Corona Supplies Ltd
for all your corona needs

Unit G, Howland Road Business Park, Thame, Oxon. OX9 3GQ. UK.
Telephone: +44 (0) 1844 261779 ~ Fax: +44 (0) 1844 358187 ~ E-mail: sales@coronasupplies.co.uk

CSR 40-100+
CORONA GENERATOR

USER MANUAL

REQUIREMENTS

IMPORTANT: *Please read this information BEFORE installing and operating the equipment.*

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, EMC considerations, and to enable the user to obtain maximum benefit from the equipment.

Applications

The equipment described is intended for industrial & commercial surface treatment of various poly and non poly substrates.

Personnel

Installation, operation and maintenance of the equipment should be carried out by competent personnel. A competent person is someone who is technically qualified and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

SAFETY

Product warnings

DANGER

RISK OF ELECTRIC SHOCK

CAUTION

REFER TO DOCUMENTATION

DANGER

RISK OF ENTANGLEMENT

PINCH POINT

CAUTION

OZONE CONNECTION PORT

Hazards

DANGER! Ignoring the following may result in injury or death

1. This equipment can endanger life by exposure to high voltages and rotating machinery.
2. The equipment must be permanently earthed due to the high earth leakage current, and the treaters station must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the corona power supply.
4. Allow at least 1 minute for the corona power supply's capacitors to discharge to safe voltage levels (less than 50V).
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range.CAT I and CAT II meters must not be used on this product.
6. Guards, covers & doors must NOT be removed unless the corona power supply has been switched off and the incoming supply isolated.
7. Ozone generated by the corona process must be removed from the treater station by a suitable extraction system manufactured from corrosion resistant materials.

CONTENTS

MACHINERY DATA

Corona power supply

Model: 2 x CSR 65+

Serial number: 2106C0385 A/B

Input voltage: 400 volts

Input current: 13 amps / phase

Frequency: 50/60 Hz

Phases: 3+E

Rated output power: 6.5 kW

Weight: 250 kg each

High voltage transformer

Model: 2 x HT8

Serial number: 2106C0385 A/B

Rated power: 10kW

Rated output voltage: 10kV

Rated frequency: 10-25 kHz

Weight: 40 kg each

Treater station

Model:

Serial number:

Base roll width:

Base roll diameter:

Electrode type:

Electrode width (treat width) min:

Electrode width (treat width) max:

Number of treatment sides:

Dielectric type:

Weight: kg

INTRODUCTION

The corona treating process

Gases are normally very good electrical insulators or dielectrics. In the presence of a very strong electrical field a gas can be forced to break down and lose its insulating capability. During this breakdown the gas molecules begin to ionize. This enables them to provide a conductive path from one molecule to another. In a treating system the strong electrical field is generated across an air gap between the electrode assembly and the treater roll. A conductive path between these two electrodes will be completed when a sufficient quantity of gas (usually ambient room air) has become ionized. A sudden discharge across this path will now occur usually resulting in a bright flash or arc. This is very similar to a lightning flash going to earth or the arc between electrodes in a laboratory experiment. In order to prevent this arc from completely developing a solid dielectric barrier is placed in the path between the electrodes. This barrier partially interrupts the conductive path preventing a complete breakdown of the gas. Instead of a hot localized arc, a cooler diffuse glow will occur. This soft violet coloured discharge indicates the incomplete breakdown of the gas and is called a corona. The material the dielectric or barrier is composed of is chosen so that enough current will flow between the electrodes and through it to sustain this corona.

During the treatment process, the web is passed through a high voltage discharge field and is exposed to the bombardment of high-energy particles. This corona field has the potential to break polymer bonds, cause micro-pitting, and deposit an induced surface charge with extremely high levels of strong oxidizing agents onto the web. Any one of or possibly all of these processes can alter the surface characteristics of the material in a way, which enhances the surface adhesion and its ability to accept printing inks, adhesives, coatings, etc.

INSTALLATION

Generator

Mount the generator cabinet vertically on the four wheels in a position leaving at least 300mm on all sides to allow for sufficient cooling and to allow for periodic checking and maintenance of the fan filters.

The generator cabinet should be located in a position that does not allow the operator to interfere with the connections while the unit is running.

Connect the supplied cables. Cables should be attached to the machine frame or run in cable trays so that they cannot become a trip hazard and are out of operators reach.

Connect the Interlock cable / customer connections (PL4) to SKT4. If no customer connections are required pins C & D must be linked in PL4. Connect
rotation sensor (PL2) to SKT2. Connect
customer connections (PL5) to SKT5.
Connect the HT transformer cable(s) to terminals TS3 located in the back of the generator cabinet. This cable must not be lengthened without reference to Corona Supplies.
Connect the Ozone extraction fan cable (optional) to terminals TS4 located above mains filter MF1.
Connect the power supply cable from the main supply to the mains filter MF1. Ensure the generator has a dedicated earth.

HT Transformer(s)

Ensure that the cable from the transformer is correctly connected to the generator. Check that the transformer case is firmly connected to the Treater frame and earthed, and that the high voltage connection is made from the transformer to the electrode.

The transformer should only be operated in the upright position as indicated on the label.

Treater Station

When lifting the treater station it is advised that the lifting eyes / lifting holes are used, as damage may result otherwise.

The treater station must be mounted so that the rolls are in line with the machine rolls. Mount the treater station horizontally between frames using suitable M16 high tensile bolts.

Ensure moving parts are not accessible to operators while the machine is running by guarding accessible rotating parts including base rollers, Nip rollers and rotating shafts.

The pneumatic control box / valve should be connected to a lubricated, filtered air supply with a pressure of between 60 & 100 psi. LPE Assembly units are supplied with a pressure regulator that must be used to reduce the incoming supply pressure to approximately 1 – 1.5 Bar to allow for correct operation of the electrode assemblies.

Electrode air gaps must be checked before operation of the treater station. All electrode units have the discharge air gap set before they are dispatched, however the gap may move out of alignment during transit or installation. See treater station maintenance for air gap setting instructions.
Do <u>not</u> switch the generator power on before rechecking that the air gap is correct.
Failure to follow these instructions could result in damage to the roll covering or the electrode.

Ozone Extraction

Ozone produced by the corona process must be removed from the area by connecting a suitable corrosion resistant extraction fan(s) (usually supplied with the corona system) to the ports provided on the electrode unit which are identified with the following label.

Corrosion resistant ducting must be used in the extraction system, i.e. stainless steel or PVC and it is recommended that the ducting have a smooth bore, to maintain the efficiency of the extraction. The length of ducting between the electrode station and extraction fans should not exceed 5 meters. Any increase on this will result in a decrease in efficiency. The extraction is monitored by an airflow switch(s) on the extraction port which are wired into the generator interlock circuit to prevent start-up of the generators if the extraction is inoperative.

GENERATOR OPERATION

Front Panel Layout

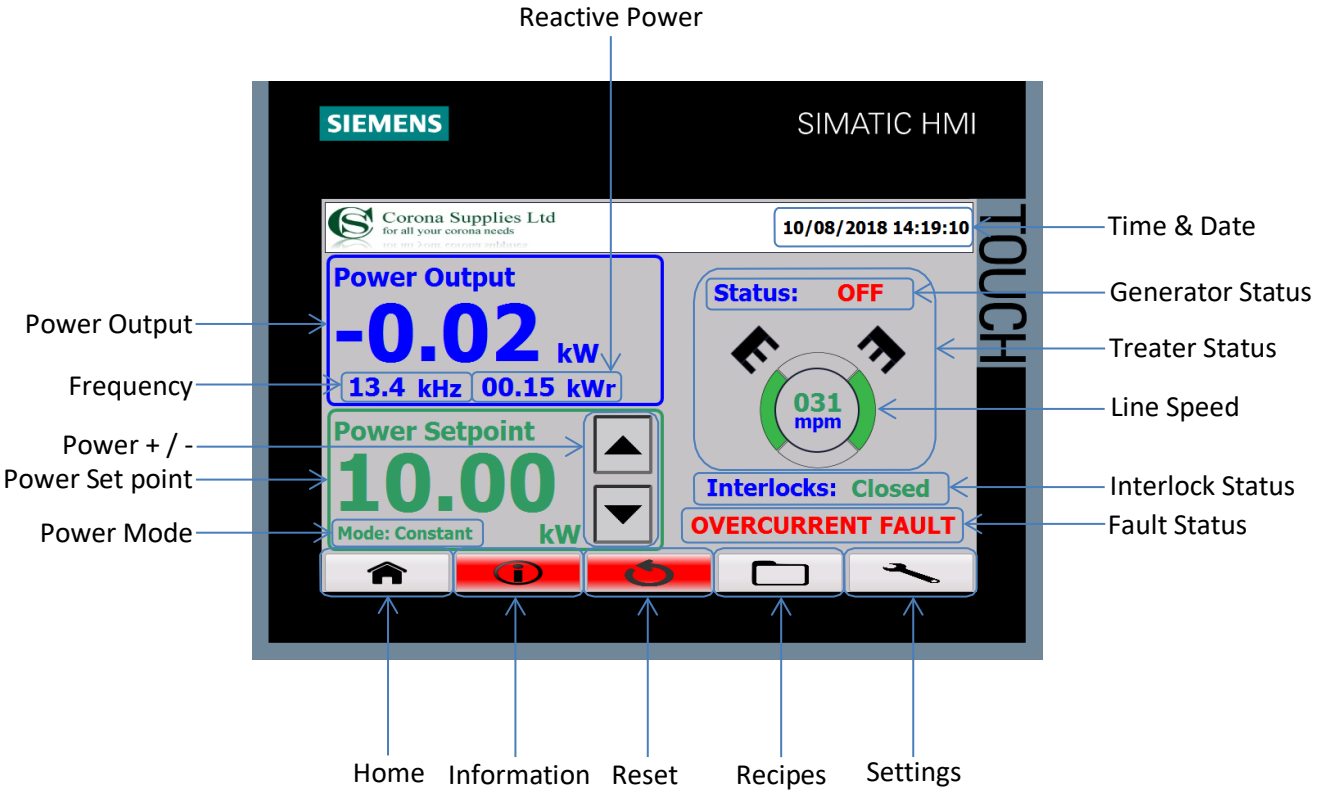
Touch panel – Used to make changes to parameters and show generator information
Stop button – Stops the generator. Red Illumination indicates generator off
Start button – Starts the Generator. Green illumination indicates generator on (flashing indicates generator in standby)

Normal Operation

Switch on the mains isolator on the front door. The mains on lamp should be illuminated and after a few seconds the touch panel should start up
When the Home screen is displayed on the touch panel press the START button. If an extraction fan starter has been fitted (option) the START button will require two presses, first to start the extraction fan and a second to start the generator once the fan is operational and the interlocks have closed.
Set output power as required
Press STOP button to stop treatment

Always use the START and STOP buttons for all normal starting - stopping. Use the mains isolator only as an isolator for prolonged shutdown.

HOME Screen



Power output - Indicates the current output power in kW
Frequency - Indicates the current inverter frequency in kHz
Reactive power - Indicates the current reactive power in kW

Power Set point - Indicates the current power setting. Press the Power +/- "UP" & "DOWN" arrows to change the value.
Power mode - Indicates the current power control method:
Constant - The power is controlled by the user and changed using the Power +/- buttons
Proportional - The power is controlled automatically by the speed of the treater roller.
Watt density - The power is controlled automatically by entering a watt density figure ($W/m^2/min$) and treat (electrode) width (mm).

Generator status - Indicates the current status of the generator:
OFF - Generator stopped
Standby / Skip - Generator on but not treating
ON - Generator on and treating

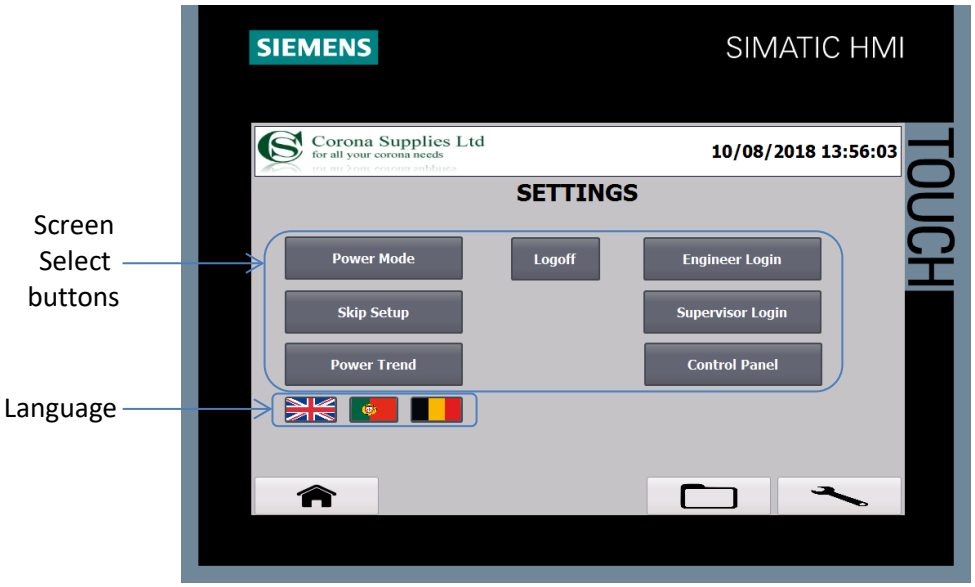
Treater status - Graphical representation of the treater station electrodes, roller and corona status.
Line speed - Indicates the speed of the corona roller in meters / minute. Digits go green when minimum line speed is met

Interlock status - Indicates whether the interlock circuit is open or closed.

Fault status - Displays Fault conditions:
Power warning, Overcurrent, Mismatch or Over temperature
Information button will change to RED indicating help is available by pressing the button. Also see fault finding guide within this manual.

SETTINGS Screen

The settings screen allows operators to change various machine parameters.
Access this screen by pressing the settings button in any screen.



Power mode - Press to enter the power mode screen.

Skip setup - Press to enter the skip / treat setup screen.

Power trend - Press to enter the power trend screen.

Supervisor Login - Press to enter the supervisor menus. Username and password required.
Username – supervisor / Password = 123456

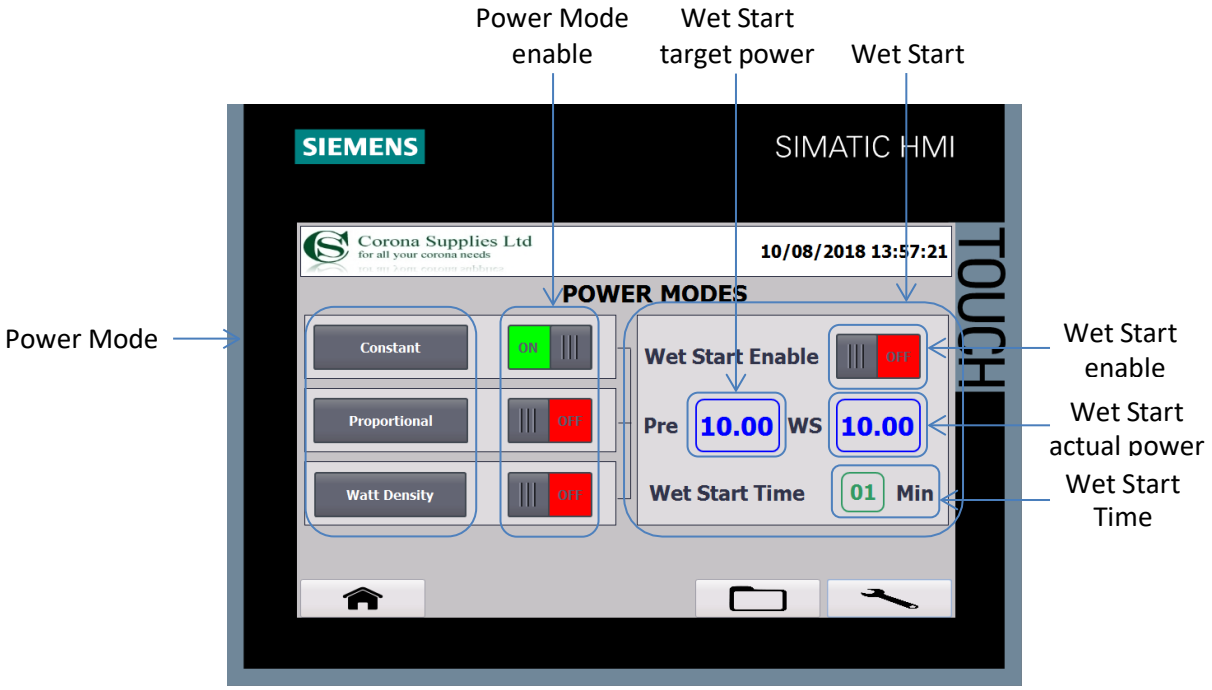
Engineer Login - Press to enter the engineer menus. For Corona Supplies Use Only.

Logoff - Press to log off from the supervisor or engineer menus. Automatic Logoff will occur after 5 minutes.

Language - Press the corresponding flag to select the desired language for all screens.

POWER MODE Screen

The power modes screen allows the operator to change the power level, power control method and to setup, enable & monitor the wet start cycle. Access this screen by pressing the power mode button in the settings screen.



Power mode - Press to enter the corresponding power mode settings (see power modes).
Power mode enable - Press to enable the desired power control method.

WET START

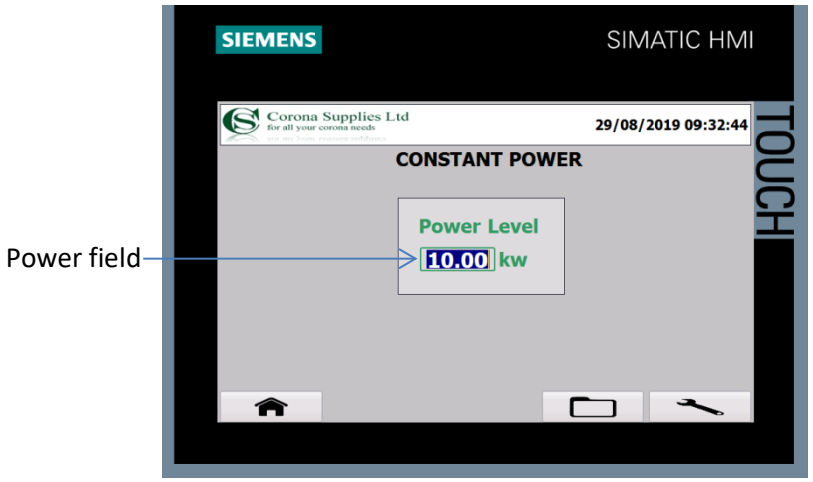
Increases the output power gradually over a set period of time. Use this function when high humidity is present and / or the corona system has been idle for an extended period of time.

Wet start enable - press to enable the wet start cycle. After the cycle has completed the wet start will switch off.
Wet start time - Press to enter the desired wet start time.
Wet start target power - The power set by the current power mode.
Wet start actual power - Current power of the wet start cycle which will increase to the target power over the set time.

POWER MODES

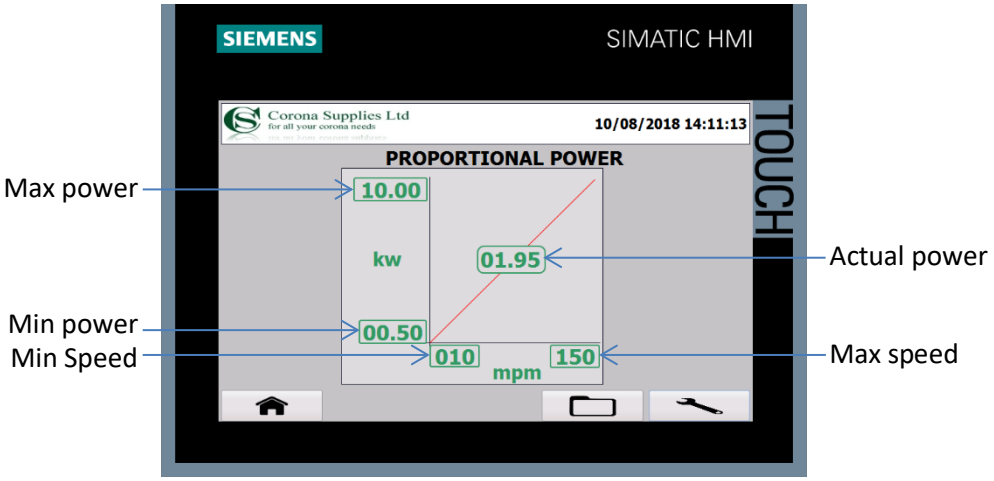
Constant Power

The power is controlled by the user and changed using the Power +/- buttons on the home screen. The power can also be set by entering the required value directly in the power level field in the constant power screen.



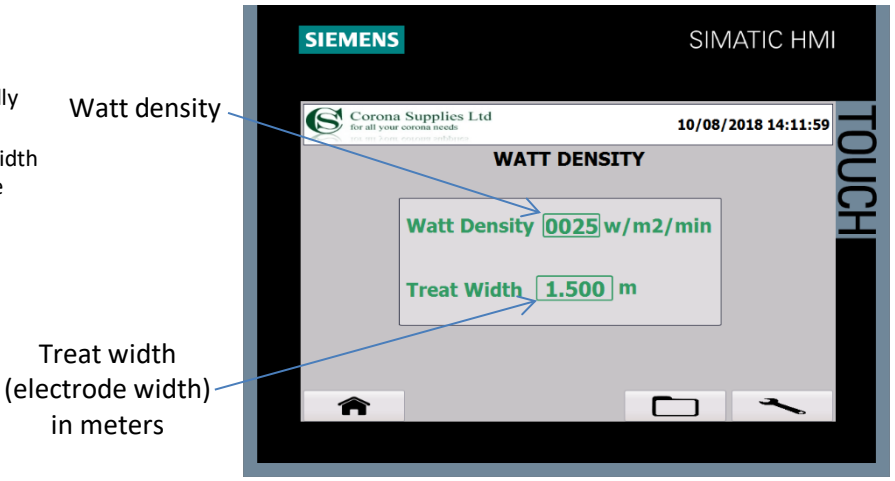
Proportional Power

The power is controlled automatically by the speed of the treater roller. The power will change linearly between the set values. Enter the required values in the corresponding fields.



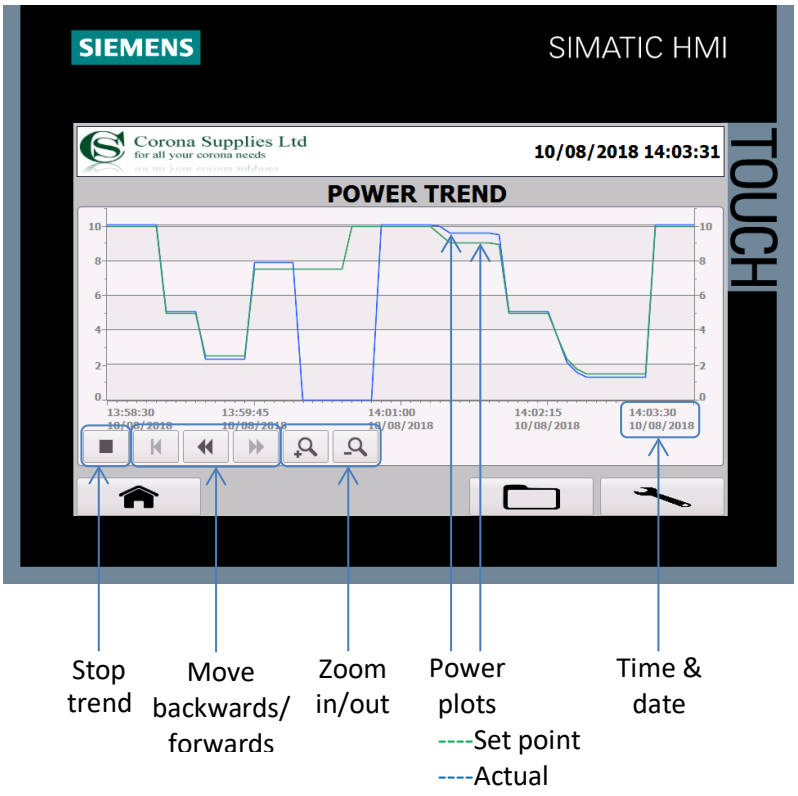
Watt Density

The power is controlled automatically by entering a watt density figure ($W/m^2/min$) and treat (electrode) width (m). Enter the required values in the corresponding fields.



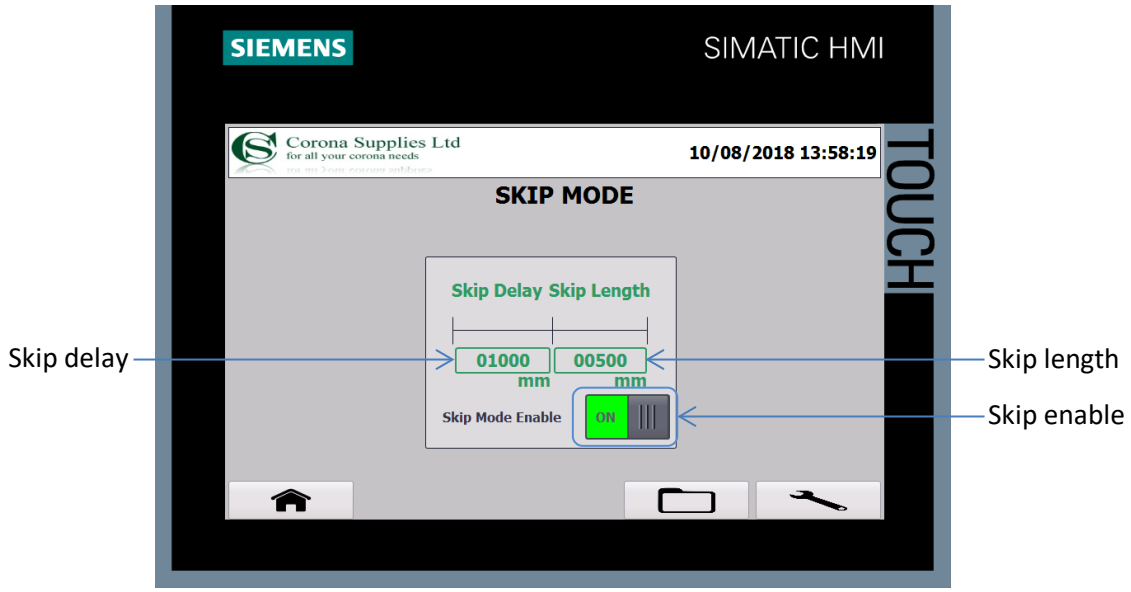
POWER TREND Screen

The power trend monitors the actual power output against the power set point allowing operators to identify problems with the treatment. Access this screen by pressing the power trend button in the settings screen.



SKIP MODE Screen

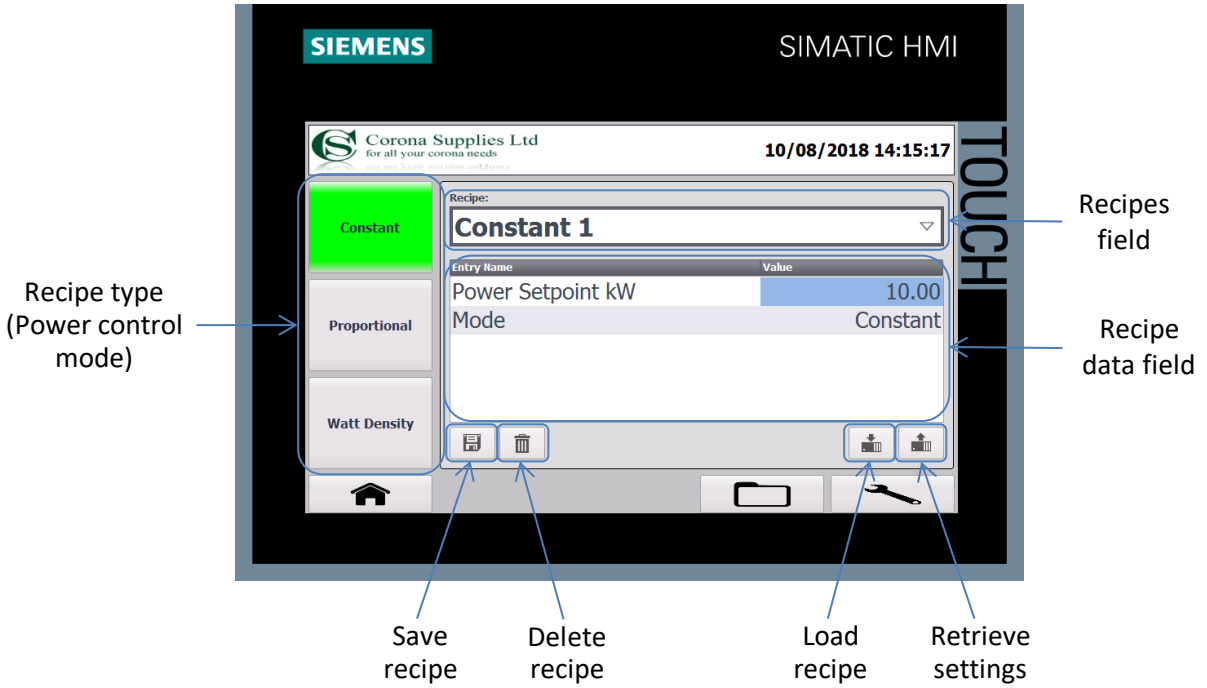
Skip mode is used when parts of the web along its width must be untreated e.g. heat-sealing bags. Skip mode allows the corona to switched on and off very quickly. Access this screen by pressing the skip mode button in the settings screen.



Skip enable – Press to enable skip
Skip delay – distance in mm from the skip detection to the point at which the skip starts (corona off).
Skip length – distance in mm of the untreated portion of web.

RECIPES Screen

Recipes allow the operator to store multiple settings for different materials and then retrieve them when required.
Access this screen by pressing the recipe button in the any screen.
NOTE: An SD memory card must be present in slot X51 in the rear of the touch screen to enable recipes to be saved. An SD card is supplied installed with all units.



Recipe type – Power control mode under which the recipe will be stored
Recipes – Allows the entry of a new recipe name & shows the list of recipes stored in memory.
Recipe data field – Shows the recipe settings.
Retrieve settings – Uploads current generator settings to recipe data field which can then be saved to memory.
Load recipe – Press to load the recipe data / selected recipe to the generator.
Save recipe – Press to save current recipe data to memory (under recipe name).
Delete recipe – Press to delete current recipe

Recipe data can be entered and then stored either by being retrieved from the current generator settings or by entering the settings directly into the recipe data field.

To store a recipe from current generator settings
When the generator settings have been finalised, power, control mode, etc. they can be stored.
1 – Press the retrieve recipe button to upload the current generator settings.
2 – Press the recipes field and enter the name for the recipe followed by the return key.
3 – Press the save recipe button.

To store a recipe by entering the settings directly
The recipe settings can be stored by entering the settings directly into the recipe data field. This allows recipes to be added without having to change the current generator settings.
1 – Press the relevant recipe type (power control method) and enter the settings directly into the recipe data fields.
2 – Press the recipes field and enter the name for the recipe followed by the return key.
3 – Press the save recipe button.

To load a recipe into the generator

Saved recipes can be loaded into the generator to enable a quick setup. NOTE the correct power control mode should be selected in the main power control menu before loading a recipe. Ensuring the correct power control mode is selected will automatically select the correct recipe type (power control mode) in the recipe screen.

1 – Ensure the correct recipe type (power control mode) is highlighted.
2 – Press the arrow in the recipes field to display the stored recipes and select the correct recipe for the job.
3 – Ensure the correct settings are displayed in the recipe data field.
4 – Press the load recipe button.
5 – Return the home screen to ensure the recipe has been loaded into the generator.

To delete a recipe from memory

Recipes no longer required can be deleted from the memory.

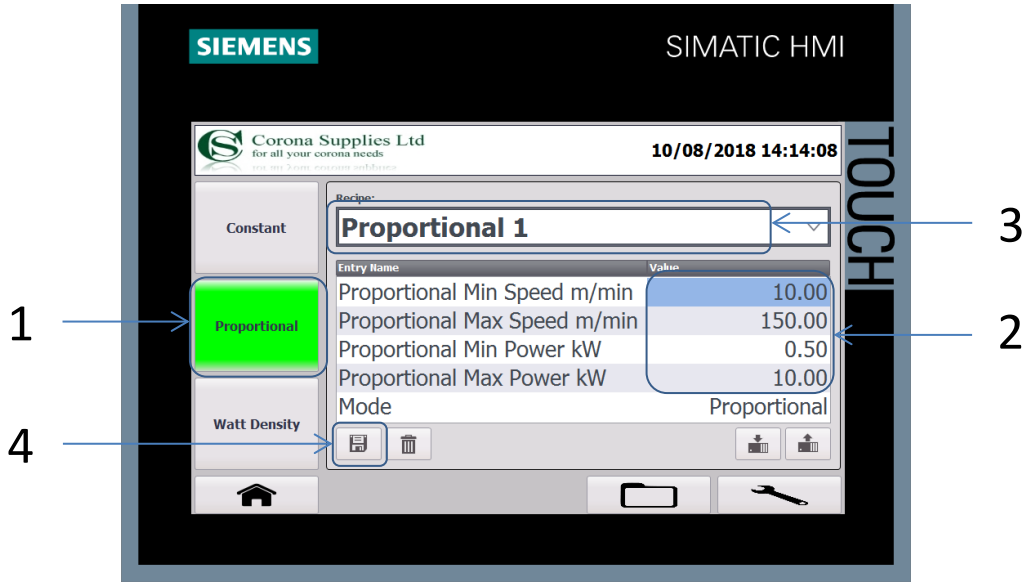
1 – Select the recipe type (power control mode).
2 – Press the arrow in the recipes field to display the stored recipes and select the recipe to be deleted.
3 – Press the delete recipe button.
4 – Press the YES button in the pop up box to confirm the deletion of the recipe.

Example

The example below explains how to directly enter the settings for a recipe (Proportional 1) that will be used for a job running in proportional power control mode (power varies with speed), save it and then load it into the generator.

Enter settings & save recipe

1 – Select the recipe type (power control mode).
2 – Enter the settings required in the recipe data field by selecting each setting and entering the required value.
3 – Press the recipes field and enter the name for the recipe followed by the return key.
4 – Press the save recipe button.



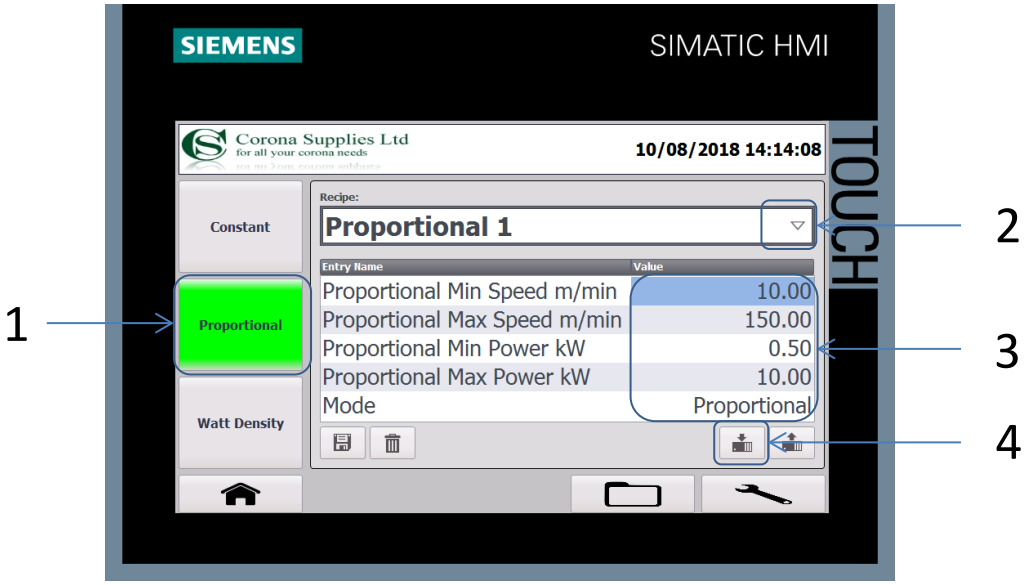
Select recipe & load to generator

1 – Select proportional power control mode in the main power control menu (see page 12). The correct recipe type (power control mode) is automatically highlighted.

2 – Press the arrow in the recipes field to display the stored recipes and select the correct recipe (Proportional 1).

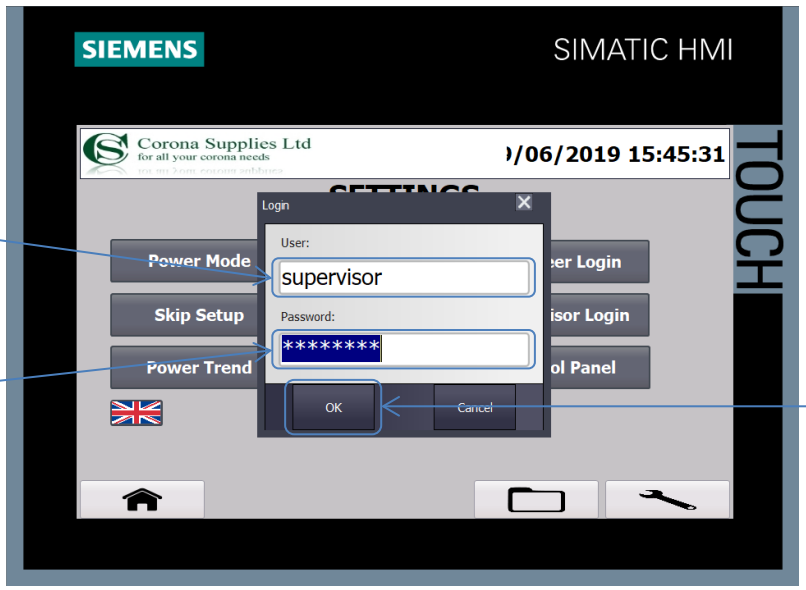
3 – Check the values in the recipe data field are correct.

4 – Press the load recipe button.



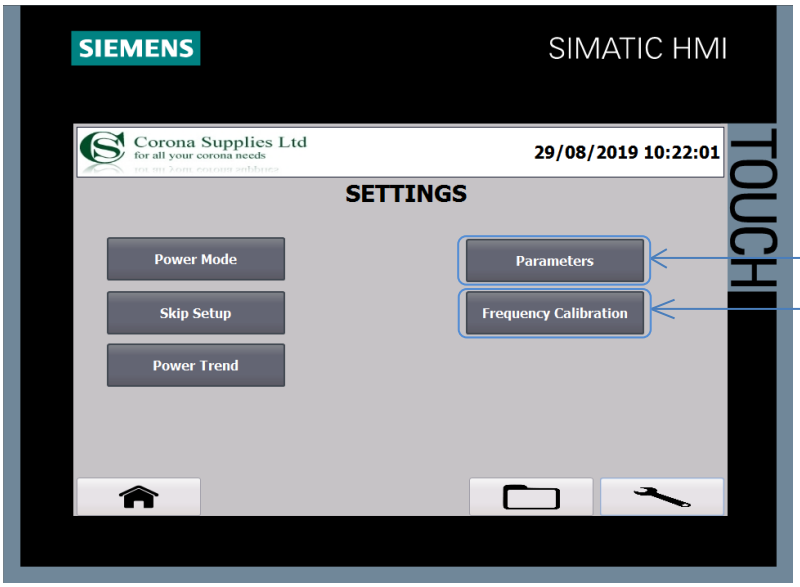
Supervisor menu

Limited machine parameters can be changed and adjustments made in the supervisor menu.
Access the supervisor menu by pressing the supervisor login button in the settings screen.



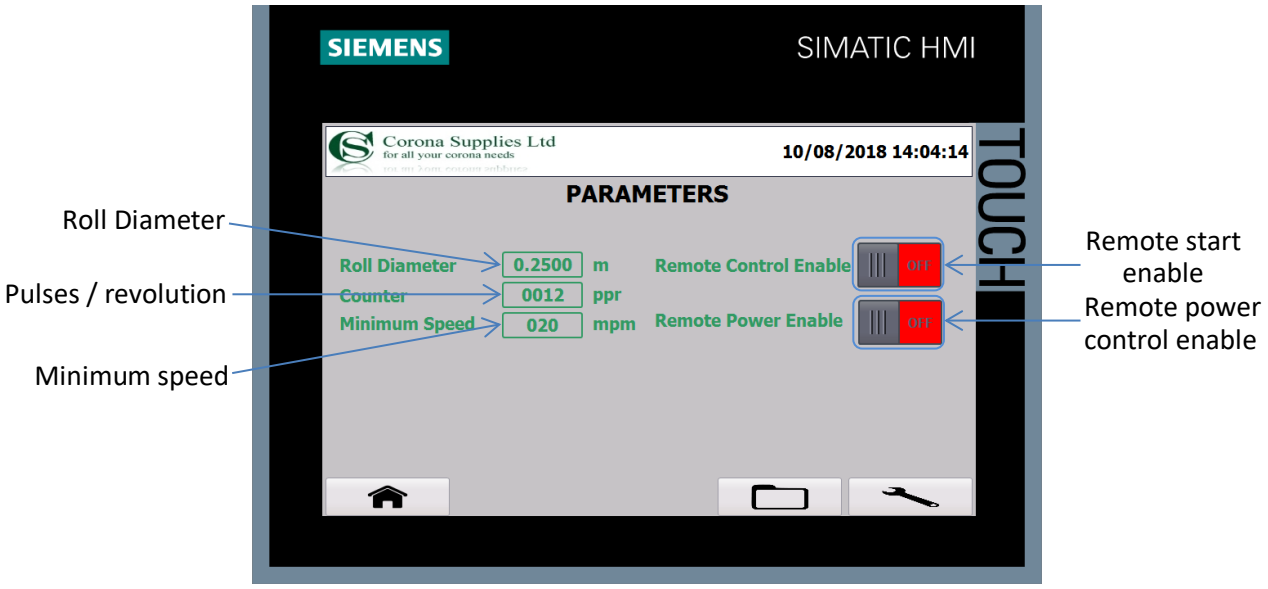
To enter the supervisor menu
1 - Press user field (keyboard popup), enter user name then press return key.
2 - Press password field (keyboard popup), enter user password then press return key.
3 - Press OK button
4 - Press Supervisor login

Supervisor settings



Parameters - Press to enter the supervisor parameters screen where limited machine parameters can be adjusted.
Frequency calibration - Press to enter the frequency calibration screen. Used for system matching & manual frequency control.

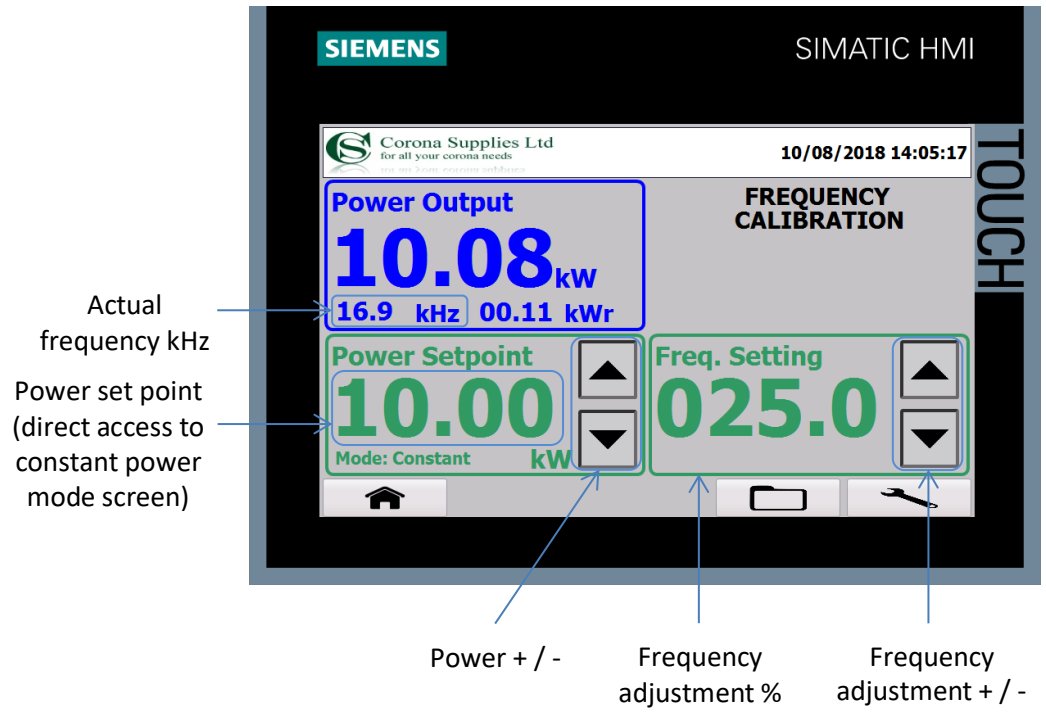
Parameters screen



Roll Diameter – Diameter of the treater roller (meters)
Pulses / revolution – Number of pulses the inductive sensor detects per revolution of the treater roller
Minimum Speed – The line speed (meters per minute) that the corona will start
Remote Start enable – Enables the customer remote start input (connection on SKT4)
Remote Power control enable – Enables the customer remote power set point input (connection on SKT4)

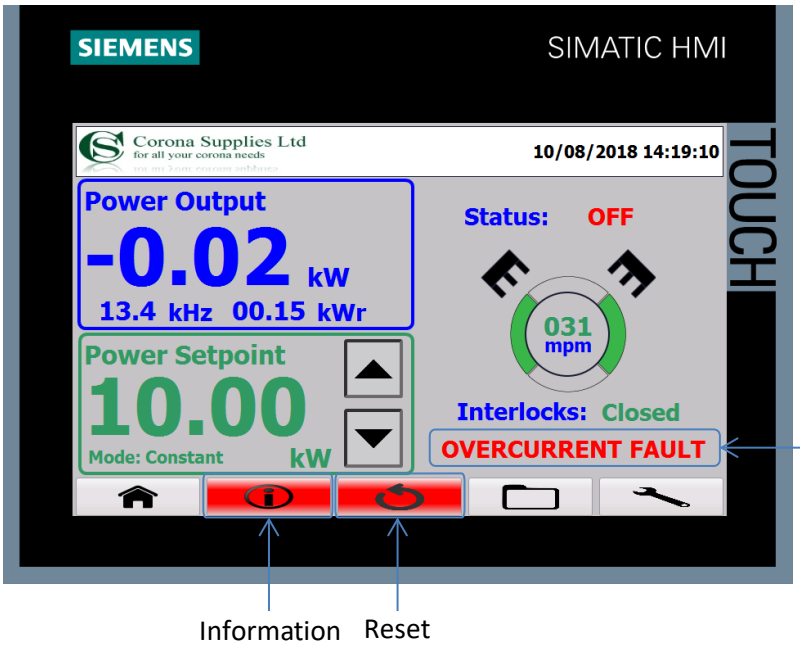
Frequency calibration screen

Frequency calibration is used to match the generator to the treater station or when manual frequency control is required. NOTE: frequency calibration will have no effect when the generator is running into automatic frequency mode. **Frequency calibration should only be used under the direct instruction of Corona Supplies engineers.**



FAULT

When a fault is detected the generator will shut down to prevent damage to the generator and treater station. The fault is displayed on the home screen, information and troubleshooting advice on the fault is available by pressing the information button. When a fault occurs the reset button must be pressed before the generator can be restarted.

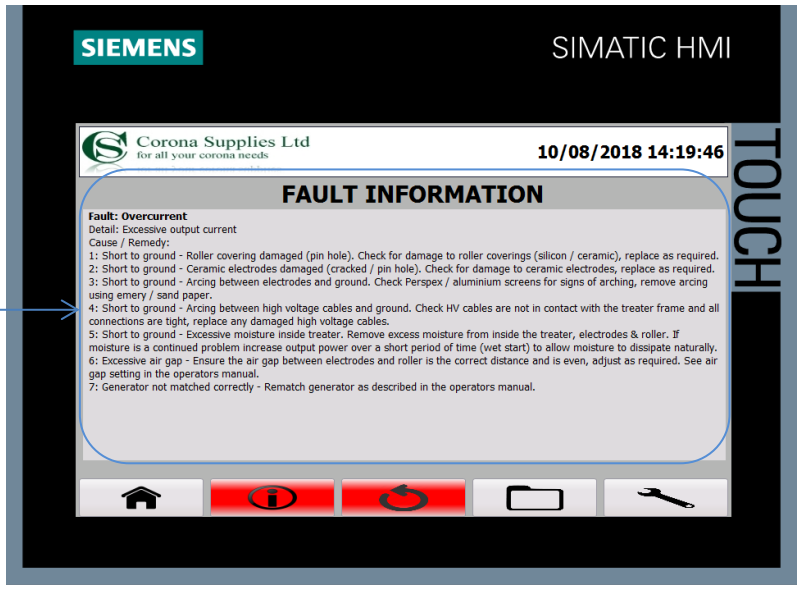


Fault Status

Over Current - Excessive output current.
Mismatch - Excessive reactive power.
Inverter over temperature - Excessive inverter temperature
K1 not energised - Contactor K1 not energised.
K2/K3 not energised - Contactors K2 & K3 not energised.
Power Warning - Actual output power not equal to set point power. NOTE: Does not shut generator down.

Information - When a fault occurs the information button will change to RED indicating help is available by pressing the button. Also see fault finding guide within this manual.
Reset - Press to clear a fault condition. Reset must be pressed before the generator can be restarted.

Example of fault information and troubleshooting advice



Fault conditions & troubleshooting guide

Fault condition	Cause		Remedy
Overcurrent / Mismatch	Short to ground	Roller covering damaged (Pin hole).	Check for damage to roller coverings (silicon / ceramic), replace as required
		Ceramic electrodes damaged (cracked / pin hole).	Check for damage to ceramic electrodes, replace as required
		Arcing between electrodes and ground	Check Perspex / aluminium screens for signs of arcing; remove arcing using emery / sand paper
		Arcing between high voltage cables and ground	Check HV cables are not in contact with the treater frame and all connections are tight; replace any damaged high voltage cables
		Excessive moisture inside treater	Remove excess moisture from inside the treater, electrodes & roller. If moisture is a continued problem increase output power over a short period of time (wet start) to allow moisture to dissipate naturally
	Excessive air gap		Ensure the air gap between electrodes and roller is the correct distance and is even, adjust as required. See air gap setting in the operators manual
	Generator not matched correctly		Rematch generator as described in the operators manual
Over-temperature	Cooling fan failure		Check inverter and cabinet (if fitted) cooling fans are rotating correctly, if not check fans are free to rotate, check fuse FS2
	Filters blocked		Check door filter is clear.
	Generator not matched correctly		Rematch generator as described in the operators manual
	Faulty thermal switch		Check thermal switch located on inverter heat sink assembly is ok and connections are tight
K1 not energised	Inverter Control circuit board fault		Check relay K4 located on circuit board (see circuit diagram CSR inverter control relays)
K2/K3 not energised			Check relay K4, K5, IC33 located on circuit board (see circuit diagram CSR inverter control relays)
Power Warning	Actual power output is not equal to set-point power		Check the air gap between the electrode and roller is set correctly (refer to operating manual)
			Check the high voltage transformer taping is set correctly (refer to operating manual) Check the generator is matched correctly to the treater station (refer to operating manual)
			Check the material being treated is suitable for the treater station and generator

Maintenance

To ensure the trouble free operation of your corona treater some regular maintenance is required. This will extend component life and lead to less down time.

! Warning !

The voltages inside the corona treater can exceed 10,000 volts; the generator must therefore be switched off & isolated from the mains supply before any work is carried out on the corona treater or generator.

Ceramic electrodes can reach temperatures in excess of 150 ^{o}C during operation. Any work inside the corona treater station should only be carried out after the electrodes have had time to cool. The corona must be stopped and the extraction fan left running for approximately 5 minutes before any work commences.

If in any doubt contact Corona Supplies service department for assistance

Corona Supplies Ltd
UNIT G
Howland Road Business Park
Thame
OX9 3GQ

T: +44 (0) 1844 261779
F: +44 (0) 1844 358187
E: service@coronasupplies.co.uk
W: www.coronasupplies.co.uk

EXHAUST / COOLING FANS / FILTERS

Fans and filters should be kept clean to ensure the power supply does not overheat

MONTHLY	6 MONTHLY
Check filters are clean. Remove any contamination with a vacuum or remove the filter media from its housing and blow out contamination with a compressed airline.	Check exhaust / cooling fans are rotating freely. Fans that are “noisy” or rotating slowly should be replaced. Remove any build-up of contamination from inside the power supply enclosure using a soft brush or compressed airline.

SAFETY INTERLOCKS

The interlock circuit should be checked regularly to ensure correct and safe operation of the corona system. Failure to carry out these checks may leave the system unsafe.

MONTHLY
Check each interlock switch is working correctly and is securely fastened to the corona treater framework, door or window. When an interlock switch is opened the corona should stop immediately. Switches are fitted to opening doors & windows and the ozone extraction system), there may also be an emergency stop button mounted close to the corona treater station. Note that the ozone extraction airflow switch will only stop the corona and NOT the rotating rollers. SEE “CIRCUIT DIAGRAM - TREATER INSTALLATION” DRAWING THAT WAS SUPPLIED WITH YOUR CORONA SYSTEM FOR MORE INFORMATION.

Warranty & after sales service

All our products are warranted for 12 month from invoice date within the underwrite conditions:

Complete replacement of any mechanics or electrics parts not properly functioning.

This replacement will be accomplished only to the following condition:

a) We are quickly informed by phone or email about a fault on our machinery, specifying equipment plate data and if possible component characteristic and identifier.

b) The faulty and/or malfunctioning material to be returned to our office within 30 days from receiving new spare parts. If within this time we don't receive the faulty part we will be obliged to charge the required.

c) Will be verified by our technicians that the component is truly faulty.
Otherwise if the damage is caused by improper equipment use or there is evidence of tampering with tools and/or unauthorized personnel or the equipment has not been used in accordance with the instruction manual, we wil not be liable for damages and parts will be charged.

d) The freight will be charged to customer.

The warranty doesn't cover technician's costs for replacement and/or spare parts installation supplied, so this cost will be charged and invoiced in the usual way.

THIS EQUIPMENT WAS SUPPLIED TO YOU BY:

Corona Supplies Ltd
for all your corona needs

Unit G
Howland Road Business Park
Thame
Oxon
OX9 3GQ. UK. Telephone: +44 (0) 1844 261779
Fax: +44 (0) 1844 358187
E-mail: sales@coronasupplies co.uk

FOR FURTHER ASSISTANCE, PARTS OR SERVICE

PLEASE CONTACT US IMMEDIATELY

THANK YOU