



# **falma machines**

**CFL-Mx: semi-automatic production line**

producing high quality compact fluorescent lamps S, D and T types



**montena**  
falma machines

# montena philosophy

*machinery components technology*

## Turning darkness into light

Montena machinery develops, builds and commissions machines and production lines for the manufacture of all kinds of light sources: incandescent or economical, traditional or the latest generation.

Working in close cooperation with montena lighting, montena machinery has acquired complete mastery over all the phases of lamp production. This synergy effect brings high benefits: for example, it enables montena machinery to make an objective and well-formed assessment of production tool quality.

Montena's foremost aim is to give you comprehensive service, dedicated to your satisfaction and success. Our customer advice focuses on research, development and engineering; we also provide on-site after-sales service, maintenance and monitoring of installations.

Montena summarises its objectives in a single declaration of intent: we can do it!

We will be happy to give you further information. Just contact us!

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# CFL - Mx

## **Semi-automatic production lines for quality compact fluorescent lamps**

- ❑ Single, double or triple lamp types
- ❑ Easy to operate
- ❑ High technology as the fully automatic line
- ❑ Short payback time
- ❑ Very short change over time
- ❑ 3 shift operation possible
- ❑ Minimal floor space
- ❑ Easy control system of the line



# 1

## products competitiveness

Close co-operation between specialists with extensive knowledge in their particular field and manufacturing experts, whose aim was to simplify procedures as far as possible, brought many new ideas which were then implemented - for your benefit. Ideas which cover all the needs of a modern production plant, such as machines capable of guaranteeing high lamp quality, a convenient man - machine interface, protection for workers and protection of the environment. Each machine functions as an independent unit. The machines are built to a rugged design. The turret indexing and drive wheels run in an oil bath. Their speed can be adjusted.

Interchangeable components enable elements of different sizes to be used.

A user-friendly control system supplies production statistics and service condition details on demand. The machine parameters can be verified and adjusted in a simple dialogue mode. The control can be connected to a floppy drive, printer or PC.





Some individual machines of the semi-automatic CFL production line.

# 2

## concept: process steps

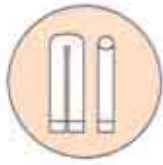
The production of Compact Fluorescent Lamps is based on a turret system which is proven falma quality. Each turret is driven by an indexing cam and automatically controlled by a supervisory control system called LSI. Each machine functions as an independent unit. Only PSM and MP are linked with a chain.

Starting with the tube bending machine or even the glass cutting machine, the glasses are manually transferred to the next machine for tube coating. Each machine adds one step in the production of a CFL-lamp (see description on the other side). At the end, you obtain a product with high quality and performances.

On the following pages, you will find a short description of every individual machine. In case you should have more questions or comments, please do not hesitate to contact us for further information.



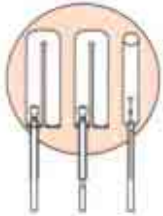
TB-tube bending. The pre-cut glass tubes are bent here.



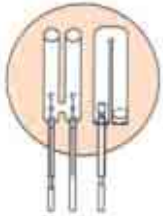
CS-coating system. The bent tubes are now coated.



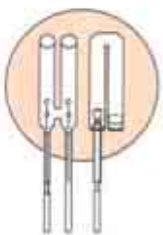
PSM-bead mount machine. The complete bead mount is assembled here.



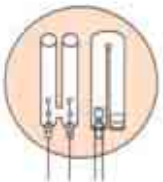
MP-mount and pinch machine. Bead mount and exhaust tube are pinched and sealed into the discharge tube.



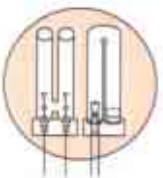
CM1-connecting machine 1. The bent tubes are connected to the D type lamp or to the first step of the T type lamp.



CM2-connecting machine 2. The individual tubes are connected to the T type lamp.



PAM-pumping and ageing machine. The lamps are pumped, activated and tested for the first time.



MCM-final assembly. The final assembly of the cap to the lamp is effected here.

# 3

## technology know-how

With a semi-automatic CFL line, montena machinery delivers as well the know-how and the technology how to produce a compact fluorescent lamp with a high efficiency, assuring a high product quality. Every single step from the beginning to the end is important and that's how we teach your personnel to solve daily problems and how to reduce raw material costs to a minimum and how to increase the overall efficiency. To ensure the quality and the high efficiency of the production line, the operators of the machines follow a specific training program. Along with our detailed documentation they will soon be able to handle the machine by their own. If later on, during operation of our installation you have questions and problems to be solved and answered, we will help you as well with our support at any time.



# 4

## technical specifications of CFL-Mx

Line type	Lamp types	Wattage	Output
<b>CFL-Mx-200</b>	Single tube lamps	5-11 Watt	1500/ h
	Double tube lamps	10-26 Watt	1250/h
	Triple tube lamps	18-32 Watt	850/h

# 5

## machine descriptions

### Individual machines CFL-Mx

- ❑ TB tube bending machine
- ❑ CS coating system
- ❑ PSM bead mount machine
- ❑ WFR cathode feeder
- ❑ MP mount and pinch machine
- ❑ CM1 connecting machine for D-types and first step T-types
- ❑ CM2 connecting machine for T-types
- ❑ PAM pumping and ageing machine
- ❑ SCM cap pasting and mounting machine
- ❑ FAS semi-automatic final assembly system
- ❑ TC transfer carriage

### Optional machines

- ❑ HAS tube cutting machine
- ❑ MPF mercury pill machine
- ❑ GPF mercury pill mounting and rim forming machine
- ❑ AFA automatic final assembly system
- ❑ LMT photometer and colour measuring system
- ❑ LT Pre-warming or test bench for CFL with 100 lamp holders



**TB**



#### Technical data

tube size	12
tube length	110-400 mm
index	2800/h
high pressure air	6 bar - 30Nm <sup>3</sup> /h
propane	8 kg/h
oxygen	8Nm <sup>3</sup> /h
low pressure air	20 Nm <sup>3</sup> /h
operating voltage	3x400/230V 50 or 60Hz
power max.	15 KVA
dimensions:	
<input type="checkbox"/> machine	3610x2630x1960 mm
<input type="checkbox"/> control cabinet	1200x500x2000 mm
weight:	
<input type="checkbox"/> machine	3200 kg
<input type="checkbox"/> control cabinet	850 kg

#### CFL tube bending machine

The pre-cut tubes are placed in the magazine and automatically loaded into the double head jaw on the indexed heating turret (resetting for different tube lengths is straightforward). After heating, the tubes are transferred to the bending turret and shaped. The tube is inspected. Broken tubes are rejected.

#### Options

- Interchangeable components for different tube diameters.



**CS**



### **CFL tube coating machine**

This machine is used to apply the fluorescent coating to the inside surface of the bent tubes. A water-based mixture is used to protect the environment. The bent tubes are transferred to the washing turret with ten positions: they are inspected, washed twice and dried. They are then loaded onto the 30 position coating turret, inspected and rotated by 180°. The fluorescent mixture is filled at 3 positions by the two tube ends.

### **technical data**

lamp tube size	12 mm
index	2800/h
high pressure air	6 bar-10 Nm <sup>3</sup>
demineralized water	150 l/h-60°C
water consumption	+/- 1 l/h
operating voltage	3x400/230V 50 or 60Hz
power max.	230 kVA

After filling, the tubes are rotated by 180° to drain the mixture and transferred onto the oven conveyor where they are dried at a temperature of less than 120°C. Coming out the drying oven, the tubes are transferred into the electrically heated baking lehr. After baking, the outside surface of the tube ends is cleaned by brushes. The tubes are then transferred onto the machine which cleans the sealing area; this machine has a 10 position turret and cleans the inside of the tubes in the sealing zone, by air jets.

### **Options**

- Interchangeable parts for different tube diameters.



**PSM**



#### technical data

lead in wires	+0.4mm/Ni-Fe
cathode	5-13,18,26,32 Watt
bead	4,6/2,8x1,8 mm
index	3500/h
high pressure air	6 bar- 5 Nm <sup>3</sup> /h
propane	0,5 kg/h
oxygen	0.5 Nm <sup>3</sup> /h
low pressure air	1.5 Nm <sup>3</sup> /h
nitrogen	0.5 Nm <sup>3</sup> /h
operating voltage	3x400/230V 50 or 60Hz
power max.	12 kVA
dimensions:	
□ machine	1989x2727x2000mm
□ control cabinet	2000x500x2000 mm
weight:	
□ machine	3400 kg
□ control cabinet	1000 kg

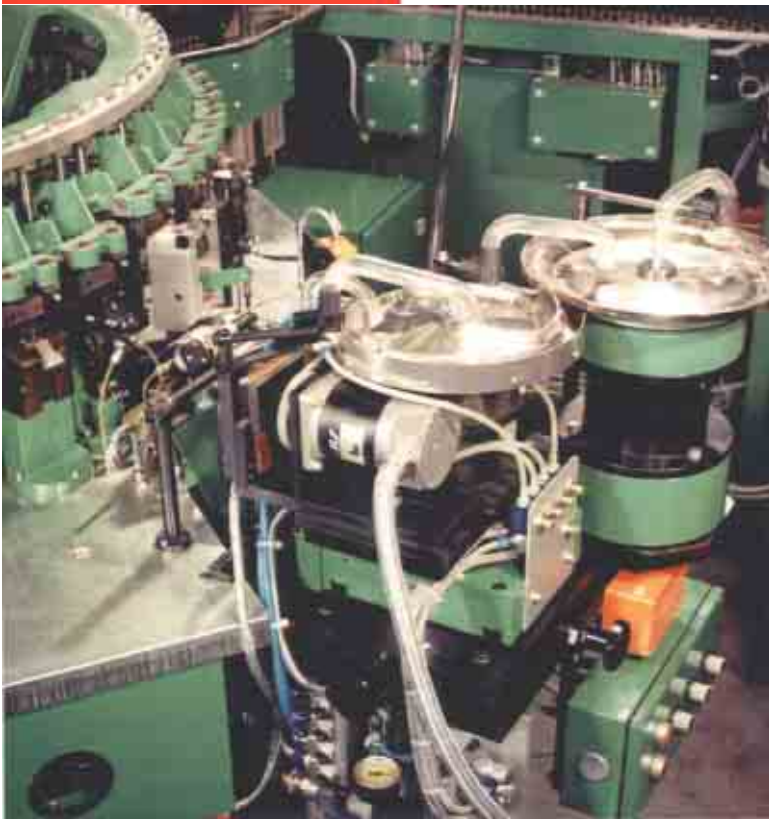
#### Machine for the manufacture of beadmounts with cathodes

The lead-in wires are taken up from a wire bobbin. The wire is cut and positioned. The lead-in wires are pre-bent and the glass beads then inserted. After fusion of the beads, the lead-in wire ends are bent, flattened and formed into hooks ready for cathode mounting. The cathode is automatically loaded by the WFR cathode feeder unit.

The cathodes are clamped into the lead-in wire hooks. Each piece is inspected. The protruding cathode ends are cut away to prevent any damage to the fluorescent coating. After the material has dried, the bead mounts are turned over and transferred onto a storage conveyor.



## WFR



### Cathode feeder

This unit separates and positions cathodes. It is an independent unit which can be located on all mounting machines with indexed feed systems.

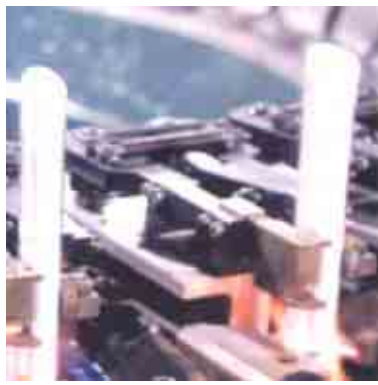
### technical data

cathodes	4-32 Watt
index	4000/h
compressed air	1 Nm <sup>3</sup> /h 6 bar
operating voltage	230V 50 or 60Hz
power	1 kVA
dimensions:	560x550x1220 mm
weight:	90 kg

### working range

coiled coil  
stick coil

The machine is independent, compact and easy to connect. The coils are then fed to a measuring wheel by means of a pot vibrator system. The measuring wheel is presenting them to an optical detection device which checks the length of the coils and compares them with the preset values. Broken coils are ejected and cannot cause any more problem in the coil feeding and mounting system. After measuring, the good coils are fed to the cascade system and from there to the coil feeding drum.



**MP**



#### technical data

lamp type:	
single type	5/7/9/11 Watt
double type	10/13/18/26 Watt
lamp tube size	12 mm
exhaust tube size	4 mm
index	2800/h
high pressure air	6 bar- 5 Nm <sup>3</sup> /h
propane	5 kg/h
oxygen	5 Nm <sup>3</sup> /h
low pressure air	15 Nm <sup>3</sup> /h
nitrogen	0.25 Nm <sup>3</sup> /h
operating voltage	3x400/230V 50 or 60Hz
power max.	60 kVA
dimensions:	
□ machine	4150x2650x1890 mm
□ control cabinet	1200x500x2000 mm
weight:	
□ machine	3400 kg
□ control cabinet	850 kg

#### Mount and pinch machine for CFL tubes

Simultaneous pinching of the two exhaust tubes ensures high precision. The tubes are transferred automatically into the machine jaws. Inspection is effected after each transfer operation. The tube is pinched in two stages with optional nitrogen gas injection to support the tube wall. The finished tubes can be delivered directly into a lehr.

#### Options

- Interchangeable components for different tube diameters.



## CM1/CM2



### technical data

double/triple type	10-32 Watt
lamp tube size	12 mm
exhaust tube size	4 mm
index	1550/h
high pressure air	6 bar-5 Nm <sup>3</sup> /h
propane	3 kg/h
oxygen	3 Nm <sup>3</sup> /h
low pressure air	9 Nm <sup>3</sup> /h
operating voltage	3x400/230V 50 or 60Hz
power max	33 kVA
dimensions:	
machine	2160x4150x1660 mm
control cabinet	1200x500x2000 mm
weight:	
machine	3400 kg
control cabinet	850 kg

### CFL tube connection machine

- 1) To connect two tubes (production of D-type lamps)
- 2) To connect two tubes (as the first connection in the manufacture of triple lamps)
- 3) To connect double tubes (of the kind made on the machine described in 2 above) with a third tube to make triple lamps.

The clamping jaws are designed to take different tube lengths. Inspection is effected after each loading operation.

The tubes are connected by heating the connection areas. They are then pierced and melted together. The lehr is divided into 3 sectors which can be adjusted individually.

### Options

- Interchangeable components for different tube diameters.





### Machine to pump and age CFL lamps

This machine pumps, fills argon in and activates the mercury pill and ages and tests the compact fluorescent lamp. The jaws are designed for lamps with two exhaust tubes and for simple lamps, double lamps or triple lamps. The four lead-in wires are connected to the rotating contacts; this ensures excellent current conduction.

### technical data

single type	5/7/9/11 Watt
double type	10/13/18/26 Watt
triple type	18/26/32 Watt
lamp tube size	12 mm
exhaust tube size	4 mm
index	1500/h
high pressure air	6 bar- 5 Nm <sup>3</sup> /h
propane	0.5 kg/h
oxygen	0.5 Nm <sup>3</sup> /h
low pressure air	1.5 Nm <sup>3</sup> /h
argon 60	0.25 Nm <sup>3</sup> /h
operating voltage	3x400/230V 50 or 60Hz
power max	98 kVA
dimensions:	
<input type="checkbox"/> machine	2175x3575x2600 mm
<input type="checkbox"/> control cabinet	3800x500x2000 mm
weight:	
<input type="checkbox"/> machine	5500 kg
<input type="checkbox"/> control cabinet	1700 kg

The vacuum and seal quality of each lamp is checked. Argon filling is adjusted precisely; after closing the exhaust tube, the lamps are then transferred to the activation turret. The mercury vapour is released into the lamp and the exhaust tube sealed. This prevents practically all pollution of the environment by heavy metal. The ready for use lamps are now transferred to the ageing and testing turret. Proper working of the lamp is checked and defective lamps are rejected.

### Options

- Interchangeable components for different types of lamps.
- Interchangeable components for different tube diameters.



## MCM



### technical data

lamp types:

❑ double type 10/13/18/26 Watt

❑ triple type 18/26/32 Watt

index 1500/h

high pressure air 6 bar- 5 Nm<sup>3</sup>

operating voltage 3x400/230V 50 or 60 Hz

power max. 15 kVA

dimensions:

❑ turret 1500x1500x1900 mm

❑ chain 7000x1000x2000 mm

weight 1000 kg (incl. control cabinet)

### Semi-automatic capping machine

This semi-automatic capping machine fills the caps with paste and feeds them to a conveyor. The glass tubes are fed manually into the drying chain. The complete machine consists of 4 sections:

- ❑ manual cap feeding
- ❑ cap printing and pasting
- ❑ paste baking
- ❑ manual loading and unloading of the lamps.

A turret where the caps are manually put on holders advances the caps to the printing positions and then to the paste fill-in station. Afterwards the caps are transferred onto a linear transfer conveyor. From there the caps are put manually on the lamps which were previously manually loaded too. The assembled lamps are then transferred through the heating tunnel where the paste is heated by hot air jets. Before unloading the assemblies are cooled down.

## FAS



### **Semi-automatic final assembly system**

Semi-automatic system for final assembly with individual work stations adapted to the requirements of the components to be assembled (cap, starter or electronic ballast).

Its advantages are:

- high flexibility
- low investment costs
- ease for adjustment to handle new products.



**TC**



### **Transfer carriage**

Manual storage systems are available for tubes transferred by hand (semi-finished lamps). The lamps are removed from the machine by hand, e.g. from the tube bending unit, and placed on the transfer carriage.

When the transfer carriage is full, it is rolled to the next machine (e.g. the coating machine) where the lead-in chain is again loaded by hand for subsequent processing.

- Flexible system
- All-round accessibility
- Easy handling
- Low space requirement

# 6

## electronic and control

The Line Supervision and Information System (LSI) meets all requirements for the control and supervision of a CFL production line. The system is designed and built to meet the needs of line personnel. It displays all essential data instantly and enables all settings to be saved and retrieved, thus making it an indispensable tool for the line supervisor.

The LSI is based on a personal computer and a normal VGA screen. The LSI can be equipped with a touch screen.

The monitor screen for each machine generally displays:

- a machine layout
- all the important counters
- the state of the emergency stop buttons
- a menu line which offers the possibility to access auxiliary screens and functions.

## samples of LSI monitors

