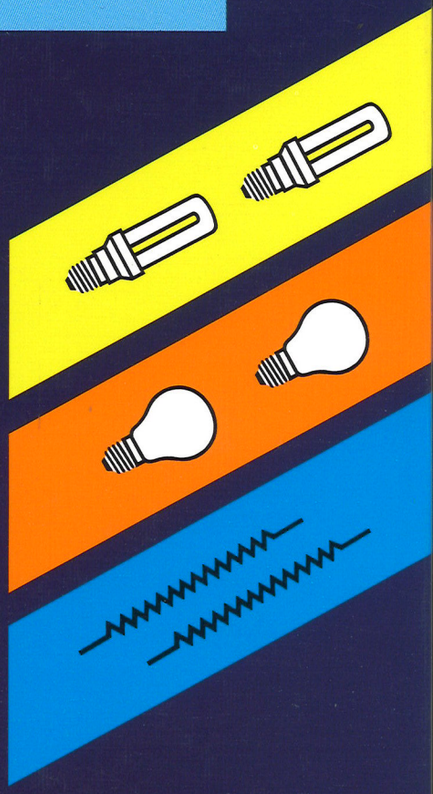

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FALMA

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Certified ISO 9001 / EN 29001

FALMA

SYSTEME DE QUALITE CERTIFIE • ZERTIFIZIERTES QUALITÄTSSYSTEM • CERTIFIED QUALITY SYSTEM

SQS

ISO 9001/EN 29001

Reg. Nº 11440-01

Our Strategy

Falma holds on a global strategy for its different activities (image, social security, education). Its management, in cooperation with its staff, endeavours to keep its business activities healthy and competitive. Every effort is made to keep durable and loyal relationships with its partners its aim "INTEGRAL SERVICE".
In a first stage this service requires a thorough and unprejudiced analysis of the customer's needs. Consequently, for FALMA a new responsibility arises as a real partner. This responsibility materialises in assistance and advice, in competitive prices and in a perfect after-sales service.

What is the "INTEGRAL SERVICE"?

All FALMA firms are dedicated to the "INTEGRAL SERVICE". At each stage, beginning with development, during its production and finally at its after-sales service, FALMA's "INTEGRAL SERVICE" is an important warranty for the customer.

FALMA, the fruit of a well-managed technology.

The environment

Today, more than ever, everywhere the opinion gets more sensitive about everything related to the environment. FALMA cares for the efficient protection of human beings and nature by its developments and its production methods.

The recycling

The waste as well as the toxic products are being collected, treated and if possible reused.

FALMA watches the environment closely, as well at its customer's as on its own premises.

Our Environment

The Groupe Fribourg consists of companies working in high technique markets. Most of them internationally active in the following activities of the electrotechnical industries:

- ENGINEERING

  (Electromagnetic compatibility, suppression of electromagnetic interferences, Industrial Electronics, including specific software)

- INDUSTRIAL COMPONENTS

  (Capacitors, filters)

- CONSUMER GOODS

  (Light sources)

- CAPITAL GOODS

  (Winding machines for capacitors and lithium batteries, Machines and complete manufacturing lines to produce:
  – filaments for light sources
  – Incandescent lamps
  – Compact fluorescent lamps

Our History

1928	Company founded by Gotthold Gehring. Until 1962 exclusively manufacture and sale of incandescent lamps.
1950	FALMA becomes the lamp supplier of the largest distributor in Switzerland (Migros).
1970	Beginning of machine building activities and export of machines for manufacture of filaments.
1972	FALMA introduces electronic control system of their machines.
1975	Transfer of all activities into the newly built factory in Matran.
1977	Delivery of first complete plant for production of incandescent lamps with index speed 2300 per hour.
1982	Fully automatic incandescent lamp line, index speed 3500 per hour.
1988	Fully automatic very high speed incandescent lamp line, index speed 5000 per hour.
1993	Fully automatic compact fluorescent lamp line, index speed 1250 per hour.
1994	FALMA becomes part of the Groupe Fribourg.
1995	Obtaining the Quality system certificate ISO 9001.

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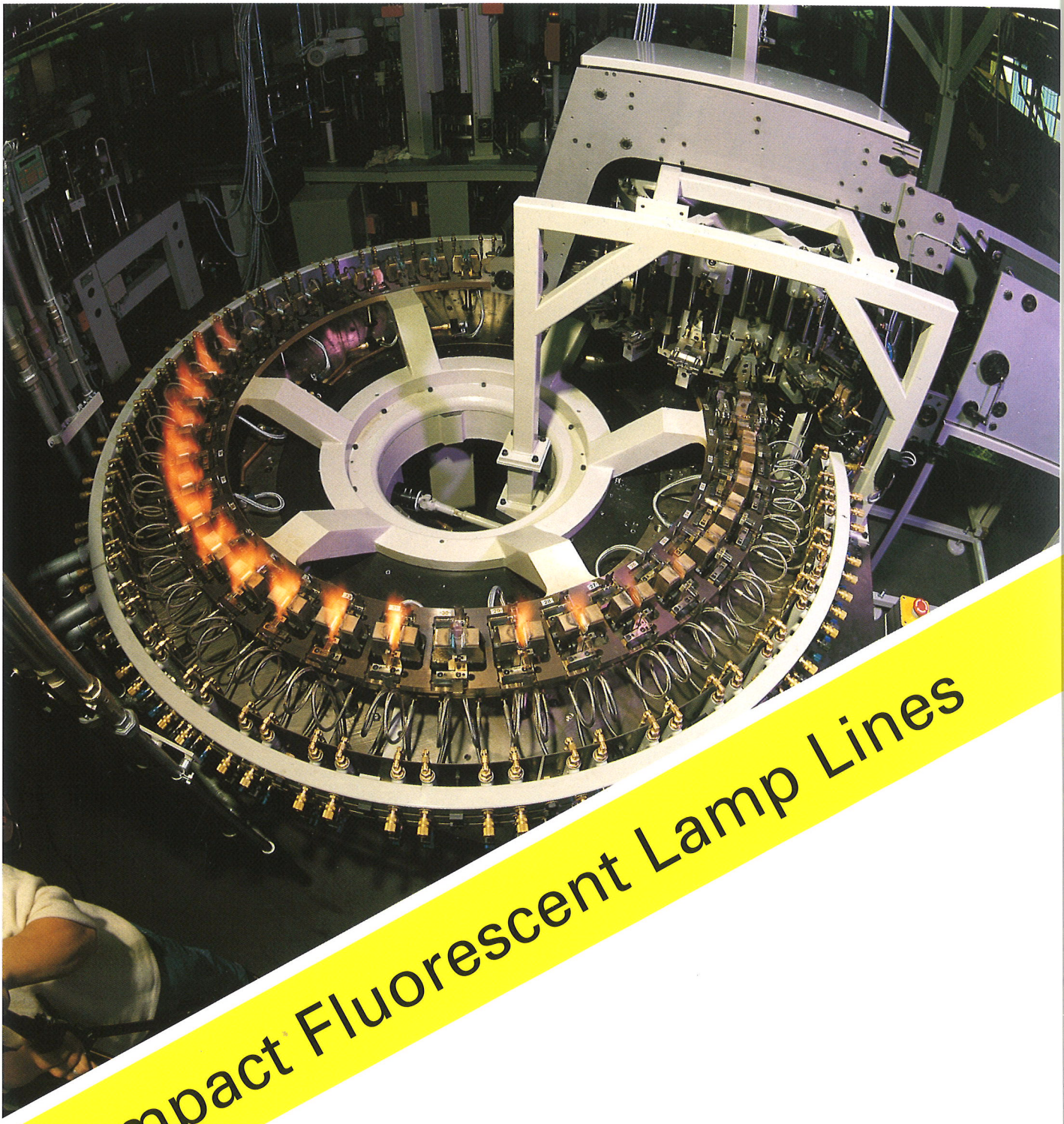

Compact Fluorescent Lamp Lines

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Compact Fluorescent Lamp Lines

The Concept

The concept in our GLS production lines with turrets, driven by an indexing cam, connected with storage chains, is proven FALMA quality. But since the line is more complex, we had to search for new solutions, to combine a high flexibility for different lamp types with the possibility to operate it with a minimum of staff.

The solution with the vertical elevators and the storage chains above the machines will set new standards in the light source industry, since, due to this concept, the machines are freely accessible all around.

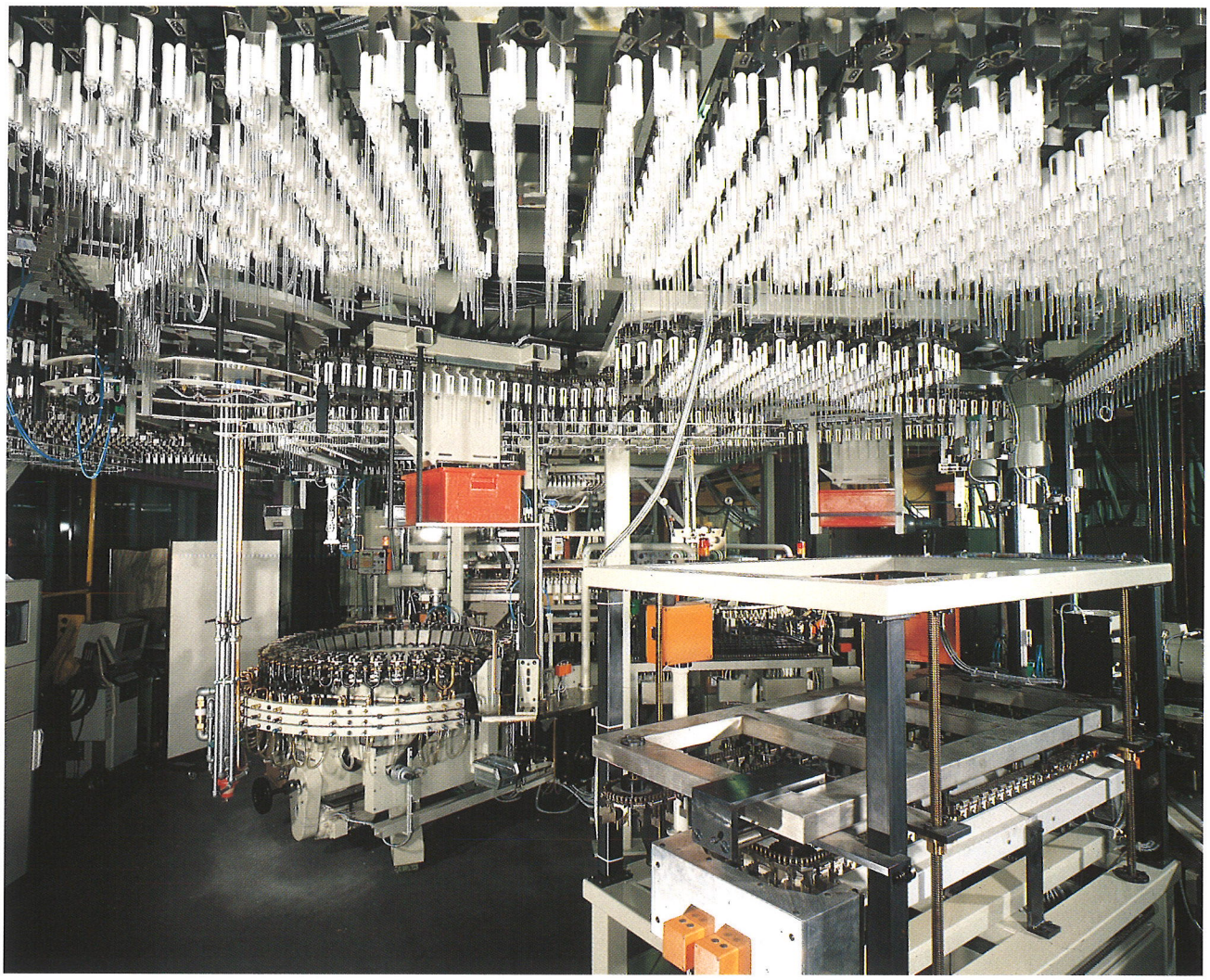
Another helpful FALMA invention reduces the change over time from one lamp type to another: All the storage chains between the machines MP, CM and PAM lead to a central distribution turret. From there the lamps are directed through electronic controls to the next operation.

This means simply, that you can switch from S- to D- and T-type lamps by pressing a button.

Changing for different wattages (length of tubes) can be done on most of the machines without mechanical settings.

The modular system of the design makes it possible to compose exactly the line required for your needs.

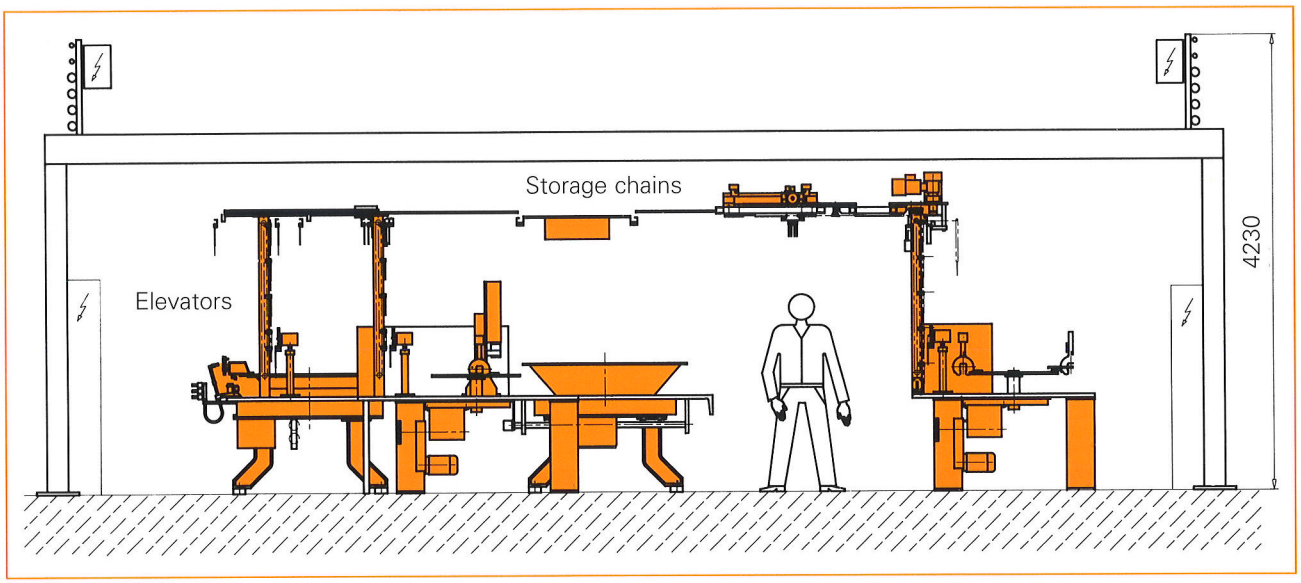
One big advantage: You can adapt the line later at any time to produce new types according to the needs of the market.



The Process

Thanks to the close cooperation between specialists with wide knowledge in their field and experts in a manufacturing process, who always asked for easy to handle procedures, many new ideas sprung up and were then realised, ideas of which you can benefit from. Ideas which cover the full needs of a modern production plant, such as:

- Assurance of high Lamp quality machines
- Easy to operate
- Man – machine interface
- Protection for the workers
- Protection for environment



The Products

Single tube lamps – 5 to 11 Watt
Double tube lamps – 10 to 26 Watt
Triple tube lamps – 18 to 32 Watt
(Other lamp types under development)

Available line types

Line type	*Lamp type*		*Theoretical output*
CFL-SS	Single tube lamp	5-11 Watt	1500/h
CFL-SSD	Single tube lamp	5-11 Watt	1500/h
	Double tube lamps	10-26 Watt	1250/h
CFL-SDT	Single tube lamp	5-11 Watt	1500/h
	Double tube lamps	10-26 Watt	1500/h
	Triple tube lamps	18-32 Watt	1500/h
CFL-SDT/1 B	Single tube lamp	5-11 Watt	1500/h
	Double tube lamps	10-26 Watt	1250/h
	Triple tube lamps	18-32 Watt	850/h

The advantages

Your investment in modern equipment using the most up to date process technology is profitable only if at the same time your commercial needs can be fully covered.

FALMA's modern technology takes fully into account the desired commercial advantages.

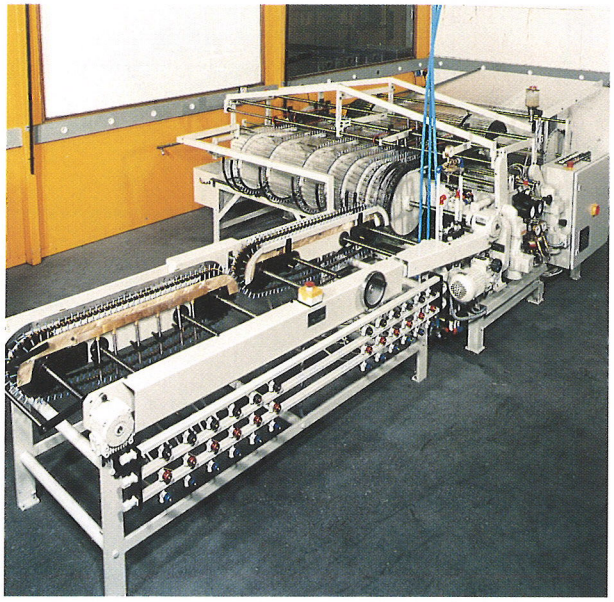
Here we can list a few of them:
- Low space requirements for the line
- Minimum of persons required
- Water based fluorescent coating
- Simple lead in wires from the bobbin
- Using a low cost mercury pill dosing system
- Computer assisted machine operating and maintenance for a minimum of material losses and a maximum of output
- Very short payback time due to the high performance at low investment cost
- Designed for 3-shift operation

Auxiliary equipment for the Compact Fluorescent Lamp production

HAS

Tube cutting machine

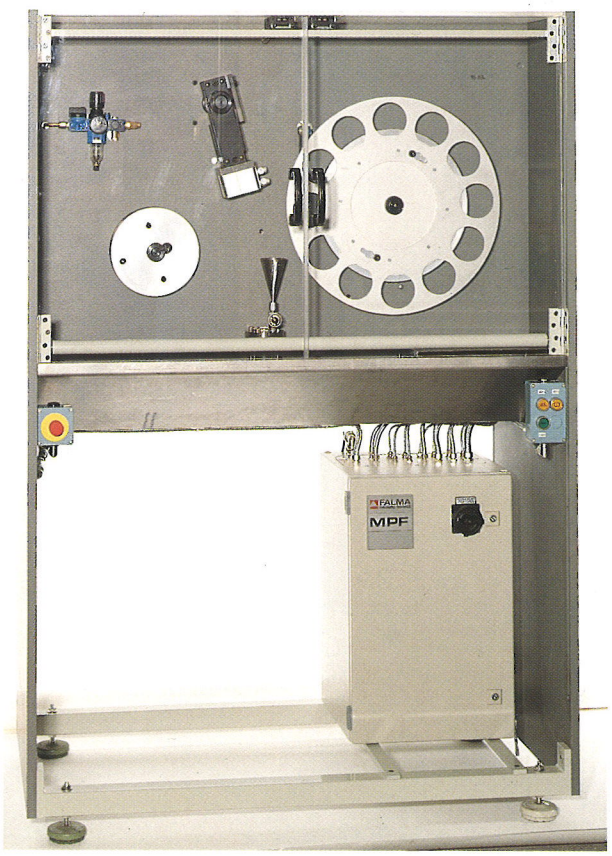
Horizontal tube cutting machine for tubes typically used for the CFL production with continuous motion thermo-shock cutting system. The tubes are fire polished at both ends. Capacity: 4000 tubes per hour.

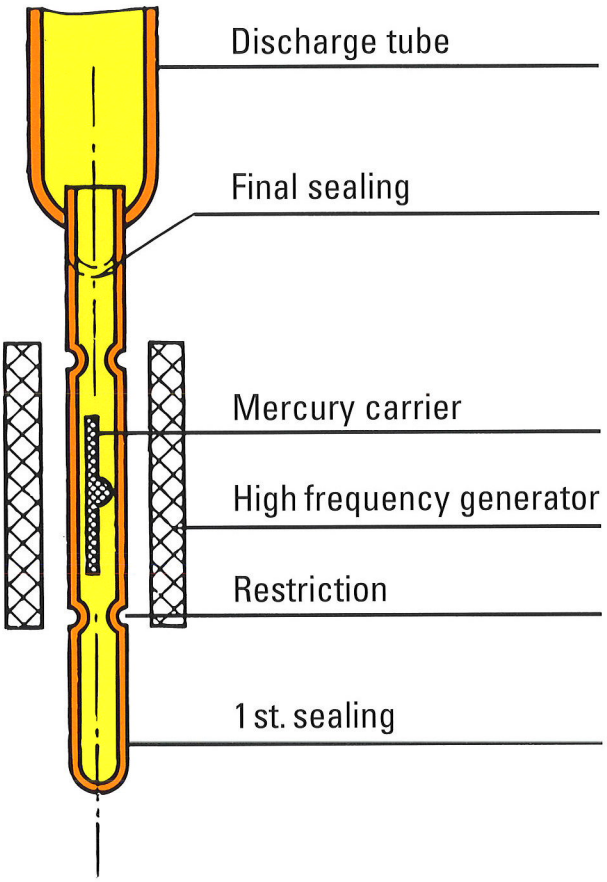


MPF

Mercury pill machine

Machine to produce mercury pills, typically used in fluorescent lamps (low pressure mercury vapor lamps).
The mercury is held in an iron container which is closed at both ends. It is designed to be held in the exhaust tube between two restrictions and act as an antenna for the heating through high frequency magnetic field.
Mercury pollution is reduced to an absolute minimum.
Production capacity: min. 8000 pieces per hour.

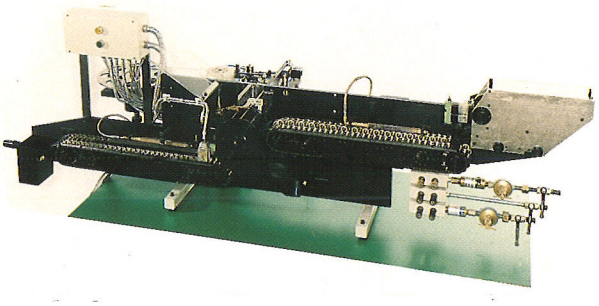


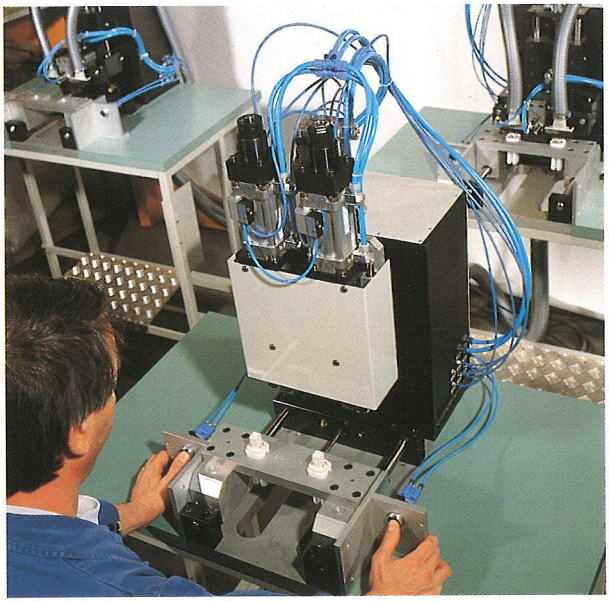


GPF

Mercury pill mounting and rim forming machine

Machine to assemble the mercury pill and the exhaust tube, typically used for the CFL lamp production.
Fully automatic, including rim forming, HG-pill mounting and presence check of the pill before unloading into a container. Production capacity: 2800 pieces per hour.





FAS

Semi-automatic final assembly system

Semi-automatic system for the final assembly of CFL lamps (cap, starter or electronic ballast) with individual working places according to the requirements of the products to be assembled.

The advantages

– High flexibility
– Low investment costs
– Easily adaptable to new products

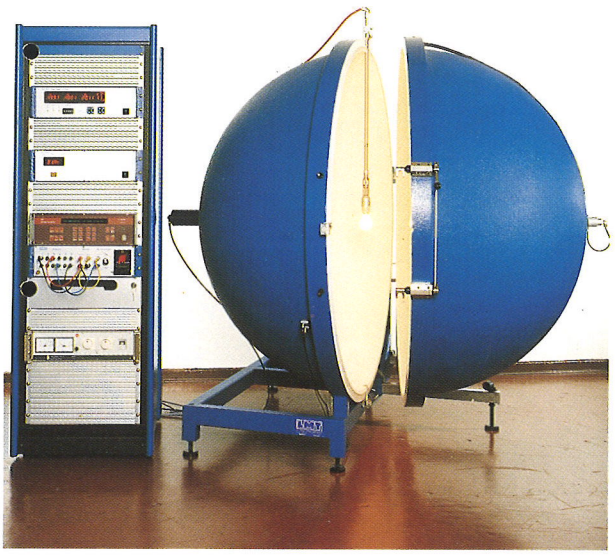
AFA

Automatic final assembly

An automatic transfer system with a pallet conveyor brings the lamps to the different automatic assembly stations.
All operations are fully automatic inclusive final control. The system is modular and can be easily adapted to any lamp design.

Photometer and color measuring device

Especially designed to measure the light output, current and voltage of compact fluorescent lamps.
It also provides color analysis of the lamps, according to the recommandations of the IEC.
The system includes a measuring sphere, stabilised power supply, electronic controls, computer, printer and software.



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Prewarming and test bench for CFL with 100 lamp holders

Life test bench for CFL with 100 Lamp holders.

Other equipment available for the CFL production

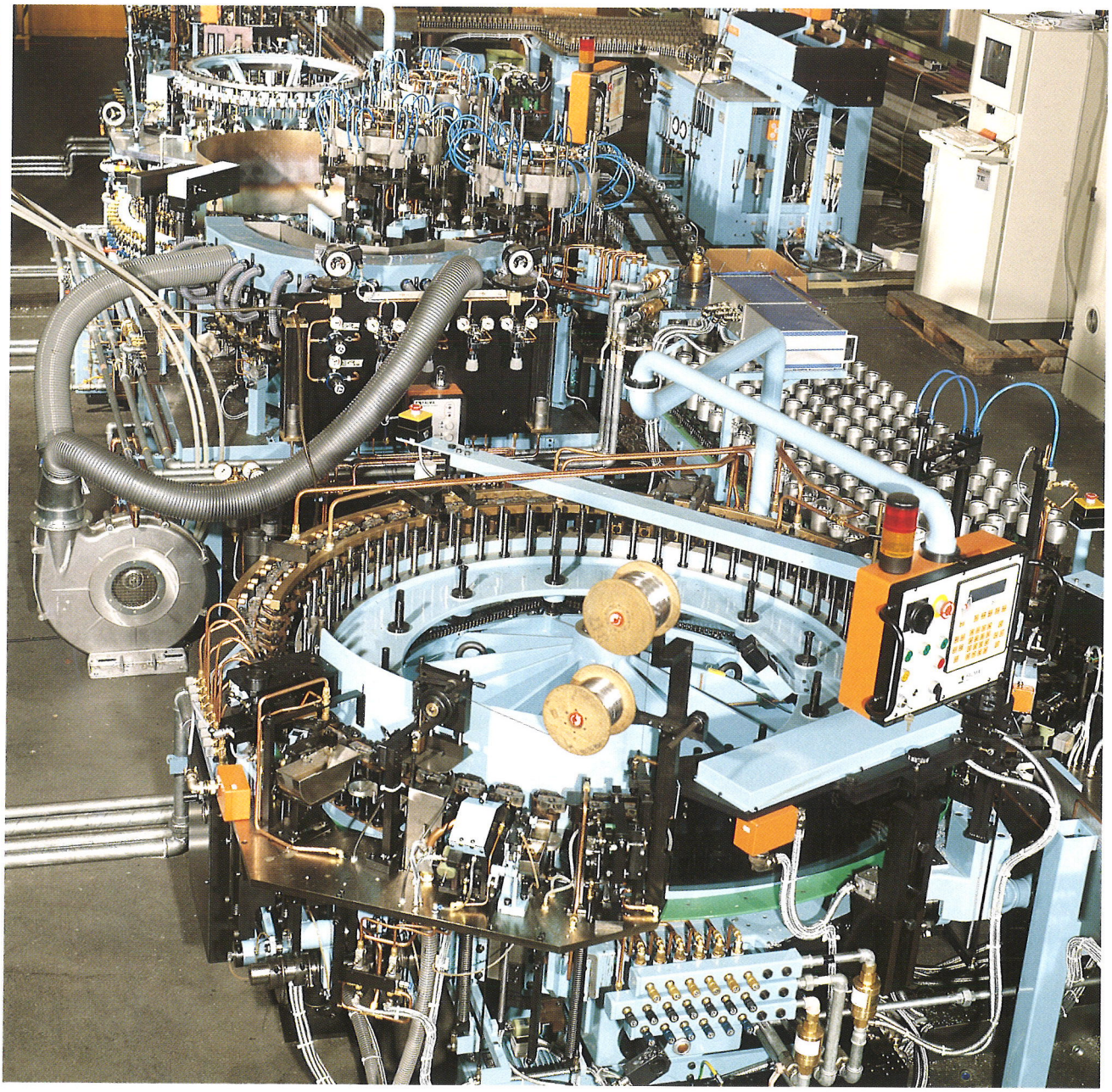
- Set of gauges for length and pitch
- Coating thickness comparison light box
- Polariscope
- High frequency tester
- Electronic thermometer
- Cap adhesion tester
- Electronic analytic balance PM300
  0–300 g, tolerance 0,01 g
- Electronic multifunction balance PM3000
  0–3100 g, precision 0,1 g
- Stainless steel mixing containers for the coating suspension
- Storage containers for coating suspension
- Viscosity measuring device
- 60 kg balance for the preparation of the coating suspension
- Ultrasonic cleaner
- Vacuum and argon filling pressure measuring device
- Lamp gas analyser

Incandescent Lamp Lines

The Concept

The concept with turrets, driven by indexing cam, connected with storage chains is proven FALMA quality. Some machines, having over 100 000 working hours have still the original index cams and rollers.
From the stem machine right through the capping machine, the lamps are kept in position, even during the transfers.
The control system, based on the most modern microprocessor technology fulfills the complete requirements for synchronisation, control and supervision. With the instant presentation of the essential production datas in the language of your personnel, it is an important tool for the line supervisor.

All the lines can be completed with the following auxiliary machines:
- Automatic in line flare machine with buffer chain, leading to the stem machine
- Automatic in line electrostatic coating machine for frostet or coloured bulbs
- Automatic in line aluminising machine for the production of reflector lamps
- Automatic final control with O_2 and H_2O measuring
- Automatic soldering control with vision system



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The Products

All types of gas filled or vacuum incandescent lamps with diameters between 28 and 80 mm, E- and B-type caps 110 or 230 Volt, 15 to 100 Watt, with tangential or radial mounts.
With special toolings: Tubular lamps, signal lamps.

The advantages

- Low space requirements for the line
- Minimum of persons required for operation (3 persons for the HSL and VHL line, 2 persons only for the HSL-S and VHL-S line)
- Minimum raw material waste and a maximum of output due to the computer assisted machine operation and maintenance
- Designed for 3-shift operation
- Very short payback time, due to the high performance compared to the investement costs

Available Line types

Line type	*Lamp type*	*Cap types*	*Index speed*
HSL-S	One type	E- or B-type*	3500/h
HSL	All types*	E- or B-type*	3500/h
VHL-S	One type	E- or B-type*	6000/h
VHL	All types*	E- or B-type*	5000/h

*with change parts

Auxiliary equipment for the incandescent lamp production

TL 83 and TL 4

Flare machines

Horizontal flare machines with a high material efficiency through cutting before loading by means of a rotating hydrogen burner.

Available flare machine types

Machine type		*Index speed*
TL 83	stand alone	4000/h
TL 4	stand alone or in line with buffer chain	6000/h

EC 3500 and EC 2

Electrostatic coating of glass bulbs

The machines have been designed for internal frosting or color coating of glass bulbs.
The powder supply unit is mobile, and can be replaced easily for color change.
Both types of machines can be installed as stand alone units or integrated in a production line.

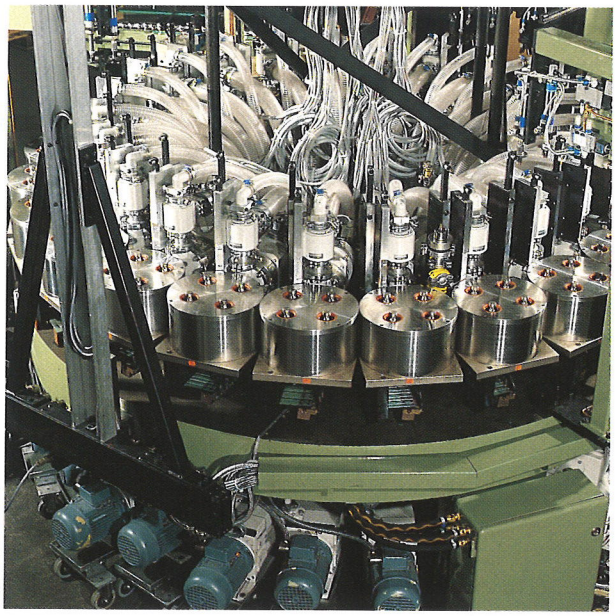
Available electrostatic coating machines

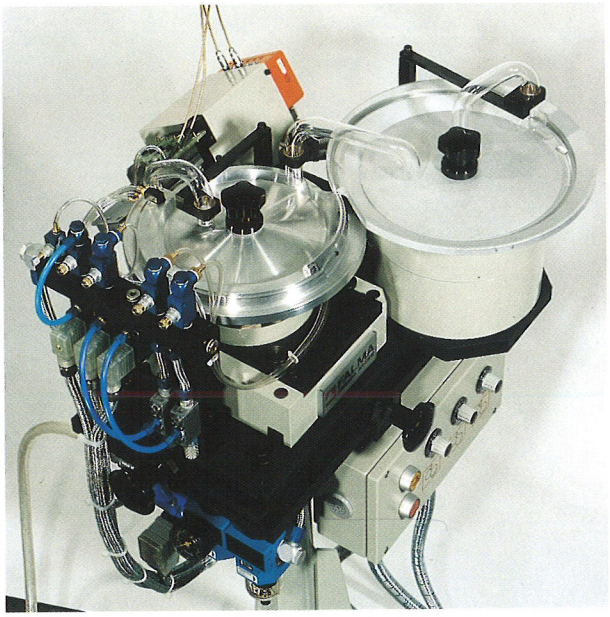
Machine type	*Bulb size*	*Index speed*
EC 3500	Dia. 35 – 60 mm	4000/h
EC 2	Dia. 35–125 mm	up to 5500/h

AM

Machine for metallisation of glass bulbs

The machine has been designed for internal coating of bulbs for reflector lamps, top mirror lamps and PAR-lamps by evaporation of aluminium by tungsten filaments. High vacuum is ensured by 24 turbo molecular vacuum pumps.
The machine is fully automatic, including loading of bulbs and aluminium wire, replacing used tungsten filaments, final control and unloading. It can be stand alone or integrated in a production line.
Index speed is up to 5500/h for bulb diameter 35–95 mm and 2750/h for bulb diameter 125 mm.

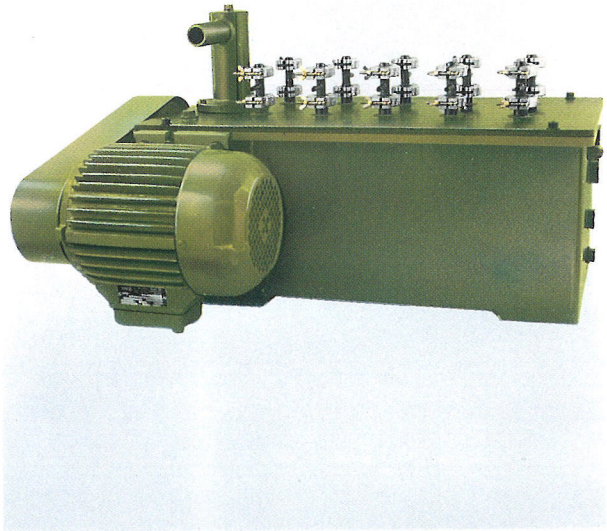




WFR

Filament feeder

For its own requirements, FALMA has developed several types of filament feeders. Over the years, many of these feeders have been put on different makes of Incandescent, Halogen and Fluorescent lines.
The latest development, our WFR includes an electronic control for the length of the filaments. If a broken filament, or two filaments hooked together are presented to the check point, they are automatically rejected.
Range: – Coiled coil filaments 15 – 200 Watt, 100 – 250 Volt
– Single coil filaments 4 – 40 Watt, 120 Volt
– Stick coil and triple coil cathodes
– Tungsten halogen filaments
Capacity: up to 6000 coils per hour.



VP 5 / VP 10

Vacuum pump

The vacuum pumps VP 10 and VP 5 are specially suitable for use in the manufacture of incandescent and compact fluorescent lamps. The compact housing, made to fit under the exhaust machine using short connection lines is equipped with 10 (VP 10) respectively 5 (VP 5) rotating slide valve pumps.

Available types

Type	*N° of pumps*	*Capacity per pump*	*Gaaranteed vacuum*
VP 5	5	5 m^3/h	10^{-2} mbar
VP 10	10	5 m^3/h	10^{-2} mbar

FC 3

Final control system

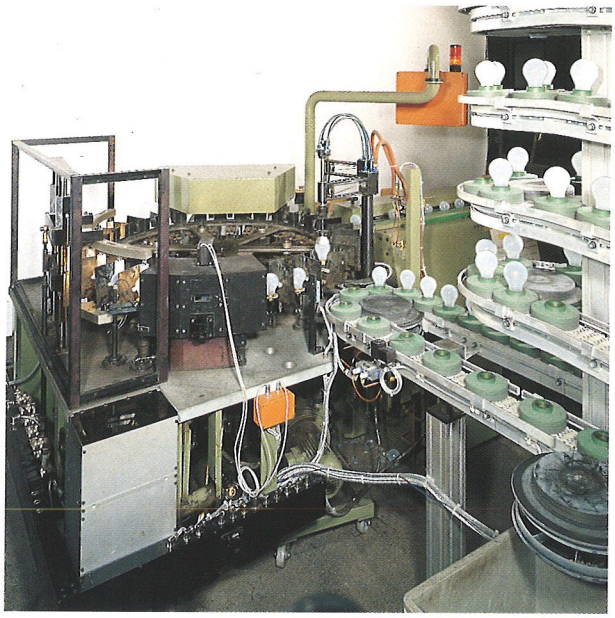
The final control system FC 3 is used for testing incandescent lamps directly after the production, eliminating the 24 hours delay time normally experienced. It is designed to be added to the FALMA Very High Speed line VHL, but since it has its own electronic control, it can be added to any other line.

Main advantages

Full production control and immediate feed back to the line operators. Direct transfer to the packing machine.

Working range

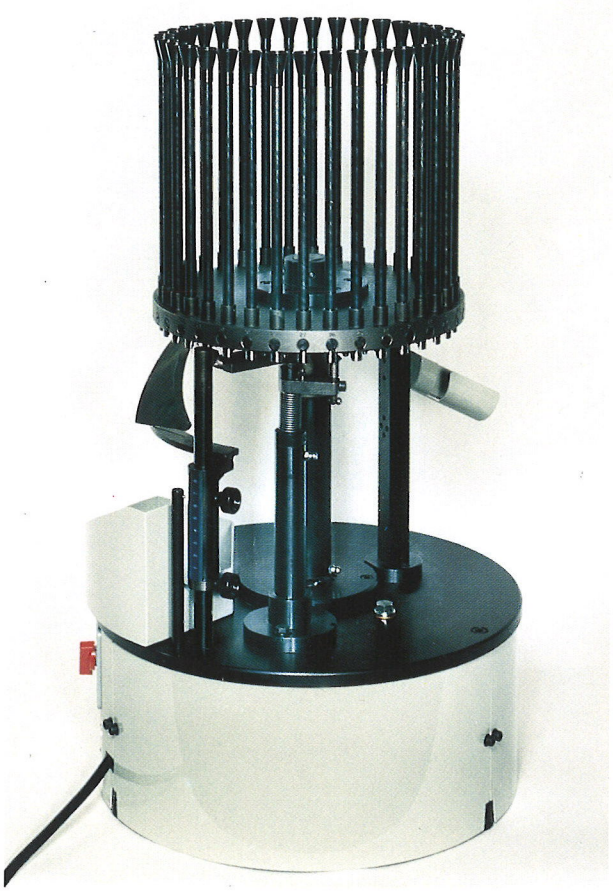
All types of incandescent lamps with diameter in the range of 35 to 80 mm (95 mm optional) except coloured lamps and vacuum lamps. Index speed is 3600 to 6000/h.



SSM

Exhaust tube cutting machine

Machine to cut exhaust tubes.
Capacity is up to 10 000 pcs/h.



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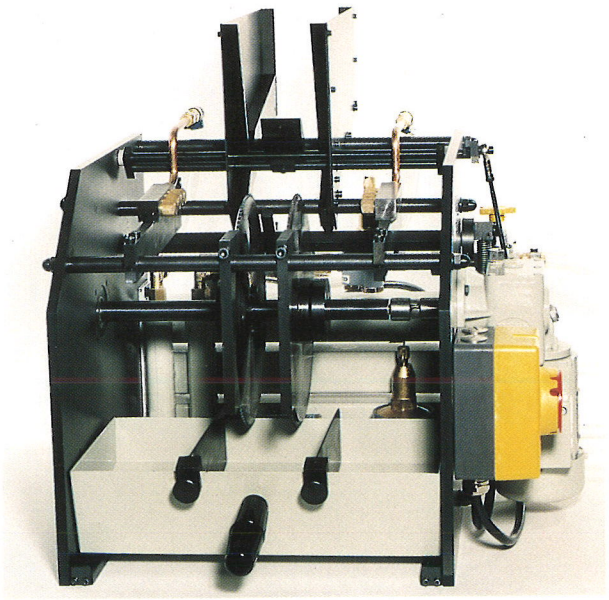
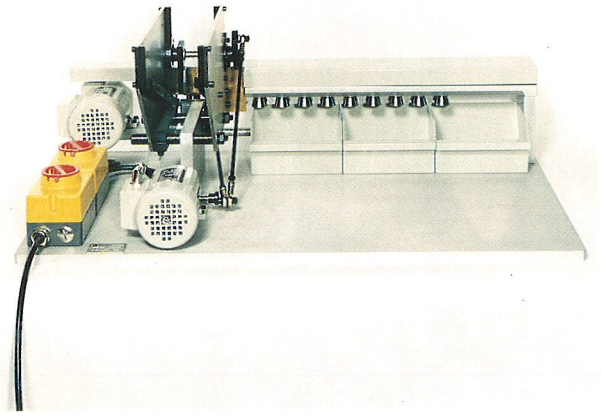


PG

Exhaust tube fire polishing machine

Machine to fire polish exhaust tubes.
Capacity is up to 10 000 pcs/h.



PK

Exhaust tube calibrating machine

Machine to calibrate exhaust tubes with a tolerance of +/– 0,1 mm.
Capacity is up to 5000 pcs/h.

Our Products

GP

Gas tester

Extremely sensitive control apparatus for testing the N_2 and Ar/N_2 gases used in light source manufacture. Possible contaminants such as oxygen and moisture are indicated by the color change of a filament heated to dull redness.

HF

High frequency tester

This table model has a quartz controlled oscillator and is entirely manufactured with semiconducters for high reliability, and is therefore a practical apparatus for the testing of gas purity or vacuum in light sources.

PI

Pirani gauge

Vacuum measuring instrument for use in the lamp industry. It is not a laboratory instrument, but it is intended for continuous control of the vacuum pumps on sealex machines.
The instrument can survey 15 measuring probes. The fourth and the fifteenth positions are giving a signal, if the preselected vacuum is not reached.
Measuring range: -10^{-2} mbar.

LT

Lamp testing apparatus

Lamp testing device, designed to be installed close to the sealex machine. Lamps are fixed into the two contact jaws and an infinitely variable current applied by means of a preselectable time swich.
The condition on the glass components, filaments and support wires give a clear indication of the lamp quality.
Tension range 0–300 Volt
Time swich 0–30 minutes

AP

Photometer

Measuring instrument for the light output, current and voltage of incandescent lamps, according to the recommandations of the IEC. The system includes a measuring sphere, stabilised power supply, electronic controls, printer and software.

LR

Life testing rack

Life testing rack to control lamp life according to the recommendations of the IEC.
In addition the LR allows a rapid test with over voltage for a quick check on current production quality.

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Filament

FALMA

Filament Production Equipment

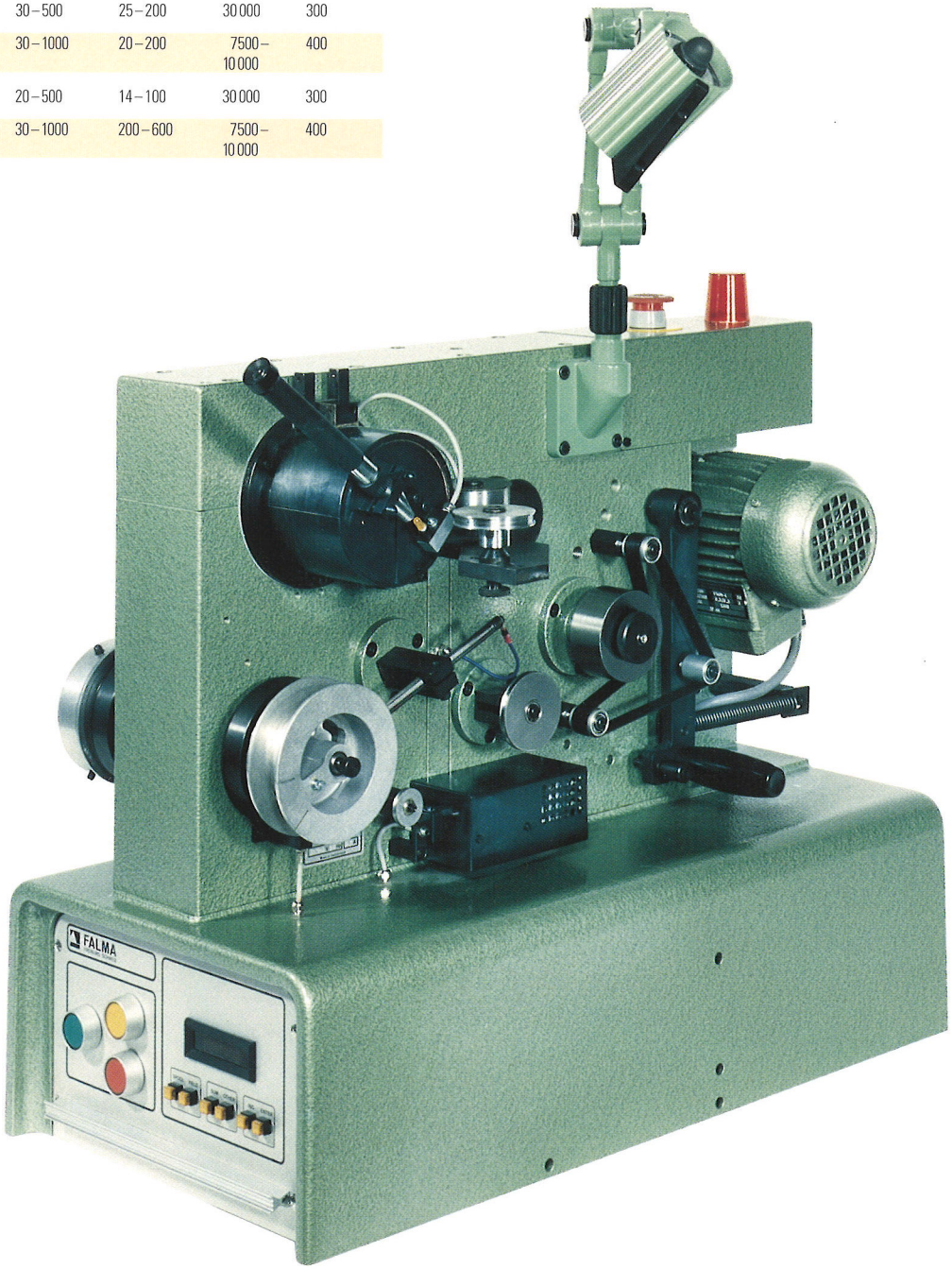
The machines are designed for the production of primary coils and offer the following facilities:
- High coiling speed (lasso principle)
- Large bobbin weight load (up to 300 g of wire)
- No mechanical friction brake
- Grease lubricated (no oil contamination possible)
- Interchangeable coiling head
- Extremely low maintenance required

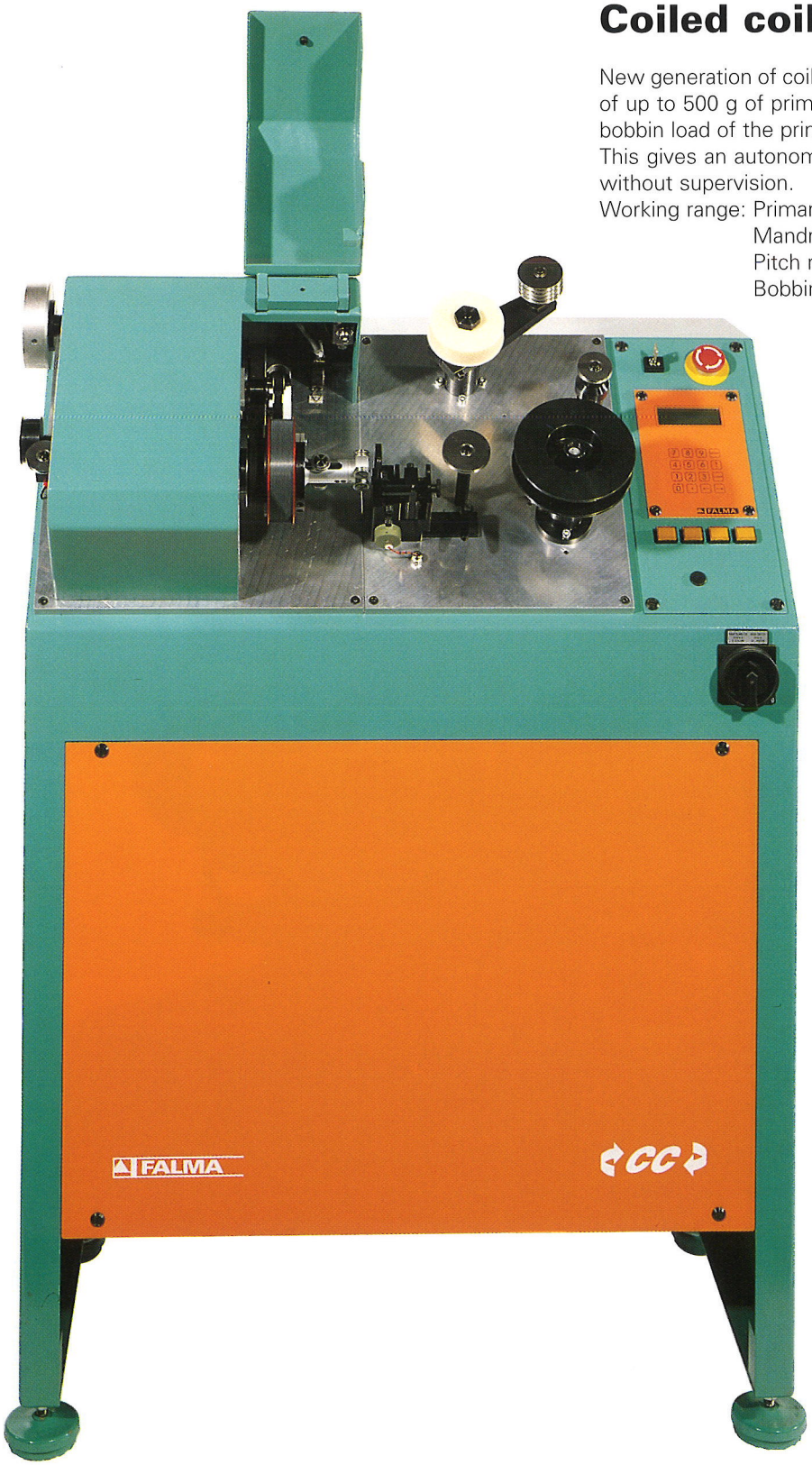
PC

Primary coiling machines

Available types

Type	*Tungsten primary coil*	*Mandrel (in microns)*	*Pitch (in microns)*	*Speed (RPM)*	*bobbin Cood (gr)*
PC	1–20 mg/200 mm	30–500	25–200	30 000	300
PCS	60–500 microns	30–1000	20–200	7500–10 000	400
PCX	0,2–10 mg/200 mm	20–500	14–100	30 000	300
PCK	60–500 microns	30–1000	200–600	7500–10 000	400





CC

Coiled coil machine CC

New generation of coiled coil machine with a bobbin load of up to 500 g of primary coil, which corresponds to the bobbin load of the primary coiling machine PC.
This gives an autonomy of up to 45 hours of production without supervision.

Working range:	Primary coiling	50 – 300 microns
	Mandrel wire	50 – 500 microns
	Pitch range	100 – 480 microns
	Bobbin capacity	500 g

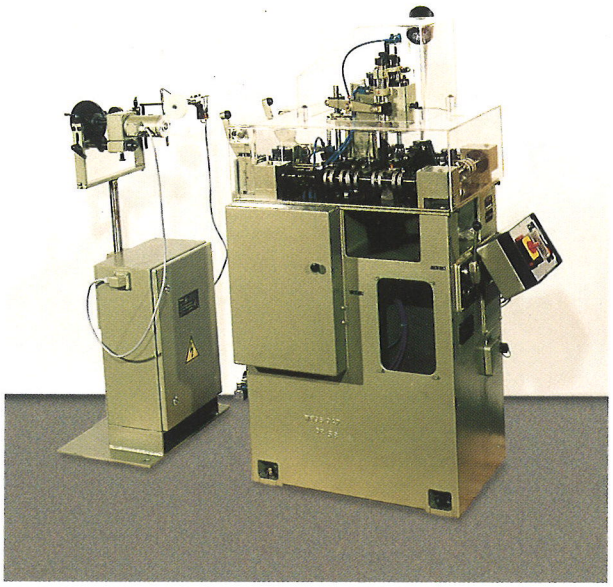
FALMA

WAFIOS

Retractable mandrel machine

Retractable mandrel machine for the manufacture of filaments and fluorescent cathodes.
Technical data:

– Wire size primary coil	100 – 500 micron
– Max. length of coil	15 mm
– Pitch range	0,25 – 1 mm
– Max. inner diameter (mandrel)	1,5 mm
– Coiling speed	1200 pcs / h (depending on coil dimensions)

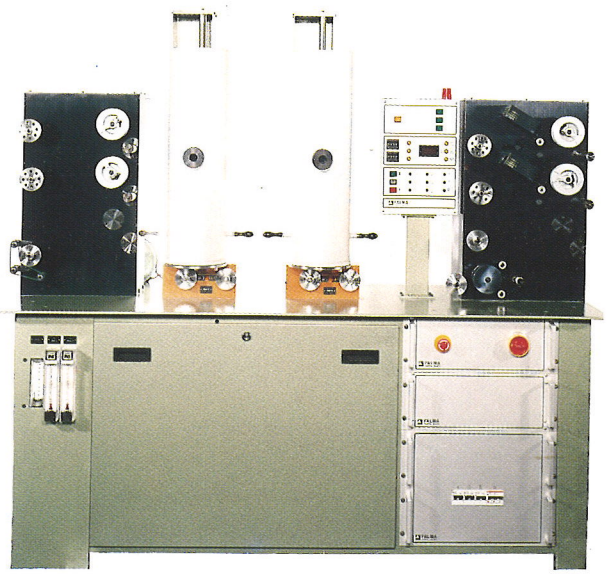


TO

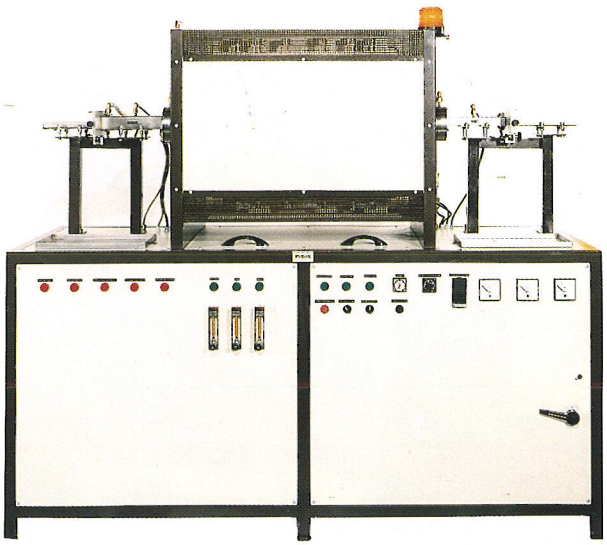
Annealing oven

Continuous annealing oven with two heating zones in tandem. Main features: – Constant temperature
– Low hydrogen consumption
– High production capacity

Up to 2 wires are processed simultaneously through the two heating zones with a temperature range of 800 to 1200 °C resp. 1400 to 1900 °C at a speed of 5 meters per minute.



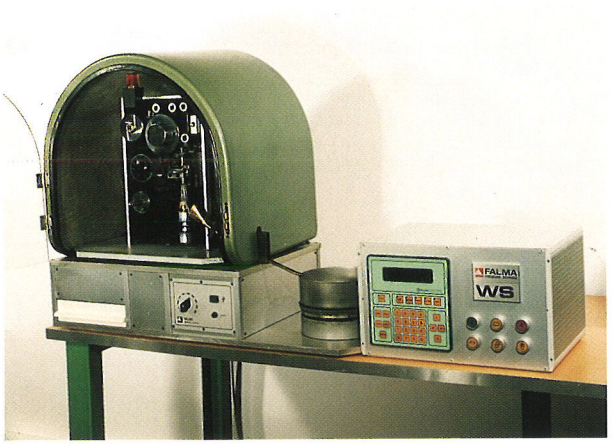
Our Products



SG

Stationary boat annealing furnace

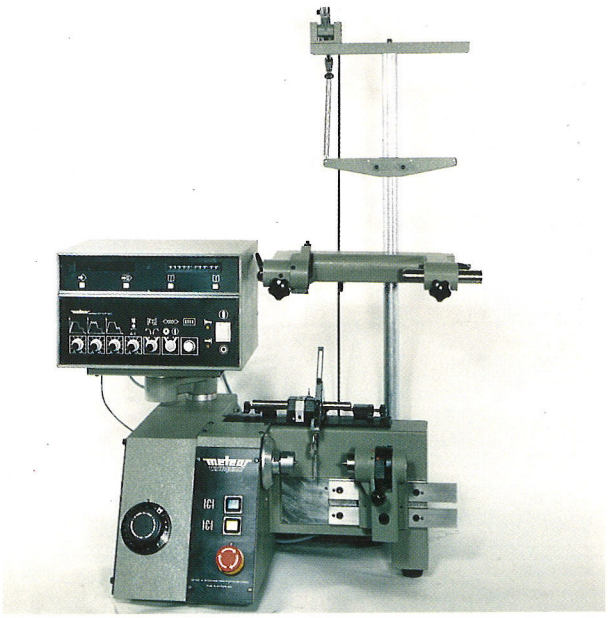
This batch type front end loading furnace is used for the final annealing of the fluorescent tube cathodes.
The furnace temperature of up to 1450 °C is achieved by molybdenum wire resistance wound on a ceramic tube with an inside diameter of 50 mm.
The coils to be annealed are placed in molybdenum boats, which can accommodate up to 7000 pieces cathodes for example.
The furnace is designed for a heating zone and a cooling zone. This allows the coils to be cooled in an atmosphere of hydrogen gas.



WS 2

Filament cutter

Coil cutting machine for continuous and gap type filaments with digital sensing system.
The integrated control system permits to check the filaments during the cutting process.
Diam. of wires: 0,1–1,2 mm
Speed: 4–8 cuts per sec.



METEOR

Spool winding machine

Spool winding machine, equipped with adapters for the rewinding of spools, for FALMA coiling machines, for easy and accurate spooling of tungsten wires ready for use.
Technical data:

– Wire dia.	0,01–0,50 mm
– Pitch	0,012–0,56 mm
– Speed	0–15 000 rpm

Dissolving equipment

WA

Dissolving unit

Fully automatic, microprocessor controlled dissolving unit for molybdenum mandrel wires. The reaction takes place in a closed vessel with fail safe locking system. No nitrogen oxides are released to the atmosphere.
Capacity: – 1,5 kg of molybdenum per hour (4 batches)
– With a double reactor, the capacity can be doubled

Cadica

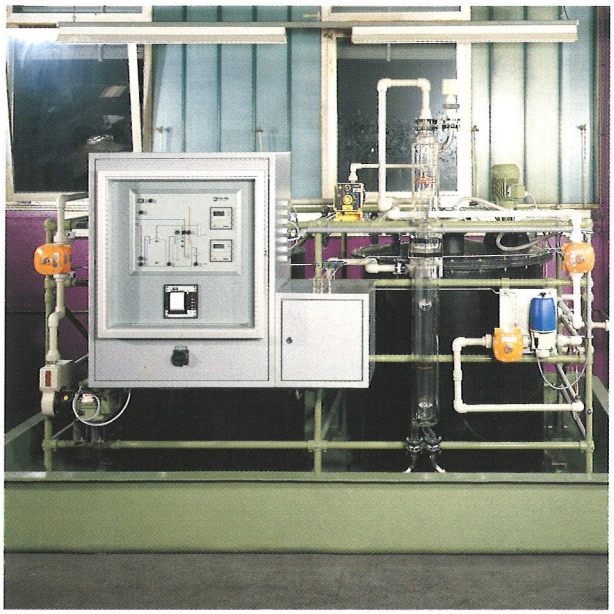
Hot-air centrifuge

Centrifuge for the rapid drying of filaments after the dissolution.

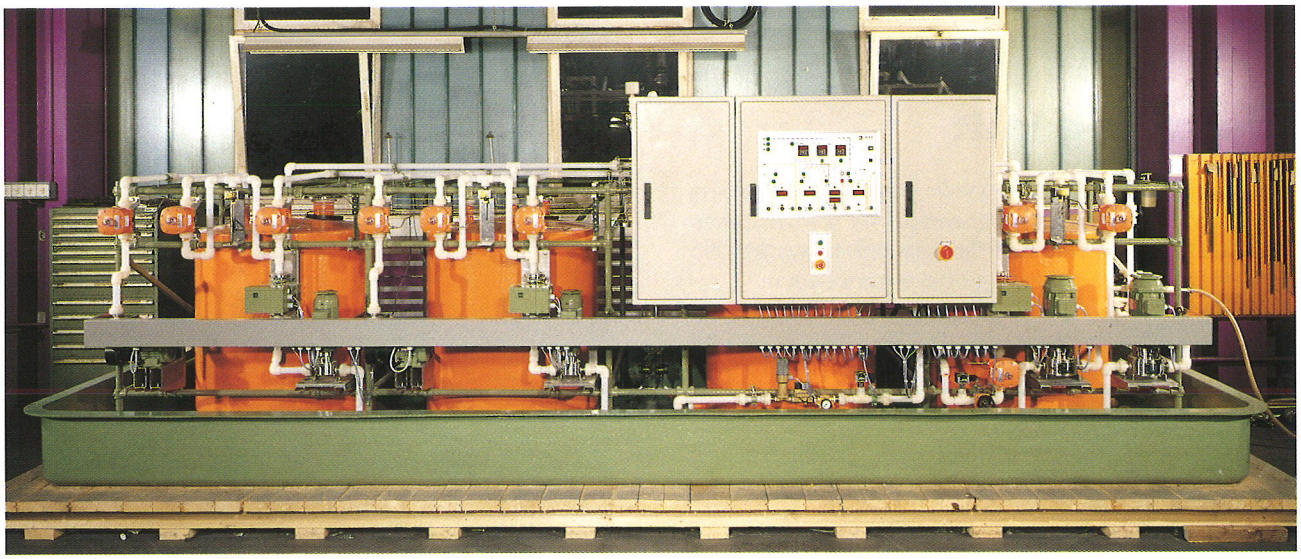
NA

Neutralisation plant

Fully automatic neutralisation plant for the neutralisation of the rinsing water and unrecovered spent acids from the molybdenum dissolving plant.
Ph controlled draining system with automatic shut off in case that the value is not within of the accepted tolerances.



Our Products



MA

Acid mixing and storage Plant

The electronically controlled mixing and storage plant consists of two 800 liter storage tanks, one mixing and one working tank. The necessary pumps, valves level detectors and alarms are standing in a overflow protection basin.

SL

Storage plant

Two storage tanks of 800 liters with level detectors, pumps, standing in a overflow basin.

RC

Recovery plant

The Recovery Plant RC is designed to recover the molybdenum and acids from the dissolving process. The molybdenum is recovered as $Mo O_3$. The recovered acids can be reused in the dissolving process.
Capacity: 400 liters per shift

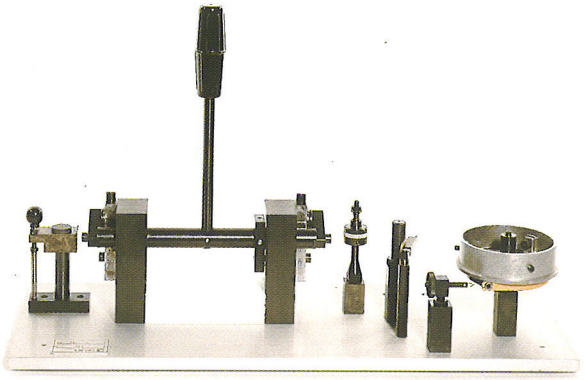
FALMA

Quality control for filaments

DS

Wire cutter

Designed to cut accurately 200 mm wires for weight control.



Mettler Micro Balance

Technical data:

– Readability	1µg
– Range	0–150 mg
– Max. weight	3050 mg

WM

Digital Resistance Bridge

For measuring the cold resistance of filaments with a length between 4 to 60 mm.

Projector 4002

This Micro Macro projector is used to visually examine coils and to determine pitch errors.

Other equipment used for the coil production

– Laboratory microscope
– Stereo microscope
– Coil calculator
– Spot welder PECO