CORONA TREATING SYSTEM

USER AND MAINTENANCE MANUAL

Translation from the original instructions

Me.Ro Order No.	****
Manufacturing Year	****
Customer	****
Customer Order No.	***

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Prepared 11/2014

CORONA TREATING SYSTEM

Manufacter	***Me.Ro S.p.A.*** *Via Balestreri,430* *55100 Ponte a Moriano (LU)* ***ITALY*** *Phone: +39.0583.406060* *Fax: +39.0583.406050* *E-mail: info@mero.it* *Internet: www.mero.it*
Customer	
End client	

REVISION HISTORY

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7	21/3/18	Added paragraph “INTERMITTENCE” mode	Riccomini S.	D.S.	M.DS.

PRESENTATION

Who these instructions are for.

Thank you for purchasing the Corona Treatment Unit from ***Me.Ro. S.p.A*.**

This use and maintenance manual is designed for all those who are to install, work with and carry out maintenance on the **Corona Treatment Unit from *Me.Ro. S.p.A.***, and in particular for operational personnel.

Copyright.

The descriptions and illustrations in this manual refer to a standard machine/unit (unless specified otherwise). ***Me.Ro S.p.A.*** reserves the right to make changes at any time that it deems appropriate for standard production.

This manual is an integral part of what is supplied and must be read in order to meet essential minimum safety standards.

If lost or damaged, a copy can be requested from ***Me.Ro. S.p.A.*** by communicating the serial number and order number on the unit's identification plate.

Me.Ro. S.p.A.. does not accept liability for any error in this documentation.

For any questions or problems during installation, contact ***Me.Ro. S.p.A*.**

We will be pleased to help you

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DECLARATION OF CONFORMITY

I, the undersigned **Mennucci Lamberto**, as legal representative of **ME.RO S.p.A.**, manufacturer of the machine identified in the references below, hereby declare that said machine complies with the essential safety requirements as set forth in European Community Directives **2006/42/EC** and **89/336**. In particular, it is compliant with the requirements in the following harmonised norms:

UNI EN ISO 12100:2010 , UNI EN 13857 , UNI EN 349 , UNI EN 1088, CEI EN 60204-1 , EN 55011 , EN 50082-2.

Manufacturer	Factory ME.RO S.p.A. Via Balestreri 430-Ponte a Moriano-LUCCA-ITALY-	
Machine	Electronic Generator	Discharge Station
Type	***	***
Manufacturing Year	2018	

The end user MUST NOT install the above mentioned machine within others without having verified compliance with the 2006/42/EC directive.

Ponte a Moriano, on 04/04/2018

GENERAL INFORMATION

Who is this chapter for?

Section profile:

This section is intended for all individuals who install, use and perform maintenance on the Corona Treatment Unit from ***Me.Ro. S.p.A.***

Contents of this chapter

This section contains the main details about the product and the operating manual.

MANUFACTURER'S GUARANTEE

Conditions of guarantee

All equipment manufactured by ***Me.Ro. S.p.A.*** is made using tested materials, and tests are carried out again by our technical personnel when construction is complete.

12-month guarantee

Our equipment is guaranteed for **12 months** ex works Ponte a Moriano, Lucca, Italy.

If callouts are requested during the guarantee period, you will be charged for travel time, travel costs, board and lodging; the cost of the time spent on repairs and any spare parts will be met by us.

Exclusion of guarantee

Damage caused by incorrect use or by unauthorised operations on the Corona Treatment Unit from ***Me.Ro. S.p.A.*** are excluded from this guarantee.

DOCUMENT STRUCTURE

General

With ***Me.Ro. S.p.A.*** two types of document are supplied:

- Use and maintenance manual

  The manual contains of all necessary instructions for the installation, start-up and maintenance of the unit.

- Technical documentation regarding the unit

  The technical documentation for the unit includes the layout, drawings and materials list. (*Attached at the end of this manual*)

This document is the **use and maintenance manual**.

Structure of the use and maintenance manual

- The manual describes all operations to be performed for the start-up and the safe operation of the Corona Treatment Unit from ***Me.Ro. S.p.A.*** Also described are the construction technologies and the corresponding maintenance operations for the Corona Treatment Unit from ***Me.Ro. S.p.A***.
- Attached to the use and maintenance manual are the mechanical and electronic diagrams, including the components list.

DESCRIPTION OF SYMBOLS


Danger!

This symbol indicates that there is a risk of personal injury..


High voltage hazard!

This symbol warns of a hazard due to the presence of high voltage (risk of electric shock).

Danger: High frequency!

This symbol warns of a hazard due to high-frequency radiation. People with pacemakers or prostheses must not enter areas where this symbol is displayed. Pacemaker operation may be affected and prostheses may overheat.

Warning!

This symbol draws attention to important information.

TECHNICAL TERMINOLOGY AND ABBREVIATIONS

DESCRIPTION OF ABBREVIATIONS

P Power

I Current

V Voltage

F Frequency

L Inductance

C Capacity

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TECHNICAL SPECIFICATIONS OF THE CORONA TREATMENT SYSTEM

1 SAFETY

Section profile:

Who is this chapter for?

This section is intended for all individuals who install, use and perform maintenance on the Corona Treatment Unit from ***Me.Ro. S.p.A.***

Contents of this chapter

This chapter contains the main details regarding safe operation of the product

1.1 END USE

Danger!

Personal and system protection is not guaranteed if the generator is not operated in compliance with its designated use.

Any maintenance or repairs to the electronic generator and to the discharge station of the corona must be carried out only by authorised specialised personnel of Me.Ro. S.p.A.

Designate use

Electronic generator applications

The system described in this manual applies exclusively to Corona effect treatment.

Depending on the type of discharge station provided, one can determine on what kind of materials and filmscorona treatment can be carried out.

Refer to the "*GENERAL DESCRIPTION AND MAINTENANCE OF ME.RO DISCHARGE STATIONS*" chapter on page 9 to determine the types of materials that can be treated.

The Corona Treatment Unit from ***Me.Ro. S.p.A*** may only be used for its specified intended use.

1.2 GENERAL WARNINGS

High Voltage Hazard

*The **electronic generator** converts mains voltage to **DC (Direct Current)** and then to **AC (Alternating Current)** at the inverter stage. Components supplied with these voltages can give electric shocks.*

Before working on the generator and the discharge station, position the main switch on the generator to OFF and disconnect the electrical supply from the unit altogether.

1.3 DANGEROUS AREAS: MAINTENANCE AND REPAIR

Dangerous areas: main switch OFF

When the main switch is in the OFF position, there are no live areas inside the **electronic generator**.

Control and protection device

Caution!

Warning!!!

*The operator is responsible for working safely on the Corona Treatment System from **Me.Ro. S.p.A**. It is their responsibility to be acquainted with the regulations and to apply them.*

The **electronic generator** is equipped with a main switch which also performs the function of **emergency disconnection**.

Fig. 1

Danger!

*Before working on the electronic generator, wait for approximately 30" to allow the **DC link** to discharge.*

Protection systems

The **electronic** generator will automatically go to OFF if there is:

- Overvoltage
- Overheating
- Overload
- Interlocking
- Main switch On

1.4 DANGEROUS AREAS: DISCHARGE STATION - OZONE

Ozone (O3) is produced by crown discharge.

It is a highly oxidizing, toxic, corrosive gas and depending on the concentration it can pose a health hazard.

The exposure limit for operators detected in the immediate vicinity of the discharge station should not exceed 0.1 ppm (0.2 mg / m3). Greater concentrations need to be avoided.

If the current regulations for exhaust gas in the atmosphere permit, ozone can be extracted from the discharge station and ejected through the ozone extractor provided.

1.5 SAFETY MEASURES

In the event of an emergency, carry out the following steps in the order given:

1. Disconnect the external power line to the **electronic generator** and any auxiliary power lines on the **discharge station**.
2. Extinguish fire by using the appropriate extinguisher.

High voltage hazard!

Due to the presence of **high voltage**, water must never be used to extinguish fires; use appropriate extinguishing agents.

1.6 RESIDUAL RISK

You can not reduce to zero the risk for those who use the facilities. It draws attention to the residual risk

• An operator that works near the discharge station, must take care to the moving roller, as it may cause injury to fingers if inadvertently inserted between the roller and the hood.

• Always check that the ozone pipe is properly connected between the discharge station and the ozone aspiration. Also check that the aspiration is efficient and that the pipe is not blocked.

2 DESCRIPTON - TECHNOLOGY

Chapter profile:

Who is this chapter for?

This section is intended for all individuals who install, use and perform maintenance on the Corona Treatment Unit from ***Me.Ro. S.p.A***.

Contents of this chapter

This section contains the main details about the functionality and technology of the Corona Treatment Systems, their operation and fields of application.

2.1 CORONA TREATMENT COMPOSITION

The Corona Treatment Unit from ***Me.Ro. S.p.A*** is mainly composed of the following fundamental components:

- **Electronic Generator**
- **Operator terminal**
- **High Voltage Transformer**
- **Discharge station**

Optionals

- ***Ozone suction fan*** (supplied only upon request, not described in the present manual)
- ***Ozone Reducer*** (supplied only upon request, not described in the present manual).

2.2 COMPONENTS AND THEIR FUNCTIONS

GENERATOR CONSTRUCTION

The Electronic Generator *is constructed in a metal cabinet. The cabinet can be equipped with wheels. All* ***Me.Ro. S.p.A electronic generators*** *have a cabinet with two hinged panels for internal inspection. The* ***electronic generator*** *is air-cooled.*

N.B.: Electronic generators up to 10kW of power are equipped with wheeled cabinet by ***Me.Ro S.p.A.*** *as standard.*

COMPONENTS

The **electronic generator** is essentially composed of:

- **Rectifier**
- **Chopper**
- **Inverter**
- **Control electronics**
- **Operator terminal**
- **High Voltage Transformer**

  OPTIONAL
- **Conditioner (optional)**

The rectifier converts mains AC voltage into DC voltage to feed the Chopper.

The Chopper adjusts output power of the **electronic generator**, controls current and voltage limits and supplies the inverter by the impedance IMF2.

The inverter is composed of two IGBT modules in a full-bridge configuration. It is electrically powered and coupled with a resonant circuit formed by the primary inductance of the output transformer and by CVOL flywheel capacity.

The control electronics cover all functions for the control and piloting of the power stages of the generator.

The operator terminal is the operator interface between the **electronic generator** and the user. Refer to chapter 4 "*OPERATION, CONTROL*" for more information regarding its operation.

The High-voltage transformer is an integrated part of the inverter, the multi-pole secondary winding allows it to be easily adapted between generation and charging.

May be supplied individually (for electronic generators which are not installed in a cabinet) or placed inside the **electronic generator** cabinet.

Separately supplied High Voltage Transformer

Fig. 3

High Voltage Transformer placed inside generator cabinet

Fig. 2

OPTIONAL

The conditioner (optional) allows for improved cooling in the cabinet, and is recommended for generators that are located in tropical climates or areas of high humidity.

COMPOSITION OF THE DISCHARGE STATION

The discharge station is mainly composed of:

- **Discharge electrodes in the suction hood**
- **Discharge roller**
- **Electrode moving unit**
- **Station Box with cables for managing the discharge station.**
- **Pressure roller (optional)**
- **Transmission rollers**

The discharge electrodes are contained in / protected by the hood and are connected to the generator by the High Voltage Cable. The hood is used as duct for suction of the ozone generated during the corona treatment procedure.

The discharge roller supports the material to be treated and can be coated with different types of materials.

The Electrode moving unit, composed of pneumatic cylinders, guides and buffers, allows for the operation of some functions, such as: smooth insertion of the film to be treated; regulating the Air Gap; possibility to move the hood further from the discharge roller to allow for unit maintenance.

The station box is positioned on one side of the discharge station and its functions as the interface between the generator and the safety devices on the discharge station itself.

The pressure roller has the main function of eliminating the problem of “counter-treatment”. This inconvenience may occur when air bubbles appear between the film and the discharge roller.

The transmission roller (optional) functions as “guide” of the film to be treated on the discharge roller.

2.3 CONTROL MODES

The electronic generator can operate with your **operator terminal**.

The operator terminal can be inserted into the front door of the cabinet, or placed in a special box to allow the remote installation of the same.

The **electronic generator** PLC has an **PROFINET®** input connector that the **operator terminal** is connected to.. Via an Ethernet-switch module (e.g. **CSM 1277 Siemens** not supplied) the PLC can also be connected to a **PROFINET®** node**.**

On the customer's request, an interface module can also be installed on the **electronic generator** (e.g. **PROFIBUS®-DP**) for connecting the PLC of the

electronic generator to the company **PROFIBUS®** node. In this way the system can be managed locally, by the **operator terminal**, or remotely by the **PROFIBUS-DP®** node.

3 INSTALLATION

Who is this chapter for?

Section profile:

This section is for everyone who installs the Corona Treatment System from ***Me.Ro. S.p.A***.

Contents of this chapter

This chapter contains information regarding the proper mechanical and electronic installation for the Corona Treatment System from ***Me.Ro. S.p.A***.

3.1 TRANSPORT, POSITIONING

TRANSPORT

After receiving the system:

Control the integrity of all parts.

Immediately advise of any damage occurring during transport.

POSITIONING

Environmental conditions

Adequate protection of the machine against water and dust is essential.

It can be stored at temperatures between -25°C and +70°C.

It is preferable to install the machine in a dry place (not necessary).

3.2 INDICATIONS FOR MOVEMENT

During shipment, the plant components are stored in suitable containers with wooden base.

Do not remove the packaging until the machine is close to its definitive position.

The generator may be handled using a fork-lift truck of adequate power. The gross weight is indicated on the packaging.

When handling without packaging, both the **electronic generator** and the **discharge station** must be lifted using the appropriate eye-bolts.

Blocking (example = using metal strips) prevents accidental opening of the **discharge station**.

When the **discharge station** is positioned and locked, and the electrical and pneumatic systems are ready, the locks must be removed, paying particular attention to the pistons which must be in the closed position.

3.3 ASSEMBLY AND FITTING INSTRUCTIONS

The **discharge station** must be firmly anchored to the supporting structure.

When installing, consider any requirements for alignment and parallel positioning in relation to the other components up or down the line.

3.4 SPACE REQUIRED FOR USE AND MAINTENANCE

The **electronic generator** can be accessed via the two hinged panels.

Position the **electronic generator** so that all sides are accessible (except for the bottom of the container) and ensure clearance on each side of 80 cm.

Should the **electronic generator** have to be placed close to other parts (so as to cover one or more sides), fix the generator so that it may be moved in order to be accessed for maintenance.

Pay particular attention to the **electronic generator** air cooling intakes; these intakes must be unobstructed and freely accessible for maintenance (cleaning filters etc.).

The discharge electrodes inside the station can be adjusted using screws on the inside of the station itself. Refer to the diagrams attached to the use and maintenance manual for perfect adjustment of the air-gap.

For visual checking of the Corona effect discharge inside the station, there are a number of windows on the side of the **discharge station**; which must be left easily accessible.

3.5 ENVIRONMENTAL CONDITIONS

The **electronic generator** can operate at temperatures between +5°C and +40°C and humidity between 30-95%, without condensation. The Discharge Station can operate at temperatures between +5°C and +55°C, humidity between 30-95%, without condensation.

The environmental conditions (temperature and humidity) must be checked with particular attention when the conditions for the formation of condensation on the inside and outside surfaces of the Electronic Generator and discharge station are approached.

In particular, avoid operating the plant when there is condensation in the **Discharge Station** to prevent possible high voltage discharges to ground.

Bear in mind that due to the ozone suction fan, the **Discharge Station** is under a slight vacuum compared to the surrounding environment and so in certain environmental conditions, condensation may form on the inside before or more than on the outside or in other equipment (**Electronic Generator**).

3.6 ISTRUCTION FOR CONNECTING THE MACHINE TO ITS POWER SUPPLY

The protective devices on the mains power supply panel (switch + fuses) and the power supply line must be sized according to the power supply voltage and the max. current drawn by the generator. Refer to the electric INPUT data on the generator itself.

3.7 RECOMMENDATIONS FOR SAFETY MEASURES WHICH MUST BE TAKEN BY THE USER

Place barriers beside the discharge station to prevent access by unauthorised persons.

Please note: if the barriers are opened when the machine is in operation, the electronic generator must switch off.

3.8 DETAILED DESCRIPTION OF THE MACHINE, ITS ACCESSORIES, GUARDS AND/OR SAFETY DEVICES

- The **Discharge Station** electrodes are rotated by a pneumatic system.
- Double acting pistons are mounted on the **Discharge Station** and the pneumatic connection is made inside the **discharge station**.
- The input jacks and global output for the compressed air connection are available on one of the pistons (usually on the operator side).
- The **Discharge Station** is equipped with an inductive sensor for detecting roller rotation and of a series of station closed position microswitches (contact closed when the station is closed).
- An electrical junction box is position on one side of the **discharge station** containing the board or terminal block where the following is connected: inductive sensor for measuring micro station station closed solenoid command speed.
- The connection between the box on the **Discharge Station** and the terminal block inside the **electronic generator** must be made by the user (see attached wiring diagrams)
- The high voltage input is via a high voltage insulator, (the high voltage cable must be connected to the discharge electrodes inside the station).
- The **Discharge Station** is prepared for the suction of ozone that is formed as a result of discharge, through the sockets placed on the mobile part of the station.
- When connecting the ozone outlet and ozone suction device (to be carried out by the user), bear in mind that the ozone has an oxidising effect and therefore piping in stainless steel or plastic must be used.

To allow the discharge station to be opened, flexible piping must be used at the start of the connection between the ozone outlet and the suction device. discharge station The pneumatic system is composed of a shut-off valve, a flow regulator, a manual valve (or solenoid), cylinders, flow regulators and valves. Place the manual valve (or remote box for solenoid management), in the vicinity of the discharge station and outside the

protections of the same, so that the operator visually follows the opening or closing stages of the discharge station.

The compressed air supply (4 bar minimum and 10 bar maximum) is applied to the plug valve. The latter has a working position as well as a safety position for maintenance operations. These positions are shown on the label near the valve itself. In the safety position, **discharge station** opening or shutting is allowed under no circumstances.

The blocking valves do not allow the shutting of the **discharge station** (with the valve in maintenance position) even in the event of failure of the compressed air pipes; for this reason it can only position the station as shown in the picture.

If the **discharge station** is to be installed upside down, the position of the station's pneumatic piston valves must be inverted in order for safety devices to operate correctly.

This operation must in any case be carried out by specialised personnel authorised by ***Me.Ro S.p.A.***.

3.9 INDICATIONS REGARING MEASURING METHODS TO USE

The discharge station rollers are dynamically balanced and comply with class _6.3_ for balancing.

The ozone concentration near the discharge station, less than one metre from it, must be 0.1 ppm or less. Use (for example) the DRAGER system with OZON 0.05/b ozone reactor phial.

3.10 OZONE EXHAUST OF THE DISCHARGE STATION

Ozone (O3) is an oxidizing, toxic, corrosive gas, depending on concentration, can pose a health hazard.

Ozone is a crown discharge effect in the air.

Exposure Limits

The exposure limit for operators detected in the immediate vicinity of the **discharge station** should not exceed 0.1 ppm (0.2 mg / m3). Greater concentrations need to be avoided.

The concentration measurement can be done using the **Dräger** vial. This is a simple to use and economical and reliable system.

If the current regulations for exhaust gas in the atmosphere permit, ozone can be extracted from the discharge station and ejected through the ozone extractor provided. It is dimensioned taking into account the output power of the generator, the length of the discharge station, the discharge losses of the ejection duct and the speed of production.

Suction duct

Prepare the ejection duct, between the **discharge station** and the **ozone suction fan**, and between the **fan** and the **atmosphere**. Use corrosion resistant materials such as **stainless steel** or plastic materials such as **PVC**.

Avoid as much as possible right-angle curves that can limit the expulsion and suction capacity.

Both the aspirator and the evacuation duct must be made of ozone resistant materials (stainless steel or plastic materials such as PVC - PET).

Reduction of ozone produced

Where the rules for exhaust gas in the atmosphere do not allow high ozone concentrations, **ozone destroyer** must be used.

Ozone destroyer are equipment that destroys it before it is ejected. With these devices (suitably sized depending on the amount of product ozone), concentrations below 0.1ppm are obtained.

This is typically lower than the norm required and in these working conditions it is allowed to eject into the atmosphere.

3.11 UNPACKAGING

Unpackage the various unit components with care

A complete system of **Corona Treatment** consists mainly of:

- **Electronic Generator *(*with operator terminal).**
- **High Voltage Transformer**
- **Discharge Station**.
- **Ozone Suction.**

The **electronic generator (with operator terminal)** can be supplied as a stand-alone unit on request, when the existing installation already has a **discharge station** and **ozone suction** present.

The **operator terminal** can be supplied in a case (and not fitted inside the **electronic generator** cabinet) in order to be positioned in the desired area. *(**remote operator terminal**)*

The packaging contains all cables required for setup, except for the main power supply line of the electronic generator (and of the ozone suction fan if supplied).

Ensure that the packaging contains all of the items listed above.

*Furthermore, check all parts for completeness of the **Discharge Station**, the **covering**, the **discharge roller** (if supplied), and the **high voltage cable** normally attached to the discharge station.*

3.12 CONNECTIONS

Electronic Generator supply line

The protections on the general supply panel (switch + fuses) and the power supply line have to be dimensioned on the basis of the supply voltage and the maximum absorbed power by the generator. Refer to the electrical data described on page 9 of this manual or on the identification plate on the generator cabinet.

High voltage hazard!

The electrical connections of the system have to be made by authorised personnel specialised for working on electrical devices.

Please respect the local safety rules for the installation of this unit.

3.13 INSTRUCTIONS FOR STARTING-UP THE GENERATOR WITH OPERATOR TERMINAL INSTALLED ON THE ELECTRONIC GENERATOR

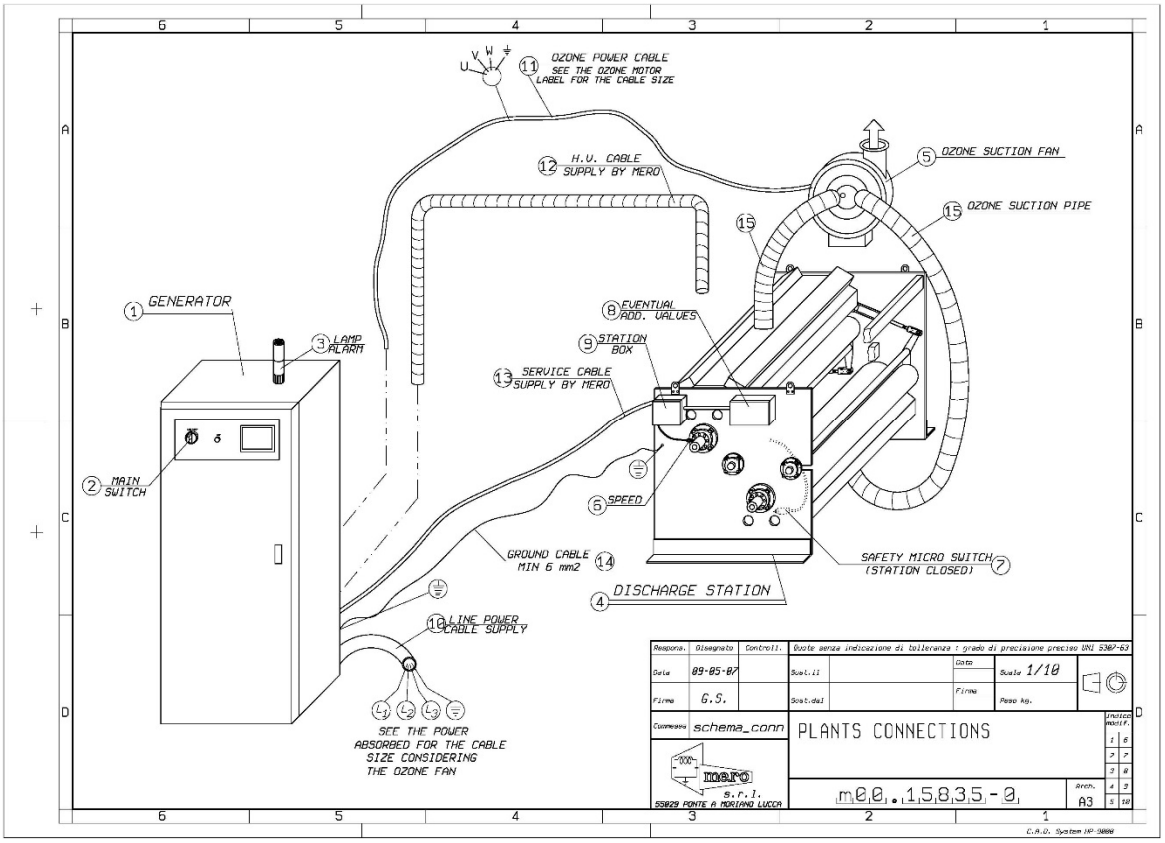


Fig. 4

N.B.: Standard treatment plant connections.

Prepare the power supply terminals L1-L2-L3-PE with the voltage on the back plate of the Electronic Generator or those on page 9 of this manual.

In the standard connection example given above [*Fig. 4*], the installation is composed of an **electronic generator** [*-1- Fig. 4*] and a **discharge station** (if supplied) [*-4- Fig. 4*].

[optional] Can be supplied with a **suction***Fig. 4* fan for the ozone generated by the corona discharge [*-5- Fig. 4*]. A complete magnetothermal switch board is installed inside the generator to start **ozone suction**, and for the protection of the ozone suction fan motor. The intervention level of the this magnetothermal switch is calibrated at the factory by technicians from ***Me.Ro. S.p.A***.

1) Power the **electronic generator** [*cable –10- Fig. 4 not supplied*] using a voltage corresponding ot the value indicated on page 9 of this manual, on the plate on the **electronic generator**, or near the power terminals.

N.B.: The generator power supply line must be protected by a differential switch in order to interrupt the supply in event of insulation loss.

The size of the **electronic generator** power lead should take into account the maximum current absorbed (see INPUT data plate on the **electronic generator**). Connect the power cable to the appropriate terminal socket on the back of the **electronic generator**.

If present, the size of the **ozone suction fan** [*cable -11- Fig. 4 not supplied*] cable should take into account the maximum current absorbed (see plate on the side of the **ozone suction fan** motor). Connect the **ozone suction fan** to the terminal on the back of the **electronic generator**.

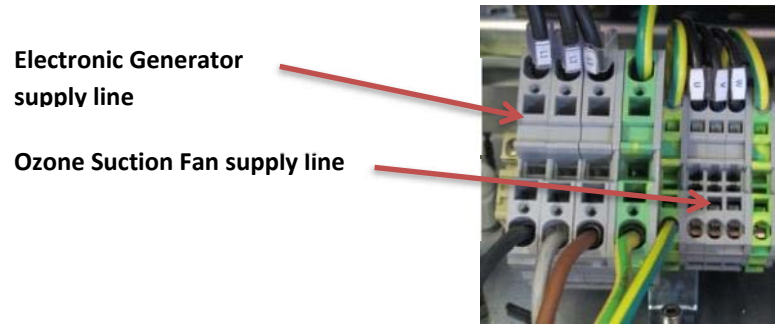
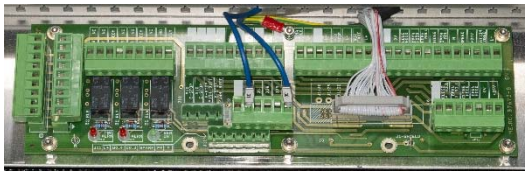


Fig. 5

2) Establish the connection between the B7673 or B9018 board and the **Electronic Generator** and the **Station Box** [*point –9- Fig. 4*] placed on the side of the **discharge station** using the service cable from the **discharge station**[*cable – 13- Fig. 4 supplied*]. Refer to the service box electrical diagram for correct connection instructions.

B7673 Electronic Generator terminal card 12K ÷ 60K.



B9018 Electronic Generator terminal board 4K ÷ 10K

Fig. 6

Box on discharge station. (**station box**)

Pressure regulation

Ground point (gnd point)

Solenoid valve

Discharge hood Open/Close selector switch [optional]

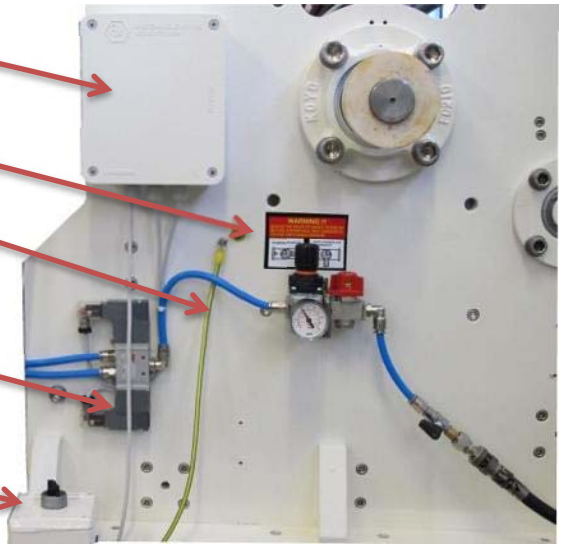


Fig. 7

3) Establish the connection with the High Voltage cable [*cable –12- FIG.5*] between the **High Voltage Transformer**and the high voltage input on the **discharge station.** Usually, during the inspection phase, the high voltage cable is left connected to the high voltage input point on the **discharge station**. It is then connected to the **high voltage transformer** using one of the 3 available sockets on its output. 

Fig. 8

To find the correct socket to use, refer to the plate on the cover of the **high voltage transformer**. The socket used is the one marked with a dot. [*see label example Fig. 9*]

H.V. transformer label example

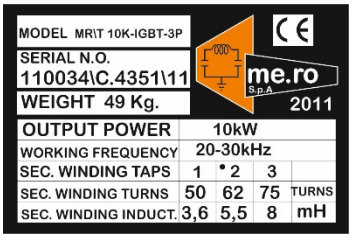


Fig. 9

4) Establish the connection between the output of the suction fan on the **discharge station** and the input on the ozone suction fan by using a flexible plastic tube of a diameter corresponding with one of the outputs on the discharge station. [*tube–15- Fig. 4 not supplied*]

If the **discharge station** is of the Universal type, the ozone suction fan will be supplied with a **vacuum switch**. This device must be connected to the terminal contained in the discharge station **box**. Refer to the wiring diagrams attached.

The plant can be supplied with one of the following ozone suction units:

- Ozone suction switch **HUBA CONTROL 625.6132**
- Ozone suction switch **IFM SA4100**

HUBA CONTROL

IFM SA4100

The vacuum cleaner **IFM SA4100** requires the parameter setting relative to the diameter of the ozone suction pipe. Refer to the manual (attached) for the correct settings of the device.

5) Make a connection to ground (*cable–14- Fig. 4 supplied*) between the **electronic generator**. and the **discharge station.** (6mm² minimum cable section)

Check the oil level using the marking on the side of the **High-Voltage Transformer.**

6) Adjust the discharge electrode axes and the Air Gap (air gap between the electrodes and the discharge roller). Refer to the diagrams accompanying this manual to perform AIR-GAP adjustment operations.

The air gap depends on the length of the electrodes, the type of dielectric coating on the discharge roller (silicone or ceramic) and the type of electrode (ceramic bar electrode , aluminium electrode, stainless steel electrode)

Dielectric silicone coating.

- Aluminium or stainless steel electrodes
  - Length up to 4m. (air-gap 1.5÷2mm)
  - Lengths over 4m (air-gap 2.5÷2.8mm)

Dielectric ceramic coating

- Lengths up to 4m (air-gap 1.2÷1.5mm)

Electrodes with ceramic bars (Universal Discharge Stations)

- Electrode lengths up to 3m (air-gap: 1,5÷1,8mm

7) Check that the coating of the discharge roller has no holes and is not damaged.

3.14 START THE PLANT WITH AN EXTERNAL CONTACT (ONLY CORONA TREATER FOR GLITTERING PLANT)

Avaiable only "Automatic speed" Mode

It is possible to start the corona treater plant ***Me.Ro. S.p.A.*** on\off throughout a N.O. contact.

When this contact closes the **electronic generator** start to work and treatment begins if the contact opens the **electronic generator** stops and the treatment too.

See the electrical drawing for the connections or **Discharge Station** diagram attached of this manual. A PLC digital input is avaible as N.O. external contact.

Once the connection is ended, the ON button must be pressed to start the cycle after with the external contact will manage the START\STOP.

This option is available only corona treater for glittering plant. For this application use AUTOMATIC (SPEED) operation mode.

3.15 WARNINGS ON FIRST USE OF THE UNIT

WARNING! Do not start the generator without having connected the A.T. transformer.

Turn **ON** the switch on the operator terminal as well as the main switch on the **electronic generator**.

N.B. before starting the generator, read the operator terminal operating instructions carefully.

3.16 DESCRIPTION OF THE WORKPLACE

The **electronic generator** does not require a fixed position for operation. The unit is mainly controlled from the **operator terminal**

3.17 PLACES OF USE

The plant cannot be used in the presence of water on the floor of the work place. The system can not be used outdoors. We recommend using in a dry area to prevent the formation of condensation inside the discharge station

3.18 SPARE PARTS

Pay attention to the following replacement parts:

- Main safety switch (must be replaced with a like-for-like model)
- Safety control unit (must be replaced with a like-for-like model)

We recommend you always use original replacement parts.

4 OPERATION, CONTROL

Section profile:

Who is this chapter for?

This section is intended for all individuals who use the **electronic generator** on the Corona Treatment Unit from ***Me.Ro. S.p.A***.

Contents of this chapter

This chapter contains information regarding the proper of the **operator terminal** on the Corona Treatment System from **Me.Ro. *S.p.A***.

4.1 COMMISSIONING

The Corona treatment system has been tested by ***Me.Ro. S.p.A.*** in its factory.

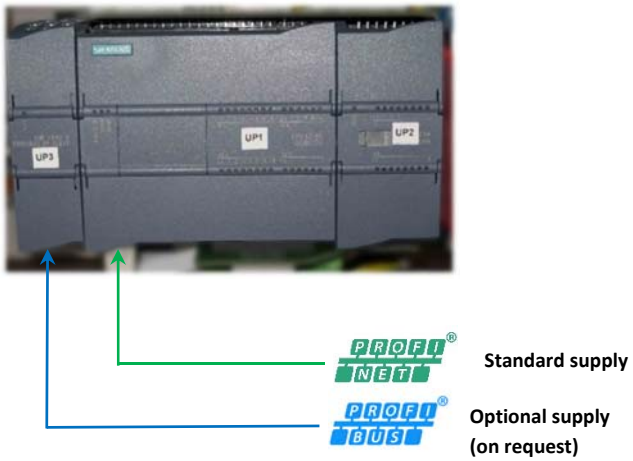
It can be commissioned immediately, without any special inspection procedures. Before starting the system, you must read the following instructions for use of the **operator terminal**.

The **electronic generator** PLC has an **PROFINET®** input connector that the **operator terminal** is connected to.. Via an Ethernet-switch module (e.g. **CSM 1277 Siemens** not supplied) the PLC can also be connected to a PROFINET® node.

S7 Ethernet.
ISO on TCP.
Modbus TCP

N.B.: On units with **PROFIBUS-DP® modules** (**optional**) or other control types, the **electronic generator** can be managed by connecting the **PROFIBUS-DP®**to the main network node.

Fig. 10



4.2 TYPE OF OPERATOR TERMINAL

The **operator terminal** is mounted in the front door of the **electronic generator**.

On request, it can be mounted in a box **(remote operator terminal***).* In this way, it can be used remotely of the **electronic generator**.

4.3 TERMINAL OPERATOR STRUCTURE

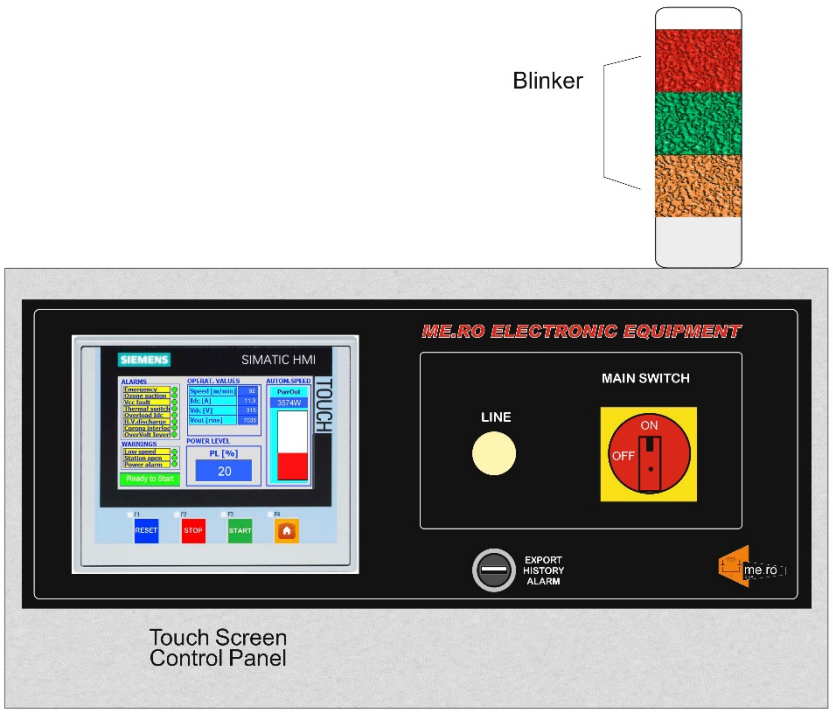


Fig. 11

It consists of:

1. **Main Switch**: main line break
2. **Line**: line lamp
3. **Touch Screen Control Panel**: to control the generator
   It has the following buttons:
   - **RESET**  : resets the electronic generator (e.g. after an alarm being triggered).
   - **STOP**  : switches the electronic generator OFF (corona treatment off).
   - **START**  : switches the electronic generator ON (corona treatment ON).
   - **HOME**  : Accesses the home page
4. **Blinker**: light\sound column (mounted on the top of the generator cabinet
   Flashing red light + buzzer = alarm
   Steady green light = generator ON
   Flashing orange light + buzzer = power alarm active

4.4 TOUCH SCREEN CONTROL PANEL

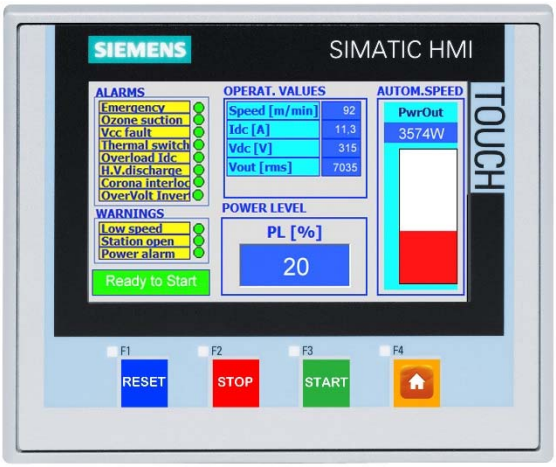


Fig. 12

The TOUCH SCREEN CONTROL PANEL displays:

1. **Working sizes** of the **corona treatment** unit, such as voltage (**V DC [V]**), current (**I DC [A]**), speed of unit (**Speed**) etc.
2. **Corona treatment** unit **warnings and alarms**.
3. **Power Level (PL [%] or PL [Wmin/m²])** to adjust the power output of the **electronic generator**.
4. **Pwr Out [W]** which represents the absolute value of the generator power output. (in Autom.Specif.Pwr mode is displayed [Wmin/m²].
5. **Bar-Graph** graphically representing the value of the **electronic generator** output power in percentage value (only in **Manual % and Automatic Speed modes**)

Pressing the button  enables access to the HOME PAGE (main page). (*Fig. 13*)

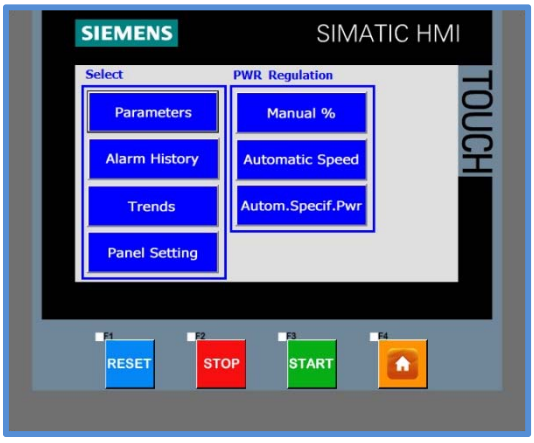


Fig. 13

From this page you may access:

Fig. 14

Furthermore, it is possible to select the operating mode between:

Fig. 15

Warning: *the* ***"INTERMITTENCE"*** 

operating mode is only available on enabled corona treatment plants.

4.5 PLANT PARAMETER SETTING

PARAMETERS

Before placing corona treatment on START, certain operating parameters must be set on the Touch Screen Control Panel.

N.B. the values displayed in the screens are only used as an example. These may vary depending on the plant supplied.

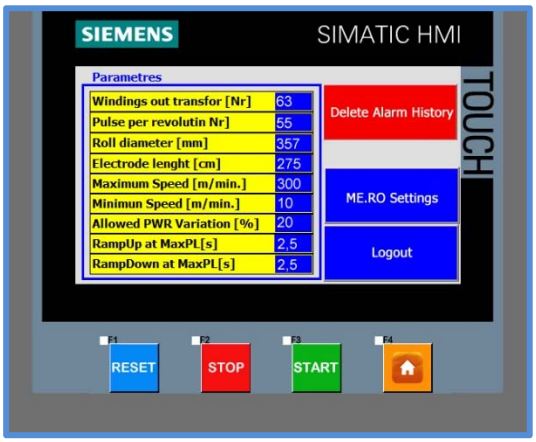


Fig. 16

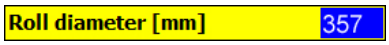
From the HOME PAGE press the Parameters button to enter the relative **parameters** page (**PARAMETERS**). (*Fig. 16).*

From this page it is possible to set or modify values of the corona treatment plant.

The variables to be set are:
(N.B. *the values reported are random*)

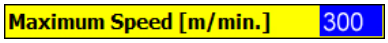
H.V. transformer coils [No.]
Number of secondary winding coils of the high-voltage transformer. Enter the number of the A.T. transformer socket used (see identification plate on A.T. transformer cover)

Pulses revolution [No.]
Number of pulses for one revolution, detected by the proximity sensor mounted on the discharge roll. (***Set the number of pins present on the toothed corona of the discharge roll***).

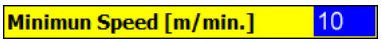


Roll diameter [mm]
Diameter of discharge roll in millimetres.

Electrode length [cm]
Length of the discharge electrode in centimetres.



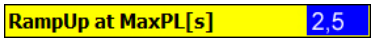
Maximum speed [m/min]
Maximum speed of the line in metres/minute.



Minimum speed [m/min]
Minimum speed setting in metres/minute below which the **electronic generator** shuts down (**STOP**).

Allowed variation percentage of generator output power [%]
Percentage of variation of the output power of the generator permissible. The variation is relative to the value stored by pressing the 

key. The variation threshold is only in power decrease.



Ascending ramp to the PL max [s]
Time, within which, (with pressing of the key 

) the **electronic generator** increases the power output, until reaching the PL set. Further *increases* of PL are applied to the output power after the *RampUp* time set.

Descending ramp from PL max [s]
Time within which (after a *decrease* of PL) the **electronic generator** reduces the output power.

CHANGING PARAMETERS

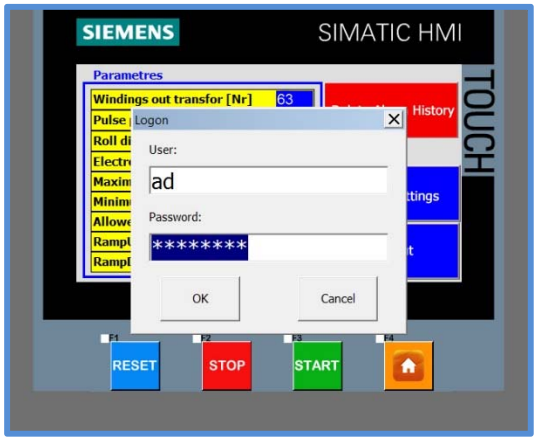


Fig. 17

The data is protected by **User and Password**, 2nd level (**administrator**) created by the **Me.Ro S.p.A.**software department and cannot be changed by unauthorised users. A document containing the afore-mentioned **User** and **Password** is attached to this manual (in a sealed envelope).

To vary one parameter **logON** must be carried out via **User** and **Password.** Another password level can be added. Refer to chap. Password on p. 44

To change a parameter, press the value to be modified.

Pressing the desired value, the password entry field appears. (*Fig. 17*)

Enter **User** and **Password** in the appropriate fields and confirm with the key 

.

Press the value to be changed once more.

Fig. 18

The numeric keyboard appears. (*Fig. 18*)

Modify the value by typing the desired value on the numerical keypad.

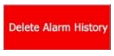
Press  to confirm the value set.

Pressing the key 

disables the **Log-ON** previously executed. In this way the parameters are once again protected by **User and Password.**

When the changes have been performed press  to exit the **PARAMETERS** setting page.

DELETE ALARM HISTORY

From the **PARAMETERS** page, press the 

button to remove all stored alarms from the memory.

MERO SETTINGS

This page displays adjustment values, important for the correct operation of the **electronic generator**.

These are set in the factory, are password protected - 1st level, and may only be changed by Me.Ro S.p.A technical personnel.

ALARM HISTORY

Fig. 19

From the **HOME PAGE** press the button Alarm History to enter the relevant page (**ALARM HISTORY**). (*Fig. 19*)

This page displays all the **alarm** messages activated together with the **Date** (DD : MM : YY) and **Time** (HH : MM) of which they occurred.

Press the button to exit the **ALARM** HISTORY page.

N.B. *Do not press the* Exit *key to quit the page. This button is for returning to the operating system of the touch panel (MS Windows™ interface). If pressed, a menu appears. Press the START button.*

TREND

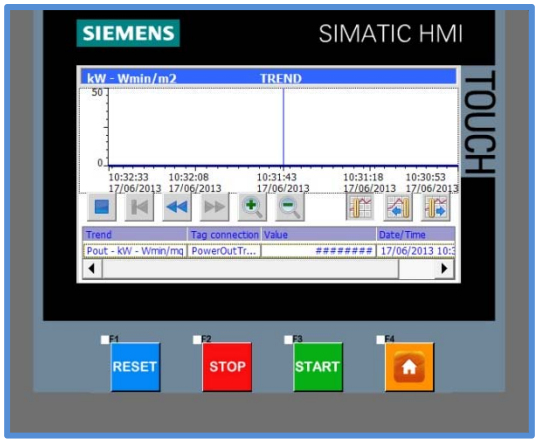


Fig. 20

From the **HOME PAGE** press the button 

to enter the relevant page (**TRENDS**).(*Fig. 20*)

In this page the graph displays the power supplied by the generator **Pwr Out [W]** according to the time (**h**).

The numerical values (graduated scale) of the graph indicate the power of the generator.

The numerical values (graduated scale) of the x-axis of the graph indicate the time.

This provides a graphical display of possible power variations during the work cycle.

The **Value** box displays the relative value in numeric format of the output power of the electronic generator.

Press the  button to exit the **TREND** page.

PANEL SETTING

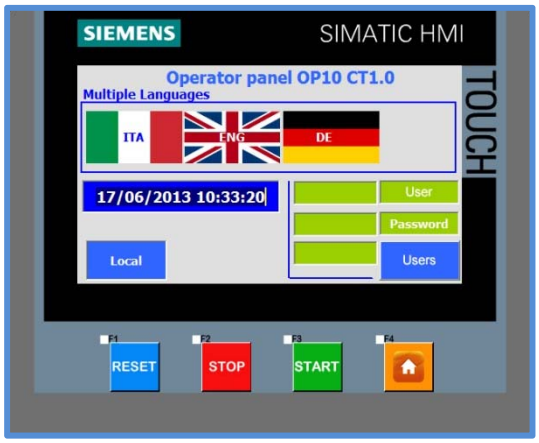


Fig. 21

From the **HOME PAGE** press the Panel Setting button to enter the relevant page (**PANEL SETTING**).

On this page it is possible to set the display language from those available, the **PASSWORD** which allows you to log-in to your account by means of the USER and PASSWORD, and the **SETTING** to set system date and time.

The window Local (local) or Remote (remote) indicates in which mode the **electronic generator** is controlled.

- **Local**: control via touch screen control panel.
- **Remote**: control via an additional optional device (esp. PROFIBUS®-DP module).

Fig. 22

MULTIPLE LANGUAGES

Press the desired display language to activate the relative translation of the Touch Screen Control Panel.

Fig. 23

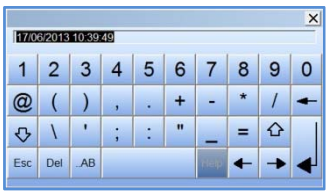


Fig. 24

SETTING DATE/HOUR

Press the value to be modified (the numerical keypad will appear).

Modify the value by typing the desired value on the numerical keypad.

Pressed send  to confirm the set value.

PASSWORD

Access to the machine is structured on 3 different levels (groups):

- Level of access **Operator** (unauthorised): allows use of the machine but parameters cannot be modified.
- Access level **Change** (user): allows use of the machine and parameters can be modified.
- Access level **Administration** (admin): Allows creation/editing/deletion of the login information of all other users

Anyone who has access to the panel, automatically has **Operator** access. The entering of a password is not required.

To access with the option of **Change** or **Administration** the relevant login details must be entered in the "**PASSWORD**" field.

In the top field of the Login area the **user name** (USER) must be entered while in the lower field the **password** (PASSWORD) is required. (see *Fig. 25*)

The last field displays the name of the group to which the user logged in belongs.

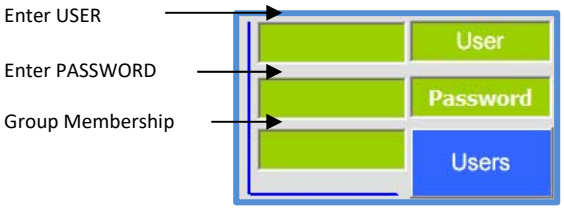
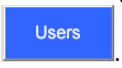


Fig. 25

ADMINISTRATOR FUNCTIONALITY

Main **User** and **Password** of the **Administrator** user are created by the ***Me.Ro S.p.A*** software department. A document containing the afore-mentioned **User** and **Password** is attached to this manual (in a sealed envelope). When you Log-ON with these details it is possible to access the machine as a **system administrator** (all the features are active). The administrator can change their details and can create new **users and passwords** for other operators, who will have access with one of the three available levels (**operator** (unauthorized), **edit (**user) or **administrator** (admin).

To create new **USERS** log on as **administrator** user and press the key 

.

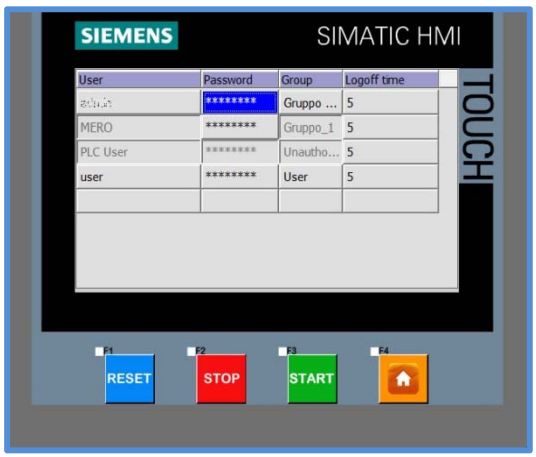


Fig. 26

CREATING A NEW USER

From this page, it is possible to modify existing login information or to create new information.

On the user list page press on an empty space.

Using the alphanumeric keypad enter, in the **user** column, the user name, and in the **password** column the keyword to correspond to the new user created. (*Fig. 26*).

In the **Group** column, select, using the drop-down menu, one of the three groups to which the new user will belong. (*Fig. 27*)

The Logoff time column shows the time (in seconds) the elapse before automatic Log-OFF. If in this period of time, the panel is not pressed, the logged-in user automatically disconnects. To make new changes, you must log in again with your details.

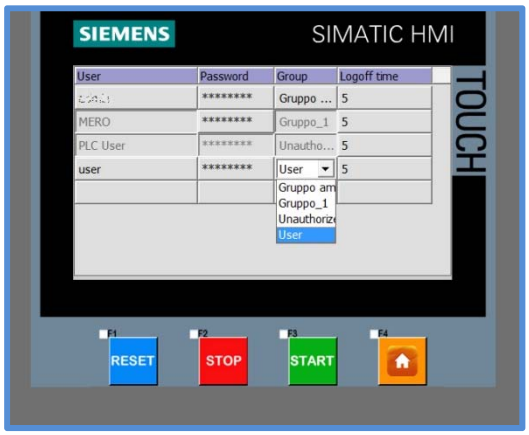


Fig. 27

DELETING A USER

Press the **User** box relating to the user to be deleted. The alphanumeric keyboard appears. (see *Fig. 28*). Press the key Del to delete the selected user.

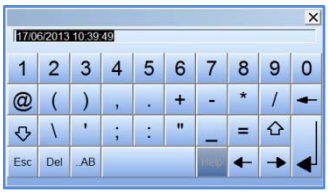


Fig. 28

PARAMETER MODIFICATION FUNCTIONALITY

Login with the **change** (user) details allows you to change the values on the **Parameters** page.

To change the parameters, simply press the corresponding value.

Refer to the paragraph on p. 38 to modify the parameters of the corona treatment plant. Fig.

4.6 FUNCTION MODE

There are three modes of operation of the **Electronic Generator**:

- **Manual %**: Manual operation (manual adjustment of the **electronic generator** output power).
- **Automatic Speed**: Automatic operation. (Automatic adjustment of the **electronic generator** output power referring to the speed of the machine).
- **Autom.Specif.Pwr**: Operation with a specific power Wmin/m² (automatic adjustment of the **electronic generator** output power [W] applied to the material to be treated per minute/m²).
- **Intermittence**: Intermittent operation of the treatment plant. It allows to make interruptions of corona treatment on the material, managed through an external electrical contact. ***(N.B: only available on systems with intermittent mode)***

MANUAL %:

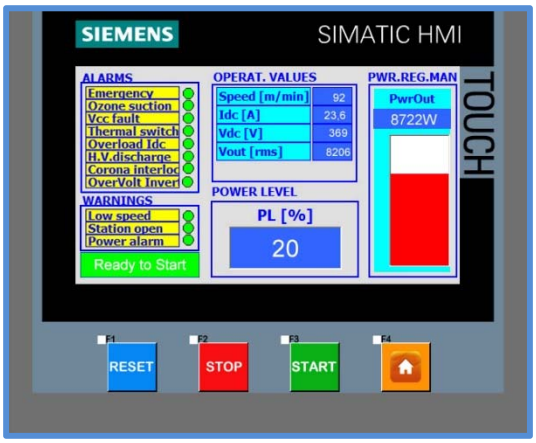


Fig. 29

From the **HOME PAGE** press the button 

to enter the page relating to **PWR REG.MAN %**.

In this operating mode, are shown the output power **PwrOut [W],** the power level set, power level **PL%[IDC] (from 0 to 100),** the operating values (Operat. **Values)** and any indications of information or alarms.

In **MANUAL % IDC** mode, the Power Level **PL%[IDC]** is the set point to adjust the electronic generator power output. The **IDC [A]** value *[inverter operating current]* is the size of working that is compared with the set **PL%[IDC]** value.

The PLC CPU, through proportional control, instantly calculates, compares and adapts the **IDC [A]** value to the **PL% [IDC]** value set.

Nevertheless, there is no correspondence between the numerical **IDC [A]** value displayed, and the numeric **PL %[IDC]** value set. The minimum **PL %[IDC]** value does not correspond with the **IDC [A] = 0** ampere value, but is forced to the minimum **IDC [A]** value (calculated between the minimum and maximum in the Mero setting).

With **PL %[IDC] = 100**, the **PwrOut [W]** value cannot be the maximum yield of the **electronic generator**. The causes could be: load resistance variations (**discharge station**) (variations mainly due to electrode (ceramic) temperature, the dielectric roller coating and the AIR-GAP, small leaks of high voltage to ground due to dirt and humidity

Another cause could be non-optimum matching between the **electronic generator** and the **discharge station** (load). Refer to chap. 7 on page 80 to optimise matching between **electronic generator** and load.

Any conditions that cannot be controlled by the regulating algorithm are indicated with the message 

POWER LEVEL SETTING (**PL% [IDC]**)

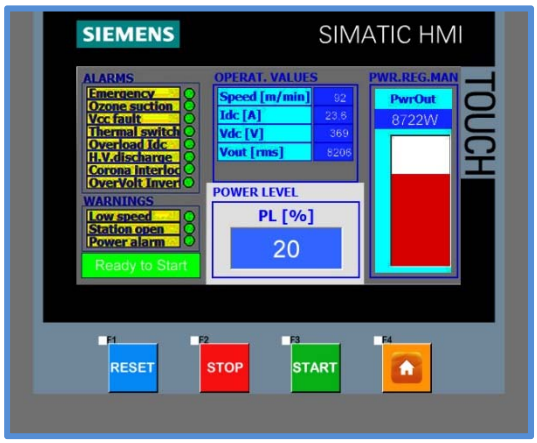
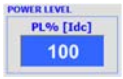


Fig. 30

To set the **Power Level PL [%];** press the



value on the numerical introduction window **"PL%[IDC]** and input the desired value using the number pad which appears as an overlay.

The set value is then displayed as **"PL%[IDC]** (0%=minimum output power, 100% maximum output power).

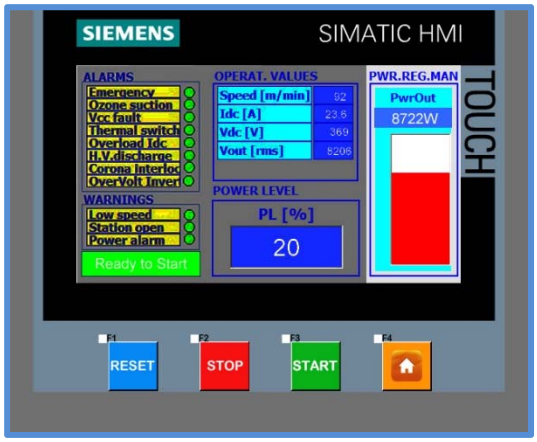


Fig. 31

The **PwrOutput [W]** value represents the actual power output of the generator in absolute value read in the relative display window. The Bar Graph below also graphically represents the **PwrOut [W]** level, (see Fig. 31)

PLANT OPERATIONAL VALUES

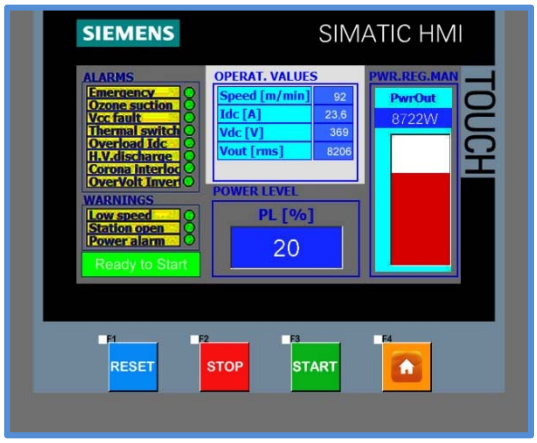


Fig. 32

In the **MANUAL %** operating mode, the **OPERAT.VALUES** window displays the following plant operational values of the **corona treatment**:

Speed [m/min]

Machine/line production speed in metres/minute.

Idc [A]

Operating current of the inverter in Amperes.

Vdc [V]

Operating voltage of the inverter in Volts

Vout [RMS]

Voltage on electrodes (Effective RMS value in Volts).

AUTOMATIC SPEED

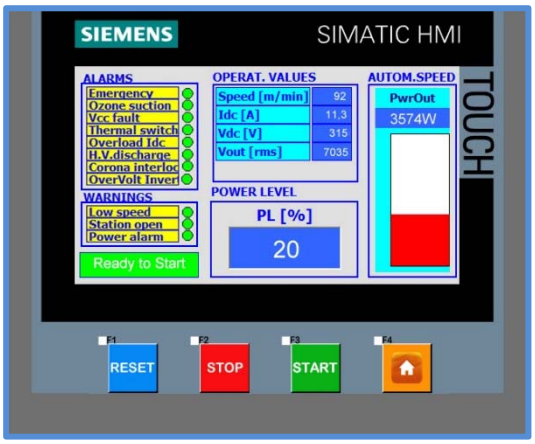


Fig. 33

From the **HOME PAGE** press the button Automatic Speed to enter the relevant page **AUTOM.SPEED**.

In this operating mode, are shown, the output power **PwrOut [W],** the set power level **PL (da 0 a 100),** the operating values window and any report of information or alarm.

Using this operating mode, the output power of the generator "**PwrOut [W],**" increases (or decreases) in proportion to production speed **Speed (m/min)**; up to the max output power of the generator if the **PL [%]** is equal to **100** and the production speed **Speed (m/min)** is equal to the maximum speed [m/min] set on the **PARAMETERS** page. Lowering the **PL[%]** decreases the output power of the generator. Fig. The Set Point that controls **PwrOut [W]** output power is obtained by taking into account the instant line speed and **PL%[IDC]** set. **PL%[IDC]** can be set between 30% (minimum) and 100% (maximum), allowing for **PwrOut [W]** output power regulation (as well line speed) also with **PL%[IDC]**. The **IDC [A]** value *[inverter operating current]* is the size of working that is compared with the set **PL%[IDC]** value.

The PLC CPU, through proportional control, instantly calculates, compares and adapts the IDC [A] value to the **PL% [IDC]** value set.

Nevertheless, there is no correspondence between the numerical **IDC [A]** value displayed, and the numeric **PL %[IDC]** value set. The minimum **PL %[IDC]** value (30) does not correspond with the **IDC [A] = 30** ampere value, but is forced to the minimum **IDC [A]** value (set during initial testing). With **PL%[IDC]** = 100, the **PwrOut [W]** value cannot be the maximum yield of the **electronic generator**. The causes could be: load resistance variations (**discharge station**) (variations mainly due to electrode (ceramic) temperature, the dielectric roller coating and the AIR-GAP, small leaks of high voltage to ground due to dirt and humidity Another cause could be non-optimum matching between the **electronic generator** and the **discharge station** (load). Refer to chap. 7 on page 80 to optimise matching between **electronic generator** and load. Any conditions that cannot be controlled by the regulating algorithm are indicated with the message PowerAlarm

POWER LEVEL SETTING (**PL% [IDC]**)

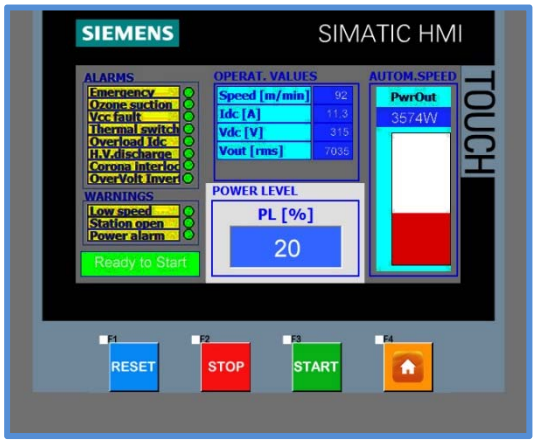
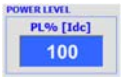


Fig. 34

To set the **Power Level PL%[IDC]**; press the value on the numerical introduction window **"PL%[IDC]** 

and enter the desired value by means of the displayed numerical keypad which appears superimposed.

The set value is then displayed as **"PL%[IDC]** (30%=minimum output power, 100% maximum output power).

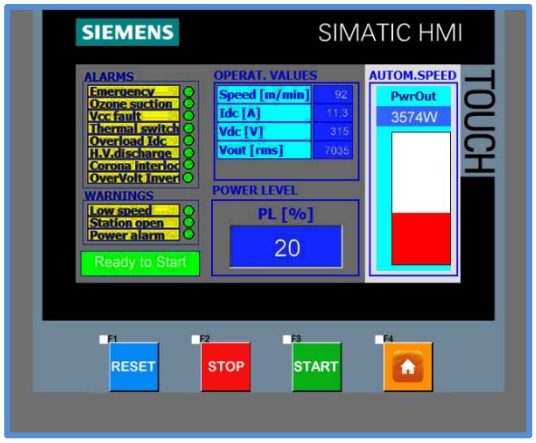


Fig. 35

The **PwrOutput [W]** value represents the actual power output of the **electronic generator** in absolute value read in the relative display window. The Bar Graph below also graphically represents the **PwrOut [W]** in percentage value **[0 - 100%].**

PLANT OPERATIONAL VALUES

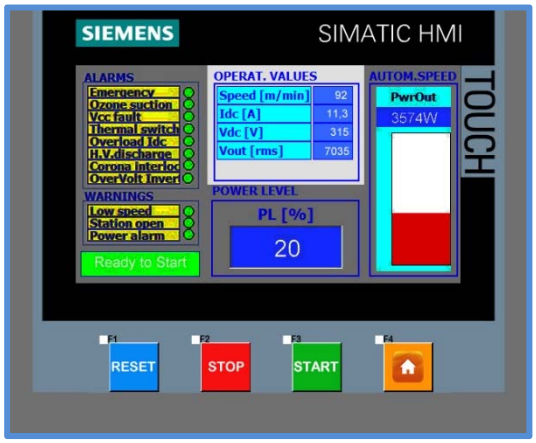


Fig. 36

In **AUTOM. SPEED** mode, the **OPERAT.VALUES** window displays the following plant operational values:

Speed [m/min]

Machine production speed in metres\minute.

Idc [A]

Operating current of the inverter in Amperes.

Vdc [V]

Operating voltage of the inverter in Volts

Vout [RMS]

Voltage on electrodes (Effective RMS value in Volts).

AUTOM.SPECIF.PWR:

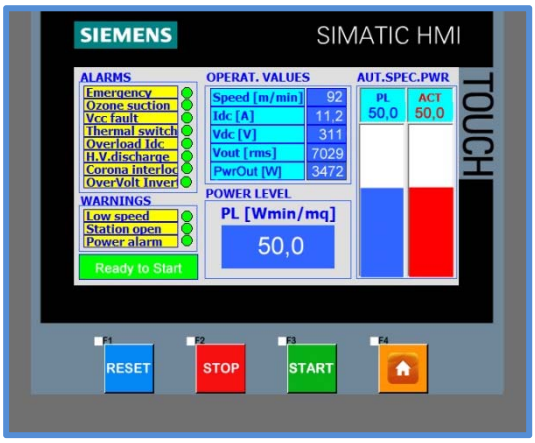


Fig. 37

From the **HOME PAGE** press the button Autom.Specif.Pwr to enter the relevant page **AUT.SPEC.PWR**.

The **Automatic Specific Power** operating mode maintains the specific power **[ACT]** applied to the film constant, even when production speed varies, or when load resistance varies.

The **Automatic Specific Power** operating mode (maintaining the specific power constant) genuinely guarantees the **Dyne** wettability level on the film obtained with the specific power applied.

In this operating mode are shown the *actual specific power* (**ACT**) applied to the film and the (set-point) *specific power* value requested, set in **PL [Wmin/mq]**. The PLC CPU calculates the specific power **Spec.PWR** in **Wmin/m²**, where: **Spec.PWR = PwrOUT[W] / Production[m²/min]**.

The PLC CPU, through proportional control, instantly calculates, compares and adapts the **ACT [Wmin/m²]** specific power value to the **PL [Wmin/m²]** value set.

This regulation system takes into account production speed and any load resistance variation (variations mainly due to electrode (ceramic) temperatures, dielectric coating of the roller and the AIR-GAP, small high voltage leaks to ground due to dirt and humidity) by automatically correcting the movement of specific power that these factors have caused.

By using this operating mode, once the specific power value for the desired treatment has been decided, the film is certain to be treated uniformly. Fig.

Any conditions that cannot be controlled by the regulating algorithm are indicated with the message PowerAlarm

N.B.: The electrode length (light discharge) **[cm]** Electrode lenght [cm] *** must be set on the **PARAMETERS** page**.** (see page 38).

POWER LEVEL SETTING (**PL [WMIN/M²]**)

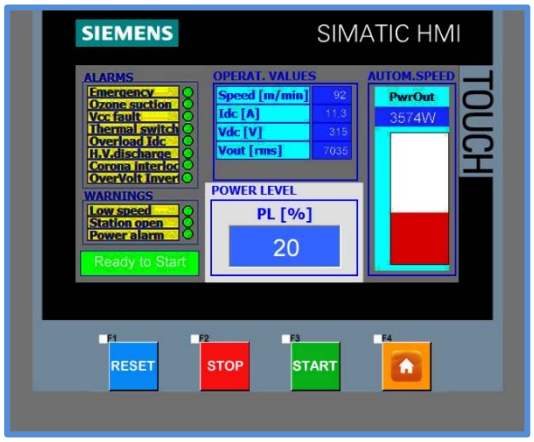


Fig. 38

To set the **Power Level PL [Wmin/m²];** press the value on the numerical introduction window **"PL [Wmin/m²]"** 

and enter the desired value by means of the displayed numerical keypad which appears superimposed.

The **PL** is the specific power that must be applied to the film in **Wmin/m2** and it is the point set for generator power.

The PLC CPU, through proportional control, instantly calculates, compares and adapts the **ACT [Wmin/m²]** specific power value to the **PL [Wmin/m²]** value set.

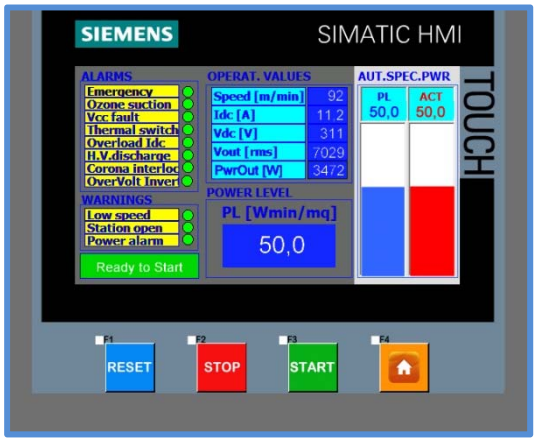


Fig. 39

Bar-Graph view, two values:

- **PL:** expresses, both graphically and numerically, the specific power value set in the POWER LEVEL window **PL [Wmin/m²]**.
- **ACT** expresses, both graphically and numerically, the currene specific power value set, supplied by the **electronic generator**.

PLANT OPERATIONAL VALUES

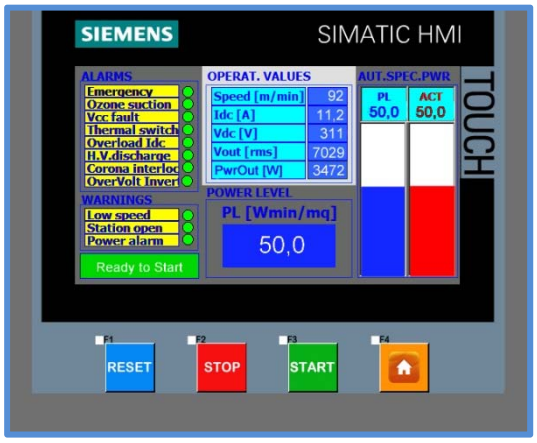


Fig. 40

In the automatic mode with specific power **(AUT.SPEC.PWR)** the OPERAT.VALUES window displays the following plant operational values of the **corona treatment**:

Speed [m/min]

Machine production speed in metres\minute.

Idc [A]

Operating current of the inverter in Amperes.

Vdc [V]

Operating voltage of the inverter in Volts

Vout [RMS]

Voltage on electrodes (Effective rms value in Volts).

PwrOut[W]

Effective output power (in Watts) from the **electronic generator** as an absolute value.

INTERMITTENCE

Connecting the external intermittence contact.

Prepare an electrical contact (N.O. contact-e.g. CAM with an **inductive sensor** or **microswitch**). It is also possible to use a positive logic digital signal (PNP).
To make one of the connections described above, refer to the wiring diagram of the generator terminal board attached to the manual. The terminal board features the terminals to connect the **intermittence** signal. After making the desired connection, the "***intermittence***" operating mode must be enabled on the **operator terminal.**

Enabling the intermittence operating mode on the operator terminal.

Before activating the "***Intermittence***" operating mode, the three-phase supply voltage of the **electronic generator** must be set. This operation is **password-protected**. To change the value, it is necessary to **log-in** in **edit** or **administrator** mode. Refer to paragraph **Password** on page 44.

On the **HOME** page  press the button 

.

Set the supply voltage of the **electronic generator. The three-phase voltage values are pre-set by Me.Ro and are the following:**

Press the blue box repeatedly until the desired supply voltage appears. Press the button  to go back to the **HOME** page.

Enabling the INTERMITTENCE operating mode.

WARNING!

When the intermittence mode is OFF, the electrode is always powered (even if the discharge effluvium is not visible). It is disconnected completely only when the **electronic generator** is turned Off by pressing the button 

or when the **discharge station** is open.

IMPORTANT: the Air-Gap of the discharge electrode is adjusted by **Me.Ro** technicians during the testing phase.

In case of treatment present (corona discharge effluvium) even with the intermittence signal **OFF**, switch off the **electronic generator**, (main switch OFF). and intervene on the discharge electrode, **increasing** the Air-Gap slightly.

INTERMITTENCE operating mode

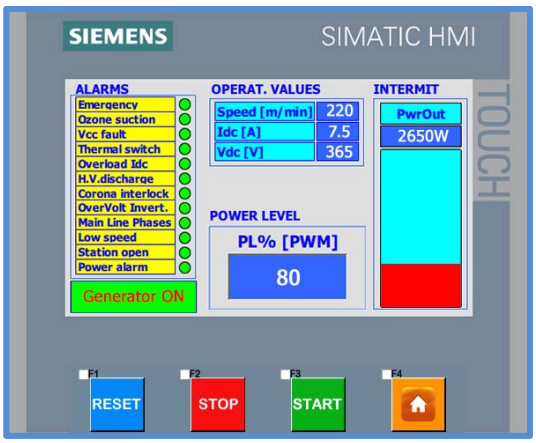


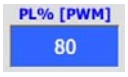
Fig. 41

On the **HOME** page press the button 

The intermittence operating mode is enabled.

In this operating mode, the output power **PwrOut,** the set power level, **PL%[PWM],** the operational values **(Operat. Values)** and any other information messages or alarm messages are displayed.

In the **INTERMITTENCE** operating mode, the Power Level **PL%[PWM]** is the set-point to adjust the output power of the electronic generator. The maximum output power of the **electronic generator** is set by **Me.Ro** during the testing phase and it is mainly determined by the maximum length of the discharge electrode and by the three-phase supply voltage of the **electronic generator**.

When the increase of the **PL%[PWM]** is equal to or greater than the set factory value, the background colour of the button 

will go from **blue** to **red** alternately. This indicates that further increases of the **PL%[PWM]** are not possible.

The reference value of the **PL%[PWM]** can be changed only by specialised **Me.Ro** technicians.

With **PL %[PWM]** = max settable value, the **PwrOut** value may not be the maximum deliverable by the **electronic generator**. The causes may be: variations of the load resistance (**discharge station**) to the dielectric coating of the roller and to the AIR-GAP, small losses of High Voltage to earth due to dirt and humidity; another cause can be a non-optimal matching between the **electronic generator** and the **discharge station** (load). Refer to chapter **7** on page 80 to optimise the matching between the **electronic generator** and the load.

Any out of control conditions of the control algorithm are indicated by the message 

IMPORTANT: with the intermittence signal **OFF** (absent) the PLC stores and displays the last operating values of the corona treatment plant.

IMPORTANT: the Air-Gap of the discharge electrode is adjusted by **Me.Ro** technicians during the testing phase.

In case of treatment present (corona discharge effluvium) even with the intermittence signal **OFF**, switch off the

electronic generator, (main switch OFF). and intervene on the discharge electrode, **increasing** the Air-Gap slightly.

*Setting the Power Level (**PL%[Idc]**)*

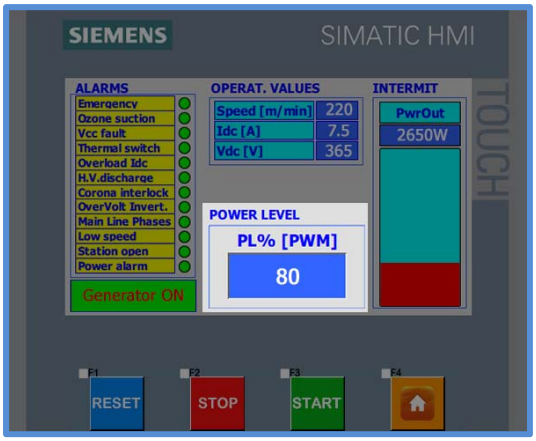


Fig. 42

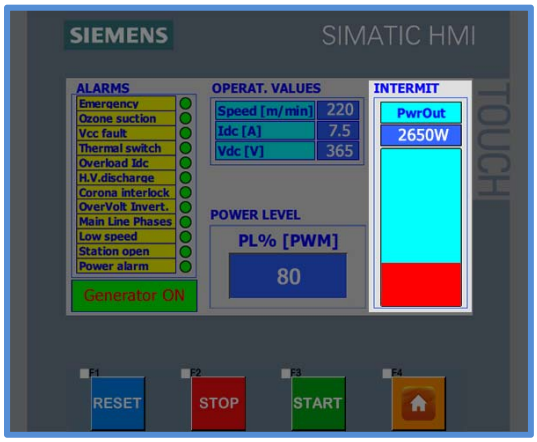


Fig. 43

To set the **Power Level PL [PWM],** press the value 

on the numerical input window **"PL%[PWM]** and enter the desired value using the keypad that appears.

Fig. 45

he actual power output of the generator in absolute value read in the relative display window. The Bar Graph below also shows the graphical representation of the **PwrOut** value.

4.6.1 PLANT OPERATIONAL VALUES

Fig. 44

In the **INTERMITTENCE** operating mode, the **OPERAT.VALUES** window displays the following operational values of the **corona treatment plant**:

Speed [m/min]

Production speed of the machine/line in metres/minute.

Idc [A]

Operating current of the inverter in Amps.

Vdc [V]

Operating voltage of the inverter in Volts

4.7 ALARMS AND WARNINGS

ALARMS

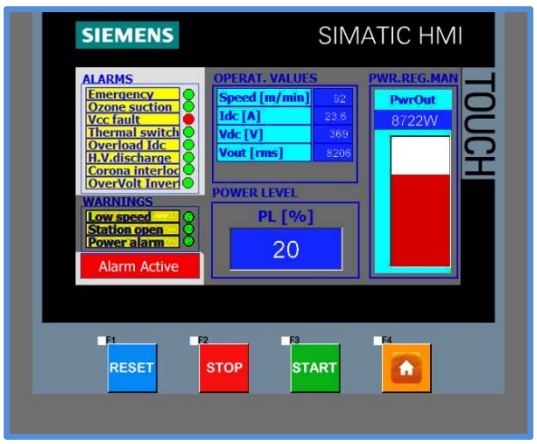


Fig. 46

The **ALARMS** window displays the status of the alarm messages present in the **corona treatment** plant.

If any of these alarms is triggered, the generator cannot **START**, and if already running in START it places it in **STOP** until the alarm is eliminated and the work status is reset by means of the button RESET.

In standard plant operating mode, the symbol ○ near each **ALARMS** item is green ●.

If an **ALARM** is triggered, the symbol turns red ● and this message appears Alarm active.

The alarm message is acquired and displayed in the **Alarms History**. Alarm History

When the alarm is reset, the symbol turns green ●.

The message disappears Alarm active.

Pressing the key RESET allows the generator once again to be ready to operate and to display the message Ready to Start.

Pressing the key START activates the generator.

ALARM MESSAGES

N.B. the warnings below refer to a standard plant. They can vary based on the specific customer requirements.

EMERGENCY

Intervention of emergency contact

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.
- **CAUSES**

  Emergency contact open.

OZONE SUCTION

No ozone suction

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.
- **CAUSES**

  Circuit breaker tripped. Ozone suction sensor adjusted improperly.
  Insufficient suction flow rate.

VDC FAULT

No direct voltage powering the CHOPPER stage of the generator.

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.
- **CAUSES**

  Incorrect power supply voltage
  Power fuse open.
  Automatic switch IA1 open.
  Contactors CN1 and CN2 open

Thermal switch

THERMAL OVERLOAD

Overtemperature on generator power component radiators

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.

- **CAUSES**

  Failure of cooling fans installed on our component radiators.
  Failure of dual metal thermostat (**thermal switch)** installed on power component radiators.

Overload Idc

IDC OVERCURRENT

Exceeding maximum set current limit**IDC[A]**

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.

- **CAUSES**

  High-voltage [H.V.] discharge towards the ground.
  Perforation of dielectric cover of discharge roll or perforation of ceramic bars.
  Loss of insulation of isolators supporting electrodes.
  Generator fault.

H.V. discharge

HIGH-VOLTAGE DISCHARGE [H.V.]

Presence of high-voltage discharge[H.V.] towards the ground.

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.

- **CAUSES**

  High-voltage [H.V.] discharge towards the ground.
  Perforation of dielectric cover of discharge roll or perforation of ceramic bars.
  Loss of insulation of isolators supporting electrodes.

CORONA INTERLOCK

Corona interlock

Intervention of interlock contact

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.

- **CAUSES**

  Opening of interlock between generator and **corona treatment** plant upon which it is connected.

INVERTER POWER SURGE

OverVolt Inverter

Power surge in the inverter module.

- **GENERATOR STATUS**
  The electronic generator automatically goes to **STOP** conditions.
  The Buzzer emits an intermittent sound and the red lamp turns on.

- **CAUSES**

  Power surge to the inverter.

WARNINGS

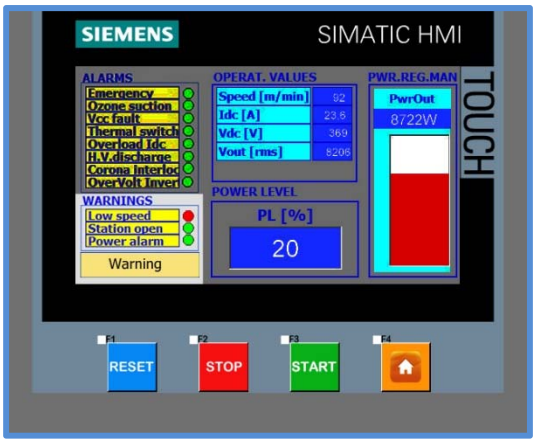


Fig. 47

The **WARNINGS** window displays the status of the warning messages present in the **corona treatment** plant.

Intervention of one of these **WARNINGS** will not allow the **electronic generator** to **START**, and if already operational will place it in **STOP** until the alarm is eliminated.

The generator **START** is performed automatically as soon as the warning is reset.

In standard plant operating mode, the symbol ○ near each **WARNINGS** item is green ●.

If a **WARNING** is triggered, the symbol turns red ● and this warning appears Warning

When the **WARNING** is reset, the symbol turns green ●.

N.B.: *the **POWER ALARM** warning does not stop the generator from operating.*

WARNING MESSAGES

N.B. the warnings below refer to a standard plant. They can vary based on the specific customer requirements.

LOW SPEED

Speed of the production line less than that set on page Parameters.

- **GENERATOR STATUS**
  The **electronic generator** automatically goes to **STOP** conditions.

- **CAUSES**
  Low production line speed.
  Failure of sensor detecting speed installed on the discharge station.

STATION OPEN

Discharge station open.

- **GENERATOR STATUS**
  The **electronic generator** automatically goes to **STOP** conditions.

- **CAUSES**
  Discharge station open.
  Failure of microswitch on discharge station hood.

POWER ALARM

Variation of set power output limit %.

This control is always active in all operating modes: **Manual %[Idc]** ; **Automatic Speed** ; **Automatic Spec. PWR**. The **electronic generator** power output **PwrOut[W]** is constantly compared with the percentage variation set in 

. on the **PARAMETERS** page. (see page 38).

If the **PwrOut[W]** output power decreases more than the set percentage, the warning 

is triggered.

- **GENERATOR STATUS**
  The **electronic generator** remains in **START** status.
  The light column lets out an intermittent sound and the orange light switches on.

- **CAUSES**
  Variation of power output caused by probable change of discharge station work conditions.

5 ELECTRONIC GENERATOR

Section profile:

Who is this chapter for?

This section is for everyone who installs, uses or carries out maintenance on the corona treatment system from ***Me.Ro. S.p.A***..

Contents of this chapter

This section contains a description of the main internal components of the electronic and electrical mechanical part of the **electronic generator** of the Corona treatment system from ***Me.Ro. S.p.A***.

5.1 INTERNAL STRUCTURE OF THE ELECTRONIC GENERATOR

ELECTRONIC GENERATOR WITH POWER FROM 4KW UP TO 20KW.

Only valid for Electronic Generators from 4kW to 20kW.

The Electronic Generator is constructed in a metal cabinet. The cabinet can be equipped with wheels. All ***Me.Ro. S.p.A electronic generators*** have a cabinet with two hinged panels for internal inspection. The **electronic generator** is air cooled.

N.B. *Electronic generators up to 10kW of power are equipped with wheeled cabinet by* ***Me.Ro S.p.A.*** *as standard.*

Inside the **electronic generator** generator (at the back) are both the electromechanical part that provides the power needed for the treatment, both the electronic part that manages the power supplied, the operation and the alarms and \ or safety of the plant.

In the figure below is represented the inside of the generator (the back) with the arrangement of the main components.

N.B. *The photo represents a standard 8kW* ***electronic generator.*** *Herewith follows a brief description of the main components:*

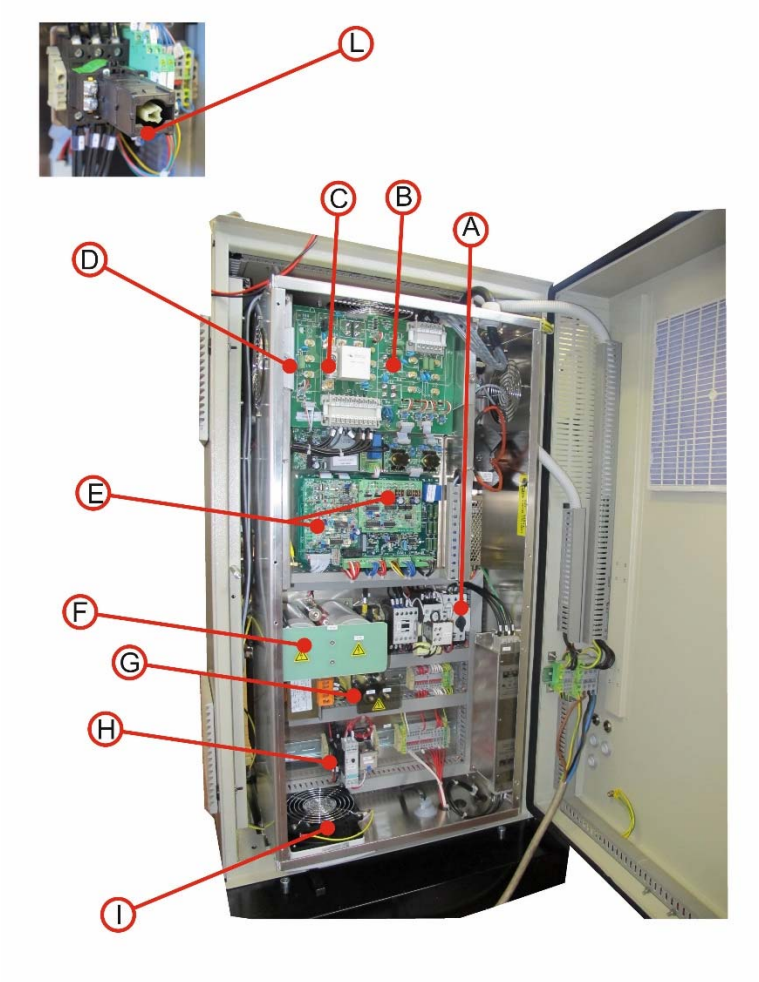


Fig. 48

What generators with greater power, the components remain the same, while it can vary their arrangement inside the cabinet.

A) **Magnetothermic main switch**.

B) **IGBT** (Insulated Gate Bipolar Transistor), power device used to commute high voltages and high powers. Composed by the chopper card (n°1 module) and the inverter card (n°2 module) of the **Electronic Generator**.

C) **Power fuse** for the protection of the electrical mechanical part from the electronic power side.

D) **B5294 Circuit Board**: for interface between the power and electronic parts of the generator controller. N.B.: in electronic generators with a power greater than 10kW, the board is replaced by physical connections (with suitably rated cables) between the power components.

E) **B8198 Circuit Board** interface between the PLC control parts and the power parts (Chopper and Inverter).

F) **Level Condenser** for the chopper's continuous supply voltage. It is comprised of the loading resistances and the contactor the **DC Link**.

G) **Load resistors** of the level condensers.

H) **Fuses with fuse carriers** for the supply voltage protection 110 Vac, fans, etc. N.B. If 220Vac is also fitted with an extra fuse and fuse holder.

I) **Output fan for cooling** electronic generator.

J) **Line switch** for switching the **electronic generator** on or off.

ELECTRONIC GENERATORS WITH POWER FROM 25KW UP TO 60KW.

Only valid for: Electronic Generators from 25kW to 60kW

The Electronic Generator is constructed in a metal cabinet. All ***Me.Ro. S.p.A electronic generators*** have a cabinet with two hinged panels for internal inspection. The **electronic generator** is air-cooled.

Inside the generator (the back) are positioned both the electromechanical part that provides the power needed for the treatment, both the electronic part that manages the power supplied, the operation and the alarms and \ or safety of the plant.

In the figure below is represented the inside of the generator (the back) with the arrangement of the main components.

N.B. *The photo represents a standard 25kW **electronic generator.** N.B. the picture is a standard generator power 30kW.*

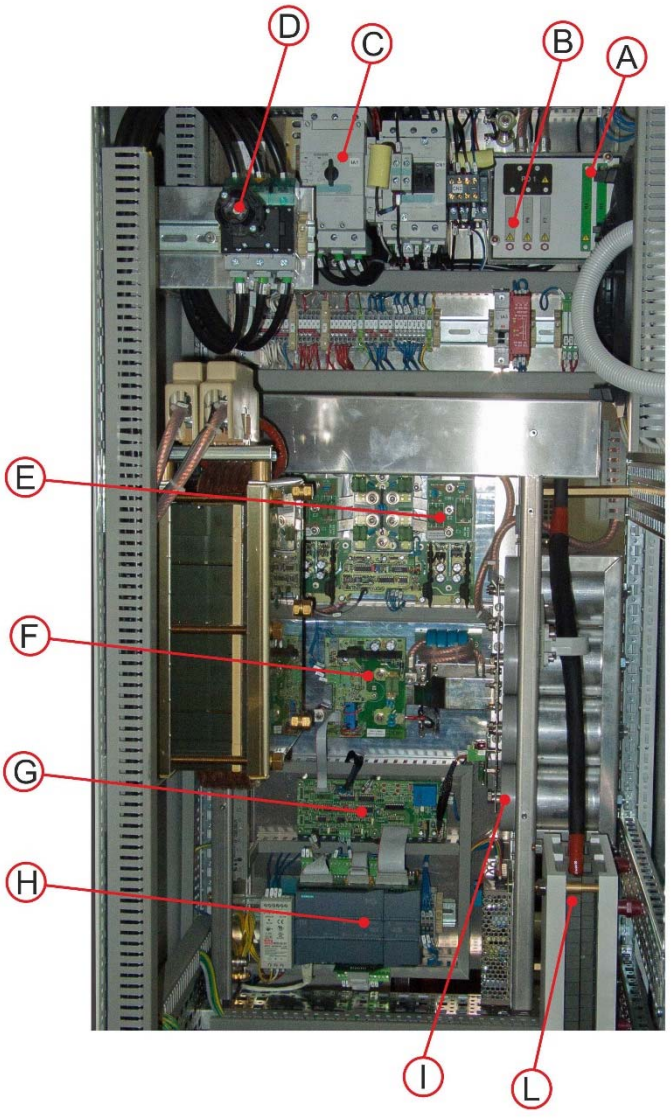


Fig. 49

A) **Load resistors** of the level condensers.

B) **Power fuse** for the protection of the electrical mechanical part from the electronic power side.

C) **Magnetothermic main switch**.

D) **Line switch** for switching the **electronic generator** on or off.

E) **IGBT Inverter** (Insulated Gate Bipolar Transistor), power device used to commute high voltages and high powers. Composed by the inverter module (n°2 or 4 module) of the **Electronic Generator**.

F) **IGBT Chopper** (Insulated Gate Bipolar Transistor), power device used to commute high voltages and high powers. Composed by the ichopper module (n°1 module) of the **Electronic Generator**.

G) **B8198 Circuit Board** interface between the PLC control parts and the power parts (Chopper and Inverter).

H) **PLC** to control the electronic generator.

I) **Level Condenser** for the chopper's continuous supply voltage. It is comprised of the loading resistances and the contactor the **DC Link**.

L) **Variable Impedance** (model in this picture is **IV-1D**).

6 GENERAL DESCRIPTION AND MAINTENANCE OF ME.RO DISCHARGE STATIONS

Section profile:

Who is this chapter for?

This section is for everyone who installs, uses or carries out maintenance on the corona treatment system from ***Me.Ro. S.p.A***..

Contents of this chapter

This section contains a general description of the discharge stations of the Corona treatment system from ***Me.Ro. S.p.A***.

6.1 DISCHARGE STATION

Discharge Stations by ***Me.Ro. S.p.A.*** are mainly divided into two macro categories

- Normal discharge station
- Universal discharge station

6.2 NORMAL DISCHARGE STATION

The discharge stations are mainly used in the treatment of plastic film. **With this type of stations is not possible to perform the treatment on the metal films or metallized.**

They are composed by aluminum or stainless steel electrodes.

The electrodes can be a fixed bar (for the treatment of the entire plastic film width), or choke type (for the treatment of single points of the plastic film). The support of the electrodes can be fixed or rotary (in foil direction).

The stations with the rotary electrodes support are used in CAST applications and have the advantage of maintaining the AIR GAP constant during the initial heating phase. They can then rotate on their on axis and therefore allow the passage of joints and/or nods without causing any damages in the case of impact.

The discharge roller can be silicon rubber coated or sleeved with a silicon sleeve.

In some particular applications a ceramic coated discharge roller is supplied (version CRAF).

The discharge stations can be unilateral (for treatment of a single side of the plastic film) or bilateral (for applications which require treatment of both sides).

Fig. 50

NORMAL STATION EXAMPLE

NORMAL DISCHARGE STATION NOMENCLATURE

Here below the recognition code of a normal discharge station.

U 1 ER – 250 – 2000

(example of a station with n°1 rotary electrode mounted)

U Indicates that the discharge station is of unilateral type. Letter "B" indicates that the discharge station is of bi-lateral type

1 Indicates the number of electrodes mounted on the discharge stationa

ER Indicates the type of electrode mounted. In this case the suffix "ER" indicates that the electrodes are of rotary type.

250 Indicates the diameter of the discharge roller.

2000 Indicates the max. width (LUCE) on which the corona treatment can be performed.

See table below in order to know the different types of stations:

STATION NAME	STATION DESCRIPTION
UT	Unilateral station with aluminium or stainless steel electrodes
BT	Bilateral station with aluminium or stainless steel electrodes
UTL	Unilateral station with aluminum electrodes with choke blades
BTL	Bilateral stations with aluminum electrodes with choke blades
U1ER	Unilateral stations with rotary electrodes in stainless steel
B1ER	Bilateral stations with rotary electrodes in stainless steel

6.3 UNIVERSAL DISCHARGE STATION

The universal discharge stations **can be used for the treatment of plastic film and for the treatment of metallic film.** The particular characteristic of these stations are the ceramic bars which compose the electrode. Thanks to this ceramic coat conductive films (e.g. metallic films) can be treated.

During the discharge process the ceramic heats and reaches high temperatures. Therefore the system is provided with a fan, which allows an efficient refrigeration of the ceramic bars of the discharge electrode, and eliminates the ozone produced by the corona treatment.

The ceramic coated discharge roller is made of aluminum which makes its more resistant and protects it from the ozone.

The universal stations can be supplied in unilateral and bilateral versions as the normal stations, depending on the kind of treatment

Fig. 51

UNIVERSAL STATION EXAMPLE

UNIVERSAL DISCHARGE STATION NOMENCLATURE

Here below the recognition code of a universal discharge station.

(example of a station with n°1 rotary electrode mounted) Each electrode hood is made up of 4 ceramic bars

U 3 ER – 250 – 2000

U Indicates that the discharge station is of universal type

B In this case the discharge station is of bi-lateral type. If the character "U" is present it indicates that the discharge station is of unilateral type.

3 Indicates the number of electrode-bearing hoods mounted on the discharge station.

X4C Indicates the ceramic bars mounted on each hood of the discharge station. (R= indicate that the elctrode can rotate).

250 Indicates the diameter of the discharge roller.

2000 Indicates the max. width (LUCE) on which the corona treatment can be performed.

See table below in order to know the different types of stations:

STATION NAME	STATION DESCRIPTION
UU	Unilateral station with ceramic electrode
UB	Bilaterale station with ceramic electrodes

6.4 DESCRIPTION OF THE MANUAL CONTROLS OF THE DISCHARGE STATION

The opening of the hood containing the discharge electrodes in order to introduce the film can be performed as follows

1-) Through the control lever of the compressed air distributor (only for stations without solenoid valves)

2-) Through the selector in proximity of the discharge station (only for stations with solenoid valves). This selector can be replaced or integrated at the customer's expenses with a PLC remote control

6.5 INSTRUCTION FOR THE CALIBRATION AND ADJUSTMENT OF THE DISCHARGE STATION

The **AIR GAP** of the **discharge station** has to be adjusted (space of compressed air between the electrode and the roller) where the discharge of the corona effect takes place. *For the regulation of **AIR GAP** refer to the drawings in the manual of use and maintenance.*

WARNING!!

BEFORE ANY INTERVENTION ON THE DISCHARGE STATION (FOR ADJUSTMENT OR MAINTENANCE), TURN THE PLUG VALVE LOCATED ON THE STATION FRAME IN SAFETY FOR MAINTENANCE; ENSURE THAT THE MACHINE IS AT A COMPLETE STANDSTILL AND THE PARTS WHICH MAY BE MOVED (NIP ROLLERS ETC.) BY PNEUMATIC OR ELECTRIC ACTUATORS ARE LOCKED IN A SAFE POSITION.

AIR-GAP

The air gap depends on the length of the electrodes, the type of dielectric coating on the discharge roller (silicone or ceramic) and the type of electrode (ceramic bar electrode , aluminium electrode, stainless steel electrode)

Dielectric silicone coating.

- Alluminium or stainless steel electrode
  - Length up to 4m. **(air-gap 1.5÷2mm)**
  - Lengths over 4m **(air-gap 2.5÷2.8mm)**

Dielectric ceramic coating

  - Lengths up to 4m **(air-gap 1.2÷1.5mm)**

- Electrodes with ceramic bars (Universal Discharge Stations)
  - Electrode lengths up to 3m **(air-gap: 1,5÷1,8mm)**

The electrode is shaped in order to upload on more lines depending on the generators of the discharge rollers.
In the case of a discharge station with ceramic electrodes, make sure that the discharge is equal on the whole width of the ceramic bars with a voltage of 5,5-6 Kvolt on the electrodes.
Take into consideration that the ceramic electrodes have to be adjusted very carefully.

6.6 HOW TO STOP THE PLANT

The **electronic generator** is equipped with a main supply switch which acts as emergency switch.

An external Emergency switch can be connected to the terminal of the **electronic generator** (see wiring diagrams) disabling the insertion of the main contactor of the **electronic generator** itself (**electronic generator** while the power can not work with the emergency button on).

6.7 DISMANTLING THE DISCHARGE ROLLER

To dismantle the roller proceed as indicated in the following steps:

- Consider the weight of the roller;
- Sling the roller with two belt slings, with the adequate capacity, positioned symmetrically with respect to the middle of the roller and with a distance between them of approx. 1 metre;
- Tension the 2 slings with a rocker arm of adequate length and capacity;
- Remove the fixing bolts;
- Let the roller slide until it is completely out of the machine;
- Place the roller on appropriate supports.

7 ADAPTING GENERATOR TO LOAD

Section profile:

Who is this chapter for?

This section is for everyone who works with the Corona Treatment System from ***Me.Ro. S.p.A***..

Contents of this chapter

This section contains a general description of the variable impedance contained in **electronic generator** of the Corona treatment system from ***Me.Ro. S.p.A***.

7.1 VARIABLE IMPEDANCE

Fig. 52

Double Variable Impedance IV-1D

(16kW ÷ 45kW electronic generators)

Fig. 53

Fig.

(50kW ÷ 65kW electronic generators)

Variable impedance Once the treatment plant is in operation with the film in production, a further tuning may be necessary, in order to better adapt the generator to the load. This is a **HV transformer** adjustment with the **discharge station**. Is done to transfer the max power to the load. This adjustment is made by means of the **variable impedance**.

Being tested at our factory, the **H.V. transformer** and the variable impedance are adjusted so as to obtain the maximum power transfer. Sometimes, however, it is necessary to intervene in the impedance variable because the film into production load conditions vary.

ATTENTION!!!

This operation can be carried out if the generator has externally-fitted variable impedance (see photo). *Me.Ro.* externally mounts variable impedance as standart only on generators with a power greater than 16kW; in order to better adapt the electronic generator to the discharge station.

With the electronic generators lower power is already has an optimal fit with the discharge station and it is not necessary to intervene often variable impedance.

It is mounted internally in the **H.V. transformer**.

It can however be modified to adapt the electronic generator to the load, but this operation must be passed is made by technical personnel of ***Me.Ro. S.p.A.***

7.2 ADJUST VARIABLE IMPEDANCE

To adjust variable impedance proceded as follow:

1. Setting the manual mode
2. Position the setpoint for power regulation to zero and push the ON/MEMORIZE button.
3. Position the setpoint for power regulation to zero and push the ON/MEMORIZE button.

IDC = Current supplied to the inverter

VDC = Voltage supplied to the inverter

VDC x IDC = Power supplied

Gradually increase PL up to 100 and check I.OUT. If the generator is not correctly adapted to the load, it will not provide the maximum power. In this case two situations could occur..

1. The VDC value reaches the max, but the IDC current remains low.
2. The IDC value reaches the max, but the VDC voltage remains low.

By using the nuts on the four ends, the space between the two magnetic circuits can be adjusted.

Due to this a different value of the inductance can be chosen varying the reluctance of variable impedance. This reel is connected in series to the primary on the high voltage transformer. By varying the impedance, a fine adjustment of IDC and VDC is possible and the whole primary power can be transferred to the secondary.

Situation 1

Open variable impedance so that the VDC value decreases with the increase of IDC. If with the variable impedance completely open, the IDC current does not reach the max and the VDC remains high, an higher secondary tap on the output transformer must be selected.

Situation 2

Close the impedance so the VDC increases and the IDC decreases. If with the variable impedance completely closed the VDC does not reach its MAX and the IDC remains high, you must choose a lower socket on the transformer.

7 ADAPTING GENERATOR TO LOAD

Generator optimum operating conditions with maximum output power are.

GENERATOR TYPE	IDC VALUE	VCD VALUE
12 kW	30 A	400 V
15 kW	37.5 A	400 V
16 kW	40 A	400 V
18 kW	45 A	400 V
20 kW	50 A	400 V
25 kW	62.5 A	400 V
30 kW	75 A	400 V
35 kW	82.5 A	420 V
40 kW	95 A	420 V
45 kW	107 A	420 V
50 kW	120 A	420 V
55 kW	130 A	420 V
60 kW	140 A	430V
65 kW	150 A	430V

These values are obtained by adjusting variable impedance and by selecting an output on the output transformer secondary (approximate adjustment).

8 INSTRUCTIONS AND WARNING

Section profile:

Who is this chapter for?

This section is for everyone who installs, uses or carries out maintenance on the corona treatment system from ***Me.Ro. S.p.A***..

Contents of this chapter

This section contains a description of the main rules to carry out safe maintenance on the Corona treatment system from ***Me.Ro. S.p.A***.

8.1 GENERAL SAFETY REGULATIONS

For your safety, follow the rules and security measures described below.

ALL MAINTENANCE AND REPAIR WORK INSIDE THE ELECTRONIC GENERATOR AND THE DISCHARGE STATION MUST ONLY BE PERFORMED BY AUTHORISED AND SPECIALISED PERSONNEL.

BEFORE ANY INTERVENTION ON THE DISCHARGE STATION (FOR ADJUSTMENT OR MAINTENANCE), TURN THE PLUG VALVE LOCATED ON THE STATION FRAME IN SAFETY FOR MAINTENANCE; ENSURE THAT THE MACHINE IS AT A COMPLETE STANDSTILL AND THE PARTS WHICH MAY BE MOVED (NIP ROLLERS ETC.) BY PNEUMATIC OR ELECTRIC ACTUATORS ARE LOCKED IN A SAFE POSITION.

N.B.: BEFORE ANY WORK ON THE ELECTRICAL AND MECHANICAL EQUIPMENT, ENSURE THAT THE MAIN POWER SUPPLY AND THE ALARM DEVICE LINE ARE DISCONNECTED.

WARNING! DO NOT PUT THE GENERATOR AT WORK WITHOUT HAVING CARRIED OUT ALL THE ELECTRIC CONNECTIONS TO THE HV TRANSFORMER.

In case any repair must be done on **electronic generator**, bear in mind that:

- The power units (power supply output, voltage regulator, inverter and high voltage primary transformer) can carry voltages around 600 VOLT.
- From the output of the high voltage transformers to the discharge electrodes, maximum voltage may be **very high**. Therefore, depending on ambient humidity, the discharge may trigger from up to 3-4 cm. See the data label on the **electronic generator**.
- Due to capacitive effect, in the proximity of the discharge electrodes and the parts carrying high voltage, there may be circulation of undesired currents and therefore it is important to control and maintain the connections to GROUND of all the panels, the closures and the shielding of all the high voltage parts.
- If the event of replacing the **high voltage transformer** bear in mind that it contains transformer insulation oil which must not be disposed of in the environment (it must be handed over to a company authorised for disposal or recovery).

8.2 ON-OFF OF THE SYSTEM

SAFETY CHECK

Before starting the system check the following:

- All safety devices must be on
- All remote interlock devices must be closed

Check the power supply

PREPARATION PROCEDURES TO THE OPERATION

*Provide power to the **electronic generator**.*

*Check if there are alarm signal messages on the **operator terminal***

The electronic controls check all alarm and/or warning inputs after the main switch of the **electronic generator** has been turned on.

If the control electronics detect a malfunction, the indicator beside the active alarm and/or warning lights up red.

The **electronic generator** can only be started after having cancelled all alarms and warnings.

9 MAINTENANCE

Section profile:

Who is this chapter for?

This section is for everyone who carries out maintenance on the Corona treatment system from ***Me.Ro. S.p.A.***.

Contents of this chapter

This section contains advice and notes for the maintenance of the Corona treatment system from ***Me.Ro***. ***S.p.A.***.

9.1 GENERAL NOTES FOR MAINTENANCE

This section contains suggestions for maintenance in order to guarantee the correct functioning of the corona treatment system.

Extraordinary maintenance must be carried out by specialised technicians of the company *Me.Ro. S.p.A.* ***S.p.A.***

Technical Support

The technicians of *Me.Ro. S.p.A.* ***S.p.A.*** can be contacted by phone. Please find the telephone and fax numbers of Me.Ro. S.p.A. on the second page of this manual.

Telephone and Fax numbers of ***Me.Ro. S.p.A.*** are on page 2 of this manual.

9.2 SAFE MAINTENANCE

For your own safety, please respect the safety rules and measures described below

Dangerous areas

High voltage hazard!

*The **electronic generator** converts low frequency, electrical energy to DC power.* Components supplied with high voltage can be electrical shocks.

Make sure to know all dangerous components of the machine.

Eliminating residual voltage

High voltage hazard!

High-voltage hazard! After having switched off the **electronic generator**, some components may have residual voltage

Disconnect **the electronic generator** and respect the safety norms regarding maintenance of high-voltage systems.

9.3 MAINTENANCE INTERVALS

Regular maintenance

Check the system at regular intervals.

Maintenance procedures have to be performed in consideration of the working hours and the environmental conditions of the corona treatment system.

9.4 MAINTENANCE PROCEDURES

VISUAL CHECK

It is recommendable to regularly perform a general visual check.

Check the system in order to detect signs of moisture, corrosions and dirt.

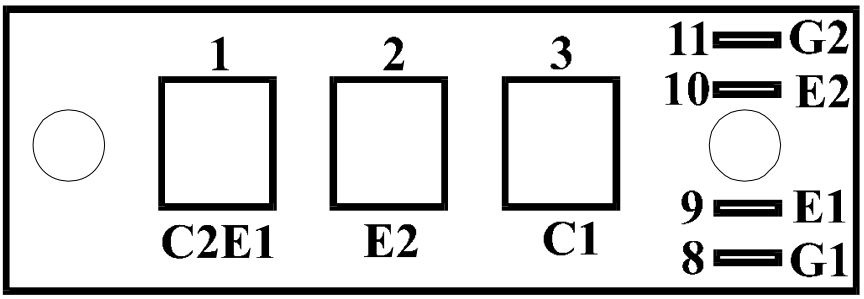
In order to guarantee the efficiency of the system it is necessary to provide for general cleaning of the discharge station , eliminating residuals of plastic materials and the dirt accumulated inside the machine once a month. The high-voltage insulators have to be cleaned accurately with non-flammable solvents, the discharge electrodes with brass brushes and solvents, and also the electrical high-voltage connections and the roller have to be cleaned.

The machine has to be checked for:

- the oil level in the A.T. transformer;
- the operation of the refrigeration fans;
- clean and replace the air filters.

9.5 PROCEDURE FOR CHECKING THE DOUBLE IGBT MODULES

The double IGBT module is composed of 2 IGBTs with a parallel diode connected between the collector and the emitter.



To check the module, proceed as follows.

1° disconnect the connections from the module terminals.

2° with the tester on diode, connect the tester positive terminal to terminal C2E1 (1) and the negative terminal to terminal E2 (2).

The reading will be OL if the IGBT connection is intact.

3° reverse the tester terminals (negative to terminal C2E1 (1) and positive to terminal E2 (2)

The reading will be approximately 0.3-0.4V if the diode parallel to the IGBT junction is integral.

4° with the tester on diode, connect the tester positive terminal to terminal C1 (3) and the negative terminal to terminal C1E1 (1).

The reading will be OL if the IGBT connection is intact.

5° reverse the tester terminals (negative to terminal C1 (3) and positive to terminal C2E1 (1)

The reading will be approximately 0.3-0.4V if the diode parallel to the IGBT junction is integral.

6° with the tester on OHM, check terminals G1-E1 (8-9).

The reading will be OL= high resistance, if the IGBT GATE is intact.

7° with the tester on OHM, check terminals E2-G2 (10-11).

The reading will be OL= high resistance, if the IGBT GATE is intact.

If one or more measurements are incorrect, the module must be replaced.

9.6 MENDING THE SILICONE INSULATED ROLLERS

The roll mending is performed using a special two compound silicone rubber (silicone + hardner) supplied by ***Me.Ro s.p.a.***

Before applying the silicone rubber to the roller this must be cleaned in the proximity of the hole or cut using non flammable solvent.

In order to better fix the rubber, the damaged rubber parts have to be removed with a blade, enlarging the hole or the cut until rubber in perfect conditions appears and the aluminum or iron surface of the roller.

Once accomplished to these preliminaries we will mix a 10% of hardner to the silicone rubber. Depending on the room temperature this compound will dry up within 5 to 15 minutes.

It is possible to vary this time by increasing or decreasing the percentage of hardner.

Apply the silicon on the roller and after drying remove excessive rubber with abrasive paper and perfectly close the surface of the roller.

9.7 REPAIRING SILICON SLEEVE INSULATED ROLLERS

Remove the old sleeve from the roll cutting it with with a blade.

Carefully clean the roller surface.

If the roller has a pass-trough shaft then seal, using adhesive tape, one of the ends where air could exit. Also, the shaft can be removed and one end of the roller be sealed.

The new silicone sleeve must be some 10 cm longer than the roller.

For rollers longer than two metres increase the sleeve lenght by sone 15 or 20 cm. To insert the new sleeve the following must be available: two or three people, compressed air; a tampon having the diametre of the sleeve, a retaining ring to secure the sleeve on the tampon; some industrial talc.

Insert by hand some 4-5 cm of sleeve onto the roll from the sealed side.

Put a small quantity of talc in the sleeve.

Insert the tampom with compressed ait intake into the other end of the sleeve. In case the tampon is not available we can insert the sleeve by some 10 cm, insert a compressed air pipe into the other end and grasp firmly.

Grasp firmly the sleeve already on the roller.

Slowly open the compressed air tap to inflate the sleeve.

Once the sleeve is inflated press and drive it on the roll.

To insert the other end (where the tampon is) use a compressed air gun blowing between the sleeve and the roll while pushing the sleeve.

Trim out the sleeve with a sharp blade.

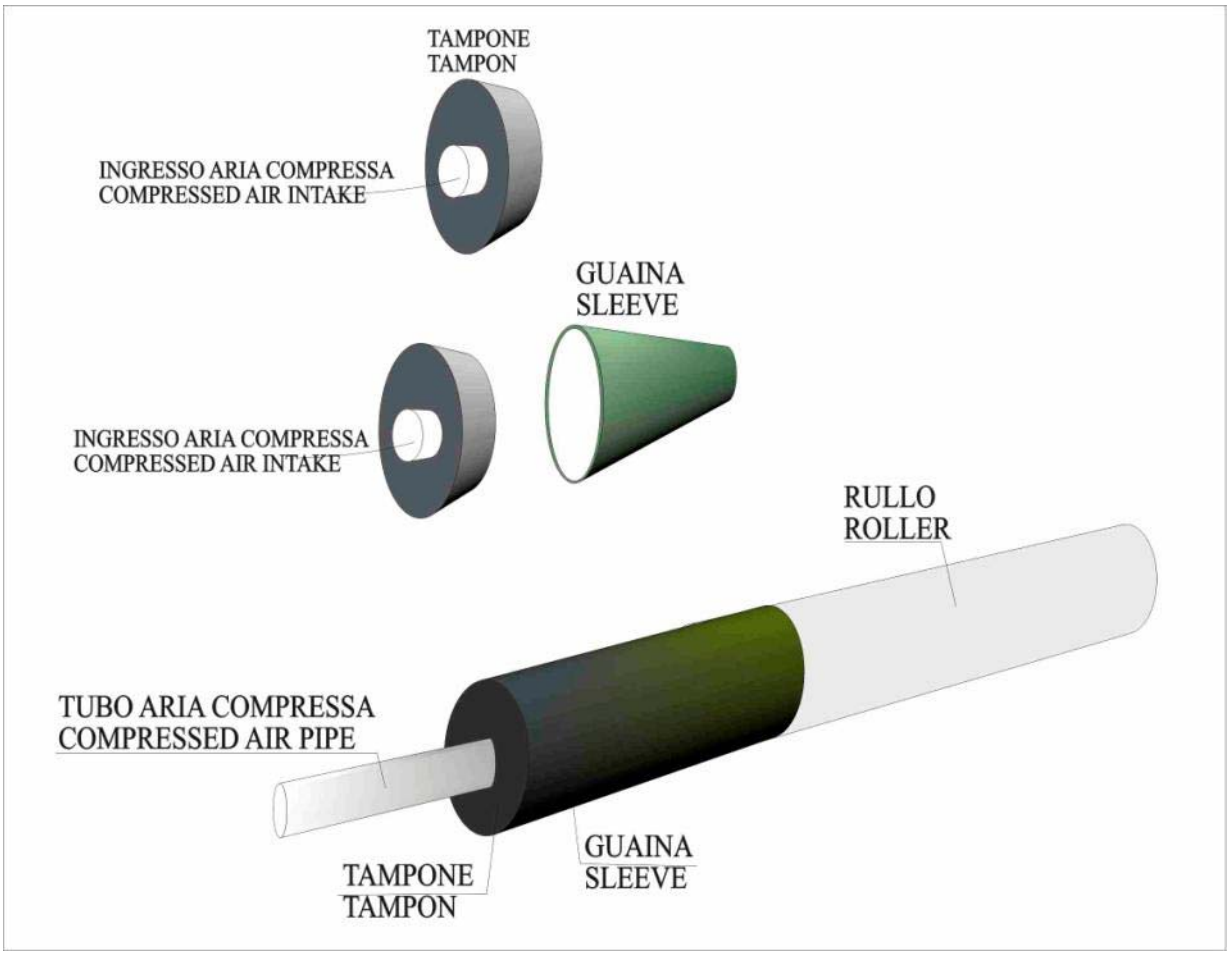

TAMPONE
TAMPON
INGRESSO ARIA COMPRESSA
COMPRESSED AIR INTAKE
GUAINA
SLEEVE
INGRESSO ARIA COMPRESSA
COMPRESSED AIR INTAKE
RULLO
ROLLER
TUBO ARIA COMPRESSA
COMPRESSED AIR PIPE
TAMPONE
TAMPON
GUAINA
SLEEVE

Fig. 54

9.8 REPAIRING CERAMIC COATED ROLLERS

- Once the puncture has been spot mark the surface around it
- Using a drill with a diamonded point of 5mm make a hole directly on the puncture until the roll iron surface has been found. Clean carefully the hole with solvent and await it gets dry.
- Blend at least 10ml of resin with the relative hardener (20%) (supply production by Me.Ro. S.p.A.This is a special cycloalifatic resin.
- Mix at least 10 ml of resin with the hardener (20%)
- This is a special cycloaliphatic resin.
- The hole has to be covered completely by the compost in a way to create an evident hill.
- Let the resin to become hard for at least 24h. Remove the resin out of the hole using a suitable sandpaper to uniform the roll radius, paing attention to not create any hollow.
- Carefully remove the excess resin to the exact radius of the roller using a suitable abrasive paper, being careful not to create a depression. At the end a small 5mm spot will be visible.
- From this moment on the roll is ready to be used.

10 UNISTALL AND DISPOSAL

Who is this chapter for?

Section profile:

This section is for everyone for all persons who are authorised to dismantle and dispose of Corona Treatment Systems from ***Me.Ro. S.p.A*.**

Contents of this chapter

This section contains advice and suggestions for a successful dismantling and disposal of components of the Corona treatment system from ***Me.Ro. S.p.A***.

10.1. IUNSULATING THE UNIT

1. Turn the electronic generator OFF.
2. Switch off the **electronic generator** power supply line.
3. Disconnect all external electrical connections.

To dismantle the roller proceed as indicated in the following steps:

- Secure the roller with two belt slings, with the adequate capacity, positioned symmetrically with respect to the middle of the roller and with a distance between them of approx. 1 metre;
- Tension the 2 slings with a rocker arm of adequate length and capacity;
- Remove the fixing bolts;
- Let the roller slide until it is completely out of the machine;
- Place the roller on appropriate supports.

10.2. PACKAGING

Package the **electronic generator** and/or the **high voltage transformer** and/or the **discharge station** considering its dimensions.

Place it on a pallet, cover it with a plastic film and wrap it with belts.

10.3. DISPOSAL

Disposal The main component materials of the **electronic generator** are:

Metals:

- **a.** Aluminium
- **b.** Copper
- **c.** Steel
- **d.** Brass
- **e.** Galvanized iron plates
- **f.** Steel plates

Plastics:

- **g.** Teflon , PA and others

Other materials:

- **h.** Electronic cards
- **i.** Ceramic

The main component materials of the **high-voltage transformer** are:

Metals:

- **j.** Aluminium
- **k.** Copper
- **l.** Steel
- **m.** Brass
- **n.** Galvanized iron plates
- **o.** Steel plates

Plastics:

- **p.** Teflon , PA and others

The high-voltage transformer also contains mineral oil not produced by ***Me.Ro. S.p.A.*** For safe disposal, request the technical specifications from ***Me.Ro. S.p.A.***

The main components of the **discharge station** are:

Metals:

- **q.** Aluminium
- **r.** Steel
- **s.** Brass
- **t.** Galvanised iron plates
- **u.** Steel plates

Plastics:

- **v.** Teflon , PA and others

Other materials:

- **w.** Ceramic

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