fixture

The Oakley Faston Connector Spot Welder is designed to weld the faston-type connectors to the terminal pins. This is a manual machine where the operator first inserts the heating element and then places the faston connector in a pocket that has been machined in the tooling to locate the connector on top of the pin. The operator then starts the machine cycle and the upper electrode is pneumatically moved down to place pressure against the faston connector. After a brief hold period to ensure that sufficient pressure has been exerted, the weld occurs. The machine cycle is only a few seconds.

The welding fixture shown below holds the elements in place and has been designed so that it can accept both straight length elements and elements with a 180 degree bend. We can also provide special tooling for a wide variety of formed elements.

Different tooling is required for each different size or configuration faston connector that you wish to use and also for each different element diameter and each different formed element. With the proper tooling, the machine can accommodate any element diameter and any type of faston connector.

In order to provide an accurate offer for this machine, we need to know all of the element diameters you would want to run on the machine, the pin diameter you will use with each element diameter, drawings or samples of each of the faston-type connectors you will use, and also drawings of each formed element that you will want to use.

Machine Specifications

Length:	864mm (34”)
Width:	762mm (30”)
Height:	1778mm (70”)
Weight:	277 kg. (610 lbs.)
Electric Supply:	220v—1ph—50/60hz (100 amps)
Air Supply:	5.6 bar (80 psi)
Min. Diameter.	3.8 Liters/min. (1.0 gal/min)

Machine Features

- HIGH PRODUCTION MACHINE –5160 TO 7740 PINS PER HOUR
- PIN LENGTHS FROM 50mm to 229mm (2” to 9”)
- PIN DIAMETERS FROM 1.57mm to 3.18mm IN DIAMETER (.062” to .125”)
- 20 to 40 MINUTE LENGTH CHANGE
- 1-2 HOUR DIE CHANGE FOR DIFFERENT DIMENSIONS ON ENDS OF PINS
- PIN DIAMETER CHANGE IN 2-3 HOURS
- HOLDS CLOSE TOLERANCE ON REDUCED DIAMETERS OF +/-0.025mm (+/-0.001”)

Wire Cutoff and Straightener

The **Oakley** terminal pin production system consists of two machines: a Wire Cutoff and Straightener and a Cold Heading machine. These machines can accommodate wire diameters from 1.57mm (.062") to 3.18mm (.125") and pin lengths from 50mm (2.0") to 229mm (9.0".)

The wire is taken from spools or stems and then fed through a rotary straightener and cut to the desired length. This straightener will cut pin blanks from 50mm (2.0") to 140mm (5.5") at a rate of 10,000 per hour and pin blanks from 140mm (5.5") to 229mm (9.0") at a reduced rate of 5,000 per hour. The wire is also cleaned as it is fed into the machine.

The pin blanks are then placed in the hopper located at the rear of the Cold Heading Machine. The pin blanks are then fed through a series of progressive dies that gradually form the ends of the terminal pins. The production rate on the cold heading machine is 7,740 pieces per hour for pins with wire diameters from 1.57mm (.062") to 2.0mm (.079") and 5,160 pieces per our for pins with wire diameters from 2.1mm (.083") to 3.18mm (.125".)

The Cold Heading Machine can be changed for different length pins in 20 to 40 minutes. The machine can be changed for different dimensions on the ends of the pins in 1-2 hours by removing and replacing the forming dies. The machine can also be changed for different wire diameters in 2-3 hours.

The Cold-Heading machine is capable of holding a tolerance of +/- 0.25mm (.010") on the length of the pins and +/- 0.025mm (.001") on the reduced diameters.

Because the machine must form the pins, the wire must have a tensile strength between 60,000psi and 75,000psi (4218 kg/cc² and 5273 kg/cc².) Stainless steel wire is **definitely not** suitable for these machines.

The following are the types of pins that can be made on these machines.

Typical upper terminal pin

Typical lower terminal pin with optional washer groove

Cold-Heading Machine Specifications

Length:	915mm (36")
Width:	915mm (36")
Height:	1651mm (65")
Weight:	680 kgs.(1500 lbs.)
Electric Supply:	380v/3ph/50hz or 220/440v/3ph/60hz
Power Consumption:	3.8Kw@220v;4.6Kw@380v; 4.15Kw@480v
Production Speed:	5,160 to 7,740 pieces per hour depending upon diameter
Min. Pin Diameter:	1.57mm (0.062")
Max. Pin Diameter:	3.18mm (0.125")
Minimum Pin Length:	50mm (2.0")
Maximum Pin Length:	229mm (9.0
Pin Material:	Must have a tensile strength between 65,000 to 75,000psi or 4218 to 5273 kg/cc²

Wire Cutoff and Straightener Specifications

Length:	2438mm (96")
Width:	915mm (36")
Height:	1220mm (48")
Weight:	365 kgs.(800 lbs.)
Electric Supply:	380v/3ph/50hz or 220/440v/3ph/60hz
Power Consumption:	3.8Kw@220v;4.6Kw@380v; 4.15Kw@480v
Production Speed:	5,000 to 10,000 pieces per hour depending upon length
Min. Pin Diameter:	1.57mm (0.062")
Max. Pin Diameter:	3.18mm (0.125")
Minimum Pin Length:	50mm (2.0")
Maximum Pin Length:	229mm (9.0
Pin Material:	Must have a tensile strength between 65,000 to 75,000psi or 4218 to 5273 kg/cc²

Terminal Pins

Our **Terminal Pins Division** produces terminal pins that are used in tubular heating elements. We specialize in producing these terminal pins in high volumes with close tolerances. We currently supply a large majority of the heating element manufacturers in the United States, Canada, and Mexico, and we also export throughout the world. Our commitment to zero rejects and 100% on-time delivery has enabled us to forge solid partnerships with our many terminal pin customers.

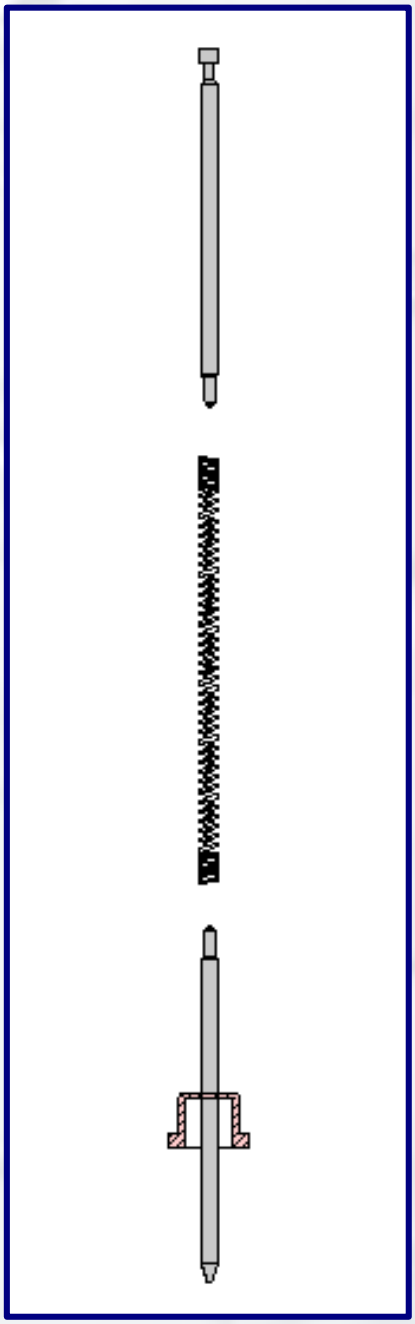
We use statistical process control together with continuous inspection to ensure that our products meet or surpass our customer's specifications. Each individual terminal pin order is manufactured using our specially designed Instant Heat process control chart. Graphs on these charts allow us to control and document critical dimensions for our customers during the actual manufacturing process.

We supply our terminal pins from 2 types of wire. The first type is un-plated, low-carbon (C-1008) mild steel. The second type is a pre-platedmaterial that has an inner core of the same low-carbon steel but then has a 2% by weight coating of nickel. Both wires have tensile strengths from
60,000 to 75,000 PSI.

We use specially designed cold-forming machines to produce our pins. These machines hold much closer tolerances than screw machines that are commonly used to make these pins. The cold-forming process allows us to use a softer wire with a lower tensile strength that makes welding the pin to coil assemblies much easier.

Oftentimes it is necessary to anneal screw-machined terminal pins before they can be used in the heating elements. This creates problems for the element manufacturer because the pins often bend, and they can also discolor or oxidize in the welding area during annealing. Our cold-forming process and the softer wire we use eliminate all of these potential problems for our customers.

The pre-plated nickel wire we use has many advantages for element manufacturers. First, the nickel coating is applied when the wire is still in rod form. The wire is then drawn down to the final size and the nickel coating becomes embedded in the steel material. Then, because we are cold-forming the parts, the nickel coating is not removed, but rather it is further embedded. The end result is that the nickel coating on our pins is impervious to peeling or flaking off and will withstand temperatures to 1200° C (2200° F) without melting away or discoloring. The nickel also greatly enhances the welding of the pins to the coils.



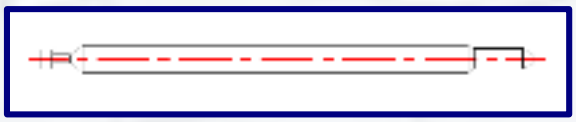
Terminal Pins

Below are the 5 wire diameters that we currently use to manufacture our terminal pins. We make these pins in lengths from 50mm to 230mm (2" to 9").

.062"	1.57mm
.075"	1.90mm
.091"	2.31mm
.105"	2.67mm
.125"	3.18mm
.109"	2.77mm
.114"	2.90mm
.141"	3.58mm

While these are the standard wire diameters for which we are tooled and for which we currently stock wire, if your volume is sufficient, we may be willing to make additional wire diameter terminal pins.

Below are shown the 5 typical styles of terminal pins that we commonly manufacture.

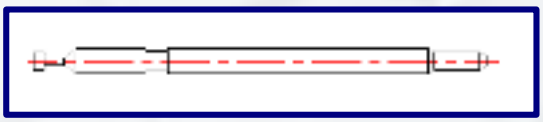


Standard Upper Pin

Standard Lower Pin

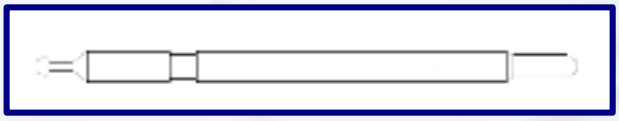
Special Upper Pin

This special upper pin with a tapered head Allows for easier insertion of the upper either an upper or sealing plug on the pins.



Combination Pin

The combination pin can be used for either an upper or a lower terminal pin. This design is not available in 2.67 and 3.18mm (.105" and .125") pins.



Universal Pin

The universal pin can be used for either An upper or lower terminal pin and also has a tapered head to allow for the easier insertion of the sealing plug. This style pin is only available in 1.57 and 1.9mm (.062 and .075") diameter pins.

The use of the special Combination or Universal style pins significantly reduces the number of different pins a customer must stock.

Helix Coil Winding Service

Oakley Industrial Machinery Inc. has been providing it's worldwide customers for over twelve years our Oakley Helix Coil Winding Services which are done directly in our in-house facility. This is in addition,to our newest generation of Oakley helix coil winding machines which are used in our customer's production facilities to wind their many different types of coils for heating elements on a daily basis. The coil is an important component part of the element which is at the core of the element. It is most critical for coils to be wound with spacing between the turns that is equal and consistent throughout the entire length of the coil. Without this consistency, hot and cold areas throughout the length of the element will occur and be apparent when the element is energized. At Oakley, extreme care is taken to ensure that this consistency is achieved on a continuous basis. Our Helix Coil Winding Service produces both coils wound to long lengths, as well as coils wound to a specific ohm value. Some customers order long lengths as they prefer to have these long lengths in stock, whereby they are then able to cut them into whatever ohm value is required. While this method does produce some waste, it eliminates any delay in the production of an element as the customer will have coiled stock at all times. We also wind coils to precise ohm values. In these cases, the coils are ready to be assembled to the pins and passed through our production process.

Another very important factor in our production of coils is to have cut ends that do not have a turn of the wire obstructing the inner diameter of the coil. This blockage will cause the assemblers that are manually putting the pin and coil together to stop and take the time to clip the obstruction. If automated assembly and welding equipment is used, the situation becomes even worse, as this obstruction will cause the automated machine to stop as the assembly process of the pin to the coil will not be able to be completed.

The final very critical aspect of a coil is cleanliness. Dirty coils can cause Hypot failures. We take a great deal of care in knowing the coils that we ship are of the utmost in cleanliness. Oakley produces coils that are being cleaned as they go through the production process due to the lubricant used in winding. After coils are produced they go through the final processes of cleaning, inspection and secured packaging for safe shipment to our customers.

Capabilities:
We currently wind coils within the following specifications; although we welcome the opportunity to quote and wind coils not within these parameters;

Machine Specifications

Material:	"A", "C" and Copel
Max Length:	288" (7315.2mm)
Minimum: ID:	.030 (.0762mm)
Maximum ID:	.533 (13.54mm).
Gauges:	17 – 37
Winding Types:	Single, Double, Triple, Intermittent and Continuous Space Wound

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