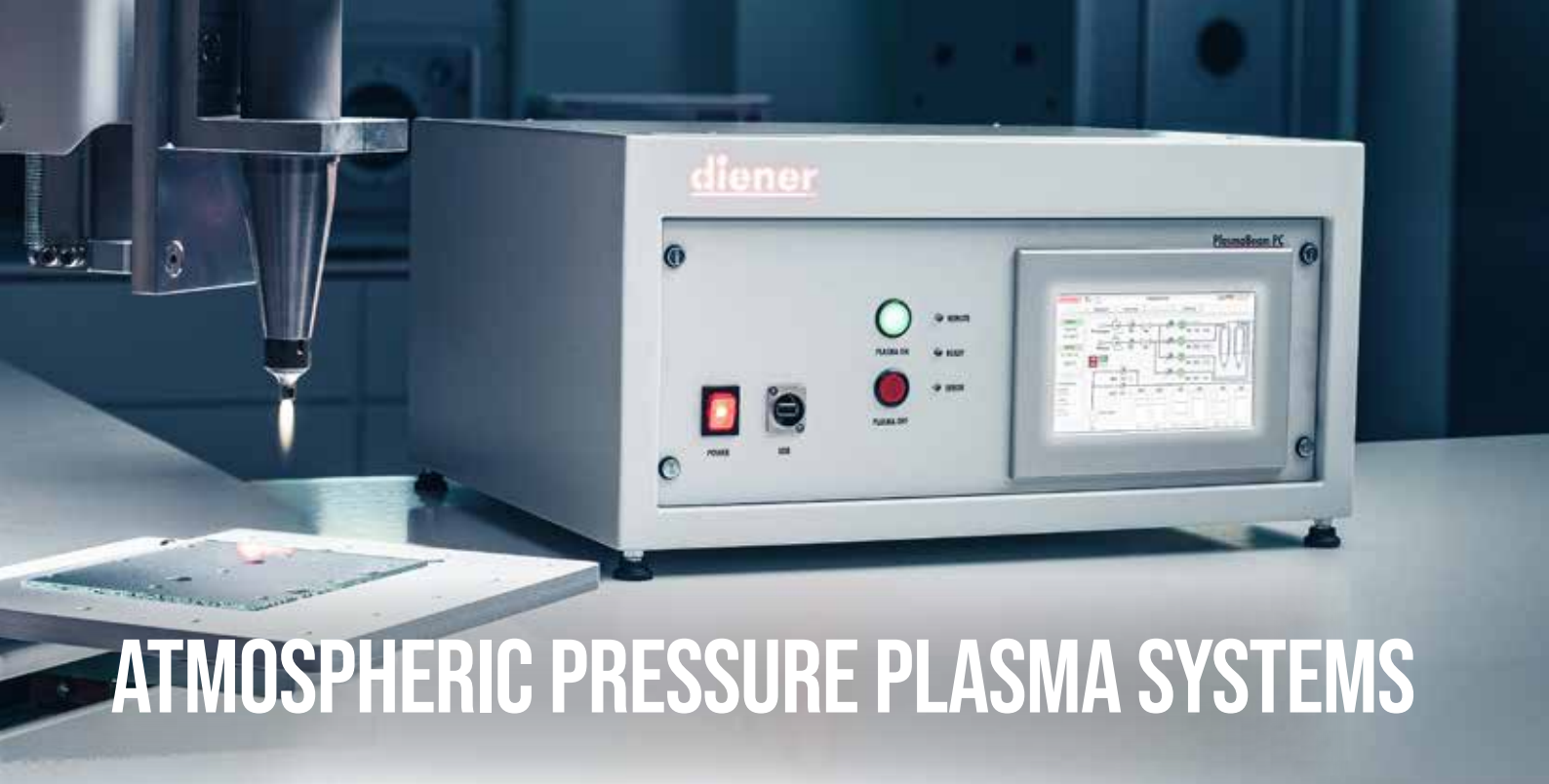


# ATMOSPHERIC PRESSURE PLASMA SYSTEMS



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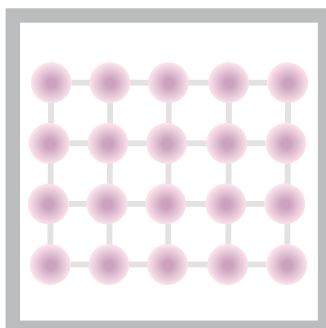
# ATMOSPHERIC PRESSURE PLASMA SYSTEMS

## WHAT IS PLASMA?

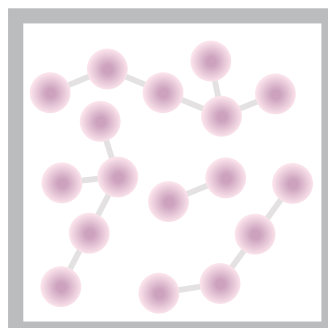
To generate plasma, a gas is supplied with sufficient energy to make a critical number of electrons leave their atomic shell. Now we have positively charged ions surrounded by free electrons. This ionised gas is electrically conductive. Plasma is often called the “fourth state of matter” since this breakdown gives the matter a multitude of new properties. Actually, the aggregate state of plasma is much more frequent than the other three states, i.e. solid, liquid and gaseous. This is because stars primarily exist in the plasma state – which thus makes up for almost all the matter in the universe.

## WHY DOES PLASMA GLOW?

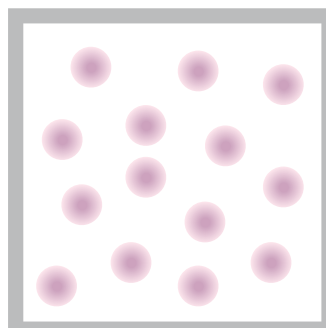
The glowing occurs when the free electrons are caught by the ions, releasing the previously absorbed energy in the form of light. The colour of the light depends on the type of gas. There are different ways of supplying gas with enough energy to ionize it. In one method the gas is for example exposed to extreme heat, in another to high voltage. In practical applications, the method of choice is usually high-frequency alternating voltage, such as in a plasma system.



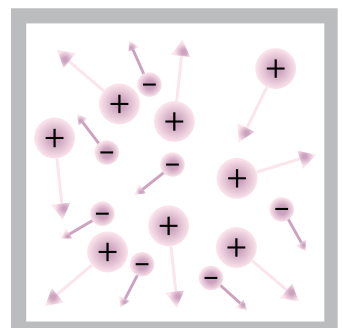
Solid



Liquid



Gaseous



Plasma



Atmospheric pressure plasma is suitable for a wide range of applications. Primarily, however, the Plasma-Beam family are intended for local pretreatment of different surfaces, e.g. cleaning and activation of polymers, metals, ceramic, glass and hybrid materials. But the Plasma Jet process can also be used for coating. Thanks to their unique design, atmospheric pressure plasma systems by Diener electronic are suitable for use with robots and for integration in existing, automated production lines.

Treatment with APC500 is a low-cost process for the activation of plastics and elastomer surfaces.

With air used as a process gas, large surfaces can be activated at atmospheric pressure. A arc discharge is ignited in the inhomogeneous field between two electrodes. The voltage is roughly 10,000 V. The air flowing through the discharge zone is ionised. Via the air flow, the plasma is blown out of the electrode range. In the released corona, the substrate can now be treated. A strip of several centimetres' width is treated in the corona. Using several plasma generators in parallel allows you treat larger surfaces.

#### **The benefits:**

- Treatment at the conveyor belt, suitable for in-line production, no vacuum technology
- In case of aluminium, very thin oxide layers (passivation) can be generated
- Pretreatment of "endless" items (e.g. tubes, cables etc.), very short process time
- Local surface treatment is possible (e.g. flutes)
- Large bulk good items directly at the conveyor belt
- Pre-treatment of metallic contacts/bond pads immediately before bonding
- In-line coating possible



# DISCOVER THE POSSIBILITIES

PlasmaBeam technology is suitable for in-line processes. Endless rubber or metal profiles, pipes or tubes can be treated. Robots can be used for treatment of 2- or 3-dimensional surfaces. PlasmaBeam allows for local surface cleaning without masking of residual surfaces, e.g. cleaning of Al, Au and Cu bond pads prior to wire bonding, without affecting the rest of the surface. Since the active gas jet from the plasma nozzle is free of dangerous voltage potential, the device can be used for various processes in the electronics industry, e.g.:

- Cleaning of bond pads before wire bonding
- Activation of glass and aluminium in smartphone manufacturing
- Activation of chips surfaces before printing or casting
- Activation of housings for electronic systems
- Treatment of voltage-sensitive electric assemblies before casting

The PlasmaBeam is also suitable for pretreating before the following processes: Gluing, Bonding, Printing, Laminating, Soldering, Welding, Flock-coating.

PlasmaBeam can be used to treat the following surfaces: Plastic, Rubber, Metals, Glass, Ceramics, Hybrid materials.

The PlasmaBeam is primarily used in the following sectors: Automotive, Electrical engineering, Elastomer technology, Precision engineering, Research and development, Semiconductor technology, Small batch production, Plastics technology, Medical engineering, Micro-system technology, Optics, Solar cell technology.

Due to its dangerous voltage potential, the Plasma APC500 is suitable for nonconductive materials only. Plasma APC500 can be used to pretreat components before the following processes: Gluing, Printing, Painting. Plasma APC500 can be used to treat the following surfaces: Plastic, Rubber, Ceramics, Glass.

## WE LOOK FORWARD TO SEEING YOU

[www.plasma.com](http://www.plasma.com)



# ATMOSPHERIC PRESSURE PLASMA BEAM

## PLASMA JET = PLASMA BEAM

The system consists of three units:

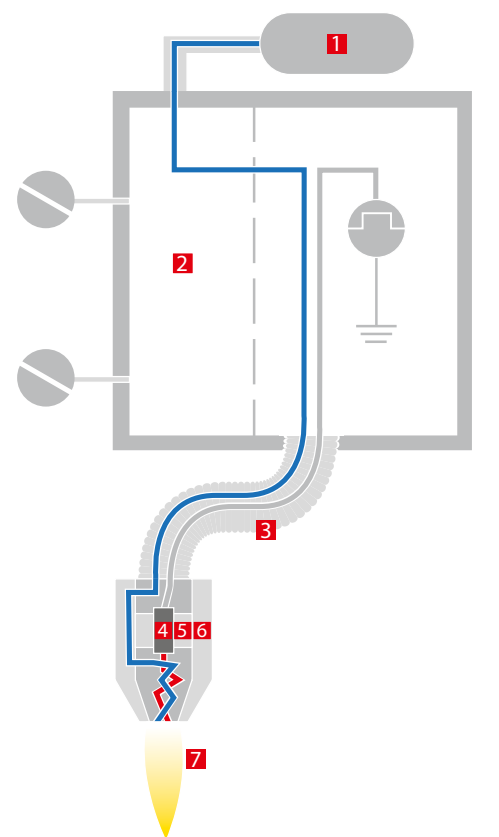
### Supply unit

- Electrical mains connection
- Process gas and cooling gas connection
- High voltage generator
- Current measurement block
- Gas control block
- Front panel with operating elements

### Gas and power supply lines in a flexible pipe

### Plasma generator

- The central electrode, the distal electrode and the insulator form the discharge zone
- The high voltage generator converts the mains voltage to high voltage (up to 10 kV) which is required for the generation of the electrical discharge.
- The supply voltage and the process gas are supplied to the discharge zone via the flexible lines.
- The air flow carries the active species ( $i^+$ ,  $e^-$ ,  $r^*$ ) created in the light arc out of the discharge zone (Plasma Jet process).
- The specifically designed nozzle shape focuses the flow of the active gas onto the workpiece to be treated.



- | Gas channel / gas flow
- | Arc discharge
- Voltage supply 230 V, 50 / 60 Hz approx. 300 W
- High voltage generator
- 1 Dry, oil-free compressed air 5-7 bar, approx. 1800 l/h
- 2 Supply unit incl. gas control block
- 3 Gas and power supply lines in a flexible pipe
- 4 Central electrode
- 5 Insulator
- 6 External grounded electrode
- 7 Plasma jet, free of dangerous high-voltage potential

# ATMOSPHERIC PRESSURE PLASMA APC

## GLIDING ARC = PLASMA APC

The system consists of three units:

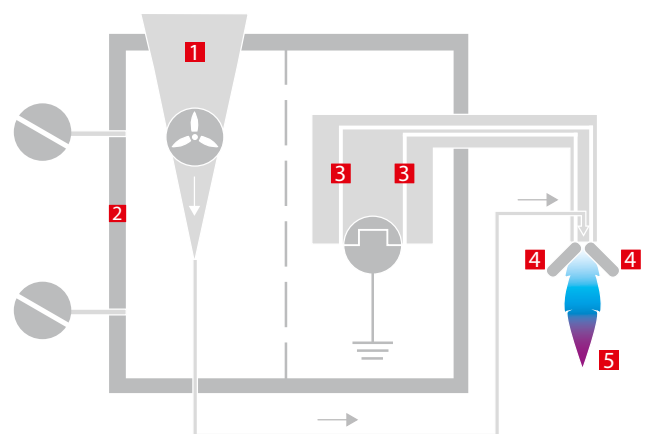
### Supply unit




- Electrical mains connection
- High voltage generator
- Control block (control via micro-controller)
- Front panel with operating elements
- Air supply

### Power and air supply lines in a flexible pipe

### Plasma generator

- Two electrodes form one discharge zone
- The high voltage generator generates a voltage of up to 10 kV required for the generation of the electrical discharge.
- The supply voltage is supplied via the flexible supply cable.
- The air flow guides the electric arc from the electrode region. (Gliding Arc process)
- The electric arc comes into direct contact with the surface.
- Danger! High Voltage! Do not touch the electric arc or electrodes.
- The PlasmaAPC 500 is used for non-conductive surfaces only.



- |                        |   |
|------------------------|---|
| 1 Air compression      |  Air supply  |
| 2 Supply unit          |  High voltage generator                            |
| 3 High voltage cable   |  Voltage supply 230 V,<br>50 / 60 Hz approx. 600 W |
| 4 Electrodes           |   |
| 5 Arc discharge plasma |   |

# PLASMA BEAM IN ROTATION FOR FLAT SURFACES

## PLASMA JET PROCESS IN ROTATION = RT

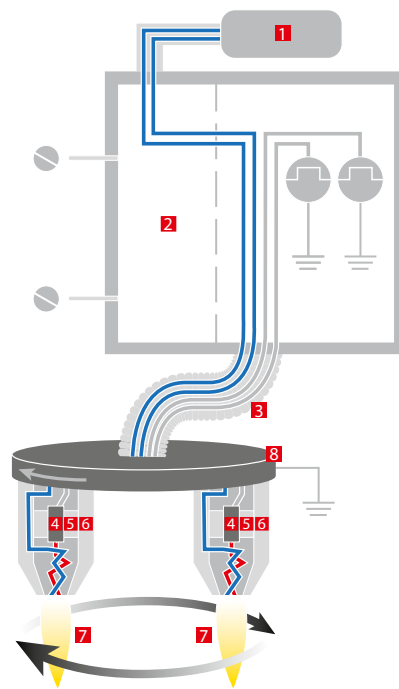
The system consists of three units:













### Supply unit

- Electrical mains connection
- Process gas and cooling gas connection
- High-voltage generator
- Current measuring block
- Gas control block
- Front panel with controls and PC with screen

### Gas and power supply line in flexible hose Rotating plasma generator

Using dry, oil-free compressed air, the rotary unit with two opposing PlasmaBeam nozzles easily processes 2D surface treatments that can be scaled in size. This enables exciting solutions for essential manufacturing processes. Pre-treatment of foils in battery production or processing of solar cells and modules in PV production are just two of dozens of application examples. The system consists of the supply unit, gas and electricity supply line in a flexible pipe plus the rotation unit (RT). High treatment speeds on the surface to be cleaned or activated are achieved continuously with the 120 mm wide Plasma Beam RT.



- |   |  |   |  |
|---|--|---|--|
|  | Gas channel / gas flow   |  | 4 Central electrode  |
|  | Arc discharge  |  | 5 Insulator  |
|  | Voltage supply<br>230 V, 50 / 60 Hz ca. 1kW                          |  | 6 Outer earthed electrode /<br>plasma nozzle                                     |
|  | High-voltage generator   |  | 7 Plasma jet free of<br>dangerous high-voltage<br>potential (active gas jet)     |
|  | 1 Dry & oil-free compressed<br>air, 5-7 bar, ca. 4 m <sup>3</sup> /h |  | 8 Rotation unit up to max.<br>Ø 120 mm with a rotary<br>feed-through and a motor |
|  | 2 Supply unit incl. gas<br>control block                             |   |  |
|  | 3 Gas and power supply line<br>in flexible pipe                      |   |  |



## TECHNICAL DATA

Version	Tabletop	19" housing
<b>Width</b>	540 mm	420 mm
<b>Height</b>	280 mm	133 mm
<b>Depth</b>	450 mm	500 mm
<b>Plasma generator</b>	Max. Ø 32 mm, Length 210 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m	
<b>Treatment width</b>	8 - 12 mm	
<b>Generator</b>	40 kHz / 300 W Other generator power versions available on request	
<b>Process and cooling gas</b>	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 2 m <sup>3</sup> / h	
<b>Gas connection</b>	Quick-connect Schott connection, 6 mm	
<b>Controls</b>	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit	
<b>Power supply</b>	230 V, 50 / 60 Hz	

All values approximate



## TECHNICAL DATA

Version	Tabletop
<b>Width</b>	540 mm
<b>Height</b>	280 mm
<b>Depth</b>	450 mm
<b>Plasma generator</b>	Max. Ø 32 mm; Length 210 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m
<b>Treatment width</b>	8 - 12 mm
<b>Generator</b>	40 kHz / 300 W Other generator power versions available on request
<b>Process and cooling gas</b>	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 2 m <sup>3</sup> / h
<b>Gas connection</b>	Quick-connect Schott connection, 6 mm
<b>Controls</b>	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit or Profinet connection - optionally available
<b>Power supply</b>	100 - 240 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

Version	Tabletop
Width	540 mm
Height	280 mm
Depth	450 mm
Plasma generator 2 pieces	Max. Ø 32 mm; Length 210 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m
Treatment width	8 - 12 mm per nozzle
Generator	40 kHz / 300 W per nozzle Other generator power versions available on request
Process and cooling gas	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 4 m <sup>3</sup> / h
Gas connection	Quick-connect Schott connection, 6 mm
Controls	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit
Power supply	230 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

	<b>Tabletop</b>
<b>Version</b>	
<b>Width</b>	540 mm
<b>Height</b>	280 mm
<b>Depth</b>	450 mm
<b>Plasma generator 2 pieces</b>	Max. Ø 32 mm; Length 210 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m
<b>Treatment width</b>	8 - 12 mm per nozzle
<b>Generator</b>	40 kHz / 300 W per nozzle Other generator power versions available on request
<b>Process and cooling gas</b>	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 4 m <sup>3</sup> / h
<b>Gas connection</b>	Quick-connect Schott connection, 6 mm
<b>Controls</b>	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit or Profinet connection - optionally available
<b>Power supply</b>	100 - 230 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

Version	Tabletop	Intermediate transformer
Width	370 mm	205 mm
Height	140 mm	115 mm
Depth	330 mm	230 mm
Plasma generator	Max. Ø 32 mm; Length 210 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m zum Plasmaerzeuger Cable length 5 m connecting cable between supply unit and Transformer	
Treatment width	8 - 12 mm	
Generator	40 kHz / 300 W Other generator power versions available on request	
Process and cooling gas	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 2 m <sup>3</sup> / h	
Gas connection	Quick-connect Schott connection, 6 mm	
Controls	Semi-automatic - via SUB-D connector at the rear panel (switches plasma on and off).	
Power supply	230 V, 50 / 60 Hz	

All values approximate



## TECHNICAL DATA

Version	Tabletop
Width	270 mm
Height	190 mm
Depth	320 mm
Plasma generator	Max. Ø 22 mm; Length 185 mm Weight approx. 0.9 kg (plus cable) Cable length 2 m
Flexible supply cable	Steel/PU hose 2,0 m with diameter 14 mm
Treatment width	3 - 5 mm
Generator	40 kHz / 80 W
Process and cooling gas	Dry, oil-free compressed air Input pressure 5 - 6 bar Gas consumption 5 - 6 l/min
Gas connection	Quick-connect Schott connection, 6 mm
Controls	Manual - Via the button at the front panel of the unit Semi-automatic - Remote control via remote connection at the rear panel of the unit
Power supply	230 V, 50 Hz

All values approximate



## TECHNICAL DATA

Version	Tabletop
Width	540 mm
Height	510 mm
Depth	600 mm
Plasma generator	34 x 85 x 207 mm (BHT) Weight approx. 1 kg (plus cable) Cable length 3 m
Treatment width	Max. 32 mm
Generator	40 kHz / 4 x 300 W
Process and cooling gas	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 8 m <sup>3</sup> / h
Gas connection	Quick-connect Schott connection, 6 mm
Controls	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit
Power supply	230 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

	<b>Tabletop</b>
<b>Version</b>	
<b>Width</b>	540 mm
<b>Height</b>	280 mm
<b>Depth</b>	450 mm
<b>Plasma generator</b>	184 x 600 x 192 mm (BHT) Cable length 3 m zzgl. Stecker
<b>Treatment width</b>	Max. 120 mm
<b>Generator</b>	40 kHz / 2 x 300 W
<b>Process and cooling gas</b>	Dry, oil-free compressed air Input pressure 5 - 8 bar Gas consumption approx. 4 m <sup>3</sup> / h
<b>Gas connection</b>	Quick-connect Schott connection, 6 mm
<b>Controls</b>	Manual - Via the button at the front panel of the unit or Semi-automatic - Remote control via remote connection at the rear panel of the unit or Profinet connection - optionally available
<b>Power supply</b>	100 - 240 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

Version	Tabletop
<b>Width</b>	540 mm
<b>Height</b>	280 mm
<b>Depth</b>	450 mm
<b>Plasma generator</b>	Length 180 mm Width 60 mm Thickness 40 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m (special length on request)
<b>Treatment width</b>	Max. 50 - 60 mm
<b>Generator</b>	40 kHz / 500 W
<b>Controls</b>	Manual - Via the button at the front panel of the unit or Semi-automatic - via SUB-D connector at the rear panel (switches plasma on and off).
<b>Power supply</b>	230 V, 50 / 60 Hz

All values approximate



## TECHNICAL DATA

Version	Tabletop
Width	540 mm
Height	280 mm
Depth	450 mm
Plasma generator 2 pieces	Length 180 mm Width 60 mm Thickness 40 mm Weight approx. 0,5 kg (plus cable) Cable length 3 m (special length on request)
Treatment width	Max. 50 - 60 mm per nozzle
Generator	40 kHz / 500 W per nozzle
Controls	Manual - Via the button at the front panel of the unit or Semi-automatic - via SUB-D connector at the rear panel (switches plasma on and off).
Power supply	230 V, 50 / 60 Hz

All values approximate

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SOLUTIONS.**

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