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 GENERATORS

CS110R TO CS200R

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

1 Introduction

2 Specification

3 Installation

3.1 Generator

3.1.1 Mains Input
3.1.2 SK2 - Rotation sensor
3.1.3 TS3 - HT Output to Transformer
3.1.4 SK4 - Interlocks/Air Flow Switch
3.1.5 PL5 - Alarm Circuit
3.1.6 Remote/Computer Interfacing

3.2 H.T. Transformer

4 Operating Equipment

4.1 Initial Switch On

4.1.1 Operating procedure

4.2 Normal operation

5 Matching the Generator to the Load

6 Routine Maintenance

7 Circuit Description

7.1 Circuit Overview

7.2 Power Supply

7.3 Major Interlocks

7.4 Minor Interlocks

7.4.1 Line Speed
7.4.2 Positive and Negative Mismatch
7.4.3 Current Trip
7.4.4 Auxiliary Shutdown

7.5 Power Control

7.5.1 Manual
7.5.2 Proportional
7.5.3 Remote

7.6 Pulse Width Modulation (PWM) Circuit

7.7 True and Reactive power Measurement

7.8 Remote

8 Trouble Shooting & LED Arrays & SW1, SW2 & SW3 positions

8.1 Circuit breakers

8.2 Inverter Overtemperature

8.3 Tripping

8.3.1 Poor match
8.3.2 Incorrect gap
8.3.3 Fault in electrode unit
8.3.4 LED, SW1, SW2 & SW3 Positions

9. Parts Lists

10. Drawings

SECTION 1

INTRODUCTION

The CSR range of generators has been developed to provide repeatability and accuracy to corona treatment applications, and, by using the most current technology in power semiconductors to maximize the efficiency of the corona treatment system.

The corona treatment equipment consists of three main parts;

a. Generator
b. HT Transformer
c. Electrode Station

The generator/inverter converts power from the mains input supply to a high frequency supply for production of the corona.

The HT transformer converts the generator/inverter output voltage to a sufficiently high voltage to produce corona discharge at the electrode.

There are various tapings on the HT transformer in order to obtain optimum matching of the generator to the electrode station (i.e. maximum efficiency, minimum power loss).

The electrode station consists, basically, of an earthed plane (the base roll), and insulating dielectric (the base roll coating, or in the case of a bare roll treater, the electrode material), an air gap, and a high voltage plant (the electrode). The corona is formed in the air gap between the electrode and the base roll when a high frequency voltage of sufficient level is applied to the electrode.

SECTION 2

SPECIFICATIONS

OPERATING PARAMETERS

MODEL CSR	**120**	**130**	**150**	**180**	**200**
TREATMENT POWER	12kW	13kW	15kW	18kW	20kW
INPUT AMPS/PHASE	25.8	27	33	34	40
INPUT FREQUENCY	50/60 Hz	50/60 Hz	50/60 Hz	50/60Hz	50/60 Hz
INPUT kVA MAXIMUM	17 kVA	18 kVA	21 kVA	24 kVA	28 kVA
MAXIMUM OUTPUT VOLTS RMS	600	600	600	600	600
OUTPUT AMPS RMS	48	54	60	68	75
OPERATING FREQUENCY	10-25kHz	10-25 kHz	10-25 kHz	10-25 kHz	10-25 kHz

SECTION 3

INSTALLATION AND CONNECTION OF EQUIPMENT

3.1 Generator

Mount the generator cabinet vertically on the four wheels in a position leaving at least 300mm on all sides to allow sufficient cooling and to allow 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.

3.1.1 MF1 - Mains Supply

Connect the power supply cable (customer supply) from the main supply directly to the mains filter MF1

3.1.2 SK2 – Rotation Sensor

Socket SK2 takes a 3-core cable and plug for the speed rotation sensor.

3.1.3 TS3 - Output to HT Transformer

The cable supplied with the equipment should be used for generator connection to the HT Transformer. This cable must not be lengthened without reference to Corona Supplies. The current flowing in the cable is75 Amps r.m.s. maximum and r.m.s. voltage will not exceed 600 Vac.

Due to the high operating frequency of the inverter, this cable must not be located in steel conduit as the eddy currents induced will reduce the effective inverter treatment power.

3.1.4 SK4 – Interlocks / Customer connections

INTERLOCKS

All the treater interlocks (which detect if any windows / covers are open or if extraction has failed etc.) are wired between pins A and B of SK4.

Further customer defined interlocks or a momentary normally closed STOP switch may be wired between pins C and D. If not required connect a link between pins C and D.

Breaking the link between A and B or C and D will turn the generator off. To re-start the generator again, the START button must be depressed.

Remote START may be installed by connecting a non-latching normally open switch across pins E and F

3.1.5 PL5 – Alarm Circuit

This generator has been fitted with both high and low alarm relays whose contacts are closed under the following condition:-

High Alarm: True power exceeds set limit

Low Alarm: True power is less than set limit

In addition both relays are closed if for any reason the power is disconnected.

The high alarm contacts are connected between pins A and B and low alarm between pins C and D. The inputs are protected with 500mA fuses. 240v AC is available all the time.

3.1.6 Remote/Computer Interfacing

With this option, the generator may be monitored and controlled remotely via 4-20mA and 0-10v opto-isolated inputs and outputs are provided, as well as STOP, START, RESET and SKIP inputs. Volt free contacts provided status indicating of the generator for rapid and accurate fault diagnosis.

A REMOTE/LOCAL SELECT input allows the user to select remotely whether the generator is to be controlled from the generator or from the remote station.

Details of the interfacing may be obtained on request.

3.2 H T Transformer

Ensure that the cable from the transformer is correctly connected to the generator. Check that the transformer case is firmly connected to the electrode case 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.

SECTION 4

OPERATING THE EQUIPMENT

In order to obtain optimum treatment from the system it is necessary to optimize the match between the generator and electrode system. This is achieved by selecting the correct tap on the H.T. Transformer (Section 5).

4.1 Initial switch On

Check that all connections have been made as described in Section 3.

4.1.1. Operating Procedure.

1. Switch on the mains isolator on the door, the mains on LED, the shutdown and low alarm LED's will light.

2. Turn output power control to minimum.

3. Close the electrodes and start the ozone extraction fans. This will illuminate the interlock closed LED.

4. When the electrode unit base roll is rotating the up to speed LED will illuminate.

5. Press the start button, the shutdown LED will go out, and after a two second delay the output will be enabled.

6. Turn output control to maximum, the treat on LED will light.

7. Switch the true (kW)/reactive switch to reactive and adjust the frequency control until a zero reading is obtained on the digital display. Switch back to true (kW) position and adjust output control to the required power level. Recheck the reactive power is zero and adjust as required.

If the following LED's do not illuminate, carry out the suggested checks.

MAINS ON	- Check Mains input supply voltage.
INTERLOCKS CLOSED	- Remove SKT4 and check for continuity between pins A and B (electrode interlocks) and pins C and D (customer interlocks and external stops).
UP TO SPEED	. Rotation sensor is fitted. . Electrode rolls are turning. . Line speed circuit is calibrated. . If UTS facility is not required, override using SW3-B (up = override).

If full output power is not available, it is probably due to the generator not being correctly matched to the treater.

(See Section 5 for matching).

If the POSITIVE MISMATCH or NEGATIVE MISMATCH indicators light, then in the same way, increase the tap for negative mismatch, reduce the tap for positive mismatch.

Operate the RESET switch to reset the MISMATCH indicators.

If, as the power is increased the red 'TRIP' LED comes on, (see Section 5) operate RESET switch.

Check that the INTERLOCKS CLOSED LED extinguishes if the interlocks circuit is broken.

4.2 Normal Operation After Initial Checks

. Switch on the mains isolator on the front door. The mains on and low alarm and shutdown LED’s should be lit.

. Depress the START button.

. Set OUTPUT POWER demand potentiometer to required level.

. Depress 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.

SECTION 5

MATCHING THE GENERATOR TO THE ELECTRODE

It is essential that the generator and electrode unit are matched to achieve maximum efficiency and to maintain correct generator operation.

The generator has been designed to operate within set limits of inverter voltage, current and frequency. If the matching is incorrect, the generator will limit the treatment to the load to ensure that the inverter always operates within its safe operating area.

As high currents flow in the output cables, it is essential that all connectors and mating surfaces are clean and that connections to the transformer are tight and locked using spring washers.

It should be possible to obtain satisfactory matching of the generator to the load simply by selecting the correct tap on the H.T. transformer and by frequency adjustment, by following the procedure in steps 1 to 11 listed below.

1. Press STOP button
2. Switch off isolator on door
3. Set the electrode gaps required, but not exceeding 2mm
4. Remove the terminal cover from the HT transformers
5. Connect the earth wire to the stud marked 'E'
6. Connect the two black wires to Tap 1
7. Connect the blue/brown wires to Tap 7
8. Switch on and set Power potentiometer to maximum.
9. Adjust frequency potentiometer to point where reactive power reads zero, and note the true power reading
10. If maximum power not achieved then proceed with step 11
11. Switch generator off and move blue/brown wires to the next lower tap and repeat steps 8 and 9 to determine the tap which gives the maximum output.

Frequency adjustment sets the optimum True Power and Reactive Power values. At best match the Reactive Power should read zero. Note that as the frequency passes optimum the Reactive Power will change polarity.

SECTION 6

ROUTINE MAINTENANCE

All maintenance should be carried out with the mains supply disconnected from the system.

Replace the air filter element regularly and remove any dust from within the cabinet by blowing with clean dry air. The generator has been designed for long life and reliability, but an excessive build-up of dirt on the air filter will compromise both these qualities and may trip the thermal switches, resulting in a loss of treatment.

1. Replace any defective LED'S.

2. Check speed circuit operation. See Section 7.4.1

3. Check that all cooling fans are rotating and impellers are clean.

4. Check all output cables for damage.

5. Check alarm circuit for correct operation, i.e., alarm LED out when digital meter reading is within the limits set by low and high controls and alarm LED lit when digital meter reading is outside the limits set by low and high controls.

6. Check that all plugs and sockets are tight.

7. Clean inside of generator compartment, checking tightness of all electrical connections.

8. Remove filters and clean. Replace any filters that are damaged.

9. Clean outside of generator.

CUSTOMER MAINTENANCE AND INSPECTION PROCEDURE

GENERATOR CHECK LIST

		MAINTENANCE INTERVAL				
No	CLEAN	Daily	Weekly	2 Weeks	Monthly	3 Months
1	All LED's light up		☼			
2	Speed circuit operation		☼			
3	Rotation of fan		☼			
4	All output cables for damage				☼	
5	Alarm operation (where fitted)			☼		
6	Tighten plugs and sockets				☼	
7	Tighten screws and nuts					☼

		MAINTENANCE INTERVAL				
No	CLEAN	Daily	Weekly	2 Weeks	Monthly	3 Months
1	Filters				☼	
2	Outside of generator cabinet					☼
3	Inside of generator cabinet					☼

SECTION 7

DESCRIPTION OF CIRCUIT OPERATION

7.1 Circuit Overview

The mains passes through a mains filter for EMC requirements.

On operation of the mains isolator on the door, the fan starts and power is fed into the CSR Inverter Control PCB via T1 transformer.

If all the interlocks conditions are met, depressing the START BUTTON will operate K1 and after a short delay K2 and K3.

The mains is rectified by BR1, creating a DC rail of 330V ±30V.

The inverter switches this voltage creating a 660V ± 60V square wave at its output. L1 smooths the output and C2 decouples it.

Feedback control and power measurement is achieved via CT2, the output current transformer and T2.

To assist the description, the control relays on the inverter control PCB will be denoted by a lower case k, and the relays mounted on the chassis plate by an upper case K.

7.2 Power Supply

The CSR Inverter Control PCB is powered via T1, which has four independent outputs. These enter the PCB by TB10. When rectified this produces four 24 Vdc supplies.

. 24V(A) powers the auxiliary circuits:

Interlocks
Skip/Treat Sensor
Rotations Sensor
Indicators on Door

. +24V(B) and -24V(B) are regulated to produce a dual ±15V (B) board supply, used to power all the analogue circuits.

. 24V(C) powers the computer interface circuits.

7.3 'Major or Hard' Interlocks

Refer to the overall circuit diagram and the relay circuit. The interlocks are powered from 24V(A) via SKT4. If all the treater interlocks (door switches, air flow switches etc.) are closed then 24V flows through the external STOP switch (normally closed) and the local STOP switch and enters the Inverter Control PCB at TB1.5.

If all the interlocks and stop switches are closed k6 will operate and the INTERLOCKS CLOSED LED will illuminate. If none of the thermal switches have opened, k7 will operate.

The generator is now in a standby state. On depression of the START button, K6 closes and a contact from this closes K1, after a short delay to allow C1 to charge up, K4 and K5 close and contacts from these close K2 and K3 allowing full power to the inverter.

If any of the interlock switches, stop switches or thermal switches open, then the interlock relay K6 will de-energise and this will then remove the 24 volt supply to K4, K5 and K6 relays and in turn will then de-energise K1, K2 and K3 relays and disconnect the supply to the inverter and the output.

To restart the generator, the fault must be remedied and the START button depressed again.

7.4 'Minor or Soft' Interlocks

There are a number of interlocks which prevent the generator from producing an output only while the fault condition exists. It is not necessary to depress the START button again after these faults.

7.4.1 Line Speed

A proximity detector is connected to SKT2 to detect the line speed.

The pulses are converted into a dc signal which is normally set to 10V at full line speed, by adjusting RV6 until LED2-J and LED3-A are both flashing at the same rate. SW3-A (normally in the up position) is used to select ranges (3-23Hz or 17-380 Hz). If the line speed signal drops below the voltage (UTS limit), k10 de-energises and a NOT UP-TO-SPEED signal is produced.

Adjustment of the minimum Up To Speed level is adjusted by RV13.

7.4.2 Positive and Negative Mismatch

If the reactive power exceeds a preset value of the full rated output power of the generator, then the positive or negative mismatch relays will operate, depending on the sign of the reactive power signal. For analysis of this fault condition see Section 8.

Although the fault signals produced by these circuits last only as long as the fault, the mismatch and shutdown indicators remain on until the reset switch is operated.

7.4.3. Current Trip

CT2, detects an overcurrent on the inverter output. This would occur should the output become short circuited, or if all the IGBT's turned on at the same time. The output of CT2 turns off the output extremely rapidly for a severe overload.

7.4.4. Auxiliary Shutdown

An additional shutdown pin, TB6.6, has been incorporated to allow for any other 'soft' interlocks, one of the gates of IC36 will go high and a shutdown signal will appear on pin 13, causing the pulse width modulation (PWM) circuit to turn off all the IGBT's. When the shutdown signal returns to a low again, the (PWM) circuit goes through a soft-start whereby the output slowly increases to its normal value, allowing time for continued faults to be detected prior to full power being delivered to the treater. The shutdown indicator will remain on until the reset switch is operated.

7.5 Power Control

The power demand signal is 0-10V for min - max output power. One of three methods of control is selected by SW2:

. Manual, (switch fully anticlockwise).

. Proportional, (switch centre position).

. Remote, (switch fully clockwise).

7.5.1 Manual

The power demand signal is varied by the power potentiometer on the cabinet door.

7.5.2 Proportional

If the line speed signal is set to 10V at full line speed as set in 7.4.1, then the output power is proportional to the line speed, giving full power at full line speed. This enables a constant treatment level to be achieved despite fluctuations in line speed.

7.5.3 Remote (Optional)

The remote power demand input is discussed in Section 7.7.1. If this switch is selected then inputs on computer interface will control the output even if the generator is in the local mode.

7.6 Pulse Width Modulation (PWM) Circuit

The power demand signal causes the PWM circuit to switch the inverter at the necessary duty cycle, until the TRUE POWER signal equals the POWER DEMAND signal.

Outputs A and B of the PWM circuit have the same pulse width but are 180º out of phase. There is always a short deadtime between O/P A going low and O/P B going high, and vice versa, to prevent large switching transients.

The inductor L1 creates a resonant circuit with the capacitance C2 and the impedance of the electrodes in the treater causing a sine wave to appear across the HT transformer input.

7.7 True and Reactive Power Measurement

The O/P voltage and current are sensed by T2 and CT2, multiplied to give true power and conditioned to provide reactive power measurement. They are both calibrated to read 10V at full rated power.

The True power signal is used as feedback in the PWM circuit to ensure that the O/P power matches the demand power.

7.8 Remote

Overall Circuit diagram shows the remote connections where fitted including the following interfaces:

ANALOGUE i/p & o/ps

. 4 - 20mA or 0-10V Power Demand i/p
. 4 - 20mA or 0-10V True Power o/p
. 4 - 20mA or 0-10V Reactive Power o/p

DIGITAL CONTROL SIGNALS

i/p Voltage - 5-24V
i/p Current - 2-10mA

REMOTE/LOCAL SELECT

REMOTE TREAT/SKIP

REMOTE NOT STOP:

REMOTE START : In remote mode generator may be started using REM START, EXT START or LOCALSTART. To ensure generator may only be started remotely, hold REMOTE NOT STOP low until you are ready to press REMOTE START.

REMOTE RESET : Resets POSITIVE and NEGATIVE MISMATCH, TRIP SHUTDOWN, relays and indicators.

SECTION 8

TROUBLE SHOOTING

In the event of a problem, carefully follow the procedures listed below. Bear in mind that HIGH VOLTAGES exist within the inverter cubicle and any checks within the cubicle must be carried out with the MAIN SUPPLY ISOLATED. 30 SECONDS SHOULD BE ALLOWED AFTER ISOLATION OF SUPPLY FOR THE DISCHARGE OF CAPACITORS WITHIN THE UNIT.

8.1 CBI Trips

This will be due to either a faulty bridge rectifier BR1, or a problem with the capacitor pre-charge circuit.

8.2 Inverter Overtemperature

(i) Check that the fan is operating and all air inlets and outlets are clear.
Change the filter if it is excessively dirty. If the fan has failed, check fuse FS1 on the DIN rail.

(ii) Check that the the generator is not being exposed to excessive heat.

If the problem persists, consult Sherman Treaters Service Department for advice.

8.3 Generator Keeps Tripping

i.e. TRIP LED comes on during treatment.
This may occur for a number of reasons.

8.3.1 Poor Match

Select correct tap on transformer. Follow procedure described in (Section 5) for optimizing the match.

8.3.2 Incorrect Electrode Gap

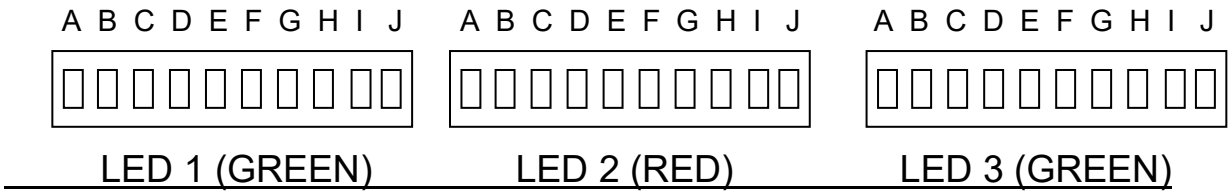
Reset the gap

Check that transformer tapping is still optimum.

8.3.3 Fault in Electrode System

Check the electrode unit and look for extraneous flashes in the treater during operation (e.g. from leads to case. Check that all the insulators are clean, and the dielectric sleeve and the discharge tubes are clean and not pinholed).

8.3.4 LED Arrays and SW1,SW2 and SW3 positions



LED 1	(GREEN)
A	24V(A)
B	15V(B)
C	-15V(B)
D	15V(C)
E	Interlock Closed
F	Overtemperature
G	24V(B)
H	Start
I	Relays Closed
J	Line up to Speed

LED 2	(RED)
A	Shutdown
B	Positive Mismatch
C	Negative Mismatch
D	Overcurrent Trip
E	Skip
F	Skip Signal
G	Remote Skip/Treat
H	High Alarm
I	Low Alarm
J	Up To Speed Signal

LED 3	(GREEN)
A	Up To Speed Signal
B	Rotation Sensor
C	
D	Treat On
E	
F	
G	No error driver one
H	No error driver two
I	Remote not stop
J	Remote/Local Select

SW1, SW2 and SW3 switch positions

SW1-A Man/Auto freq control	-up=man down=auto
SW1-B Local/remote	-not used
SW1-C PSC2 Man/Auto freq	-not used
SW1-C	-not used
SW2 Power Control	-left=manual centre=proportional right=remote
SW3-A UTS Hi/Low Freq	-up=high(normal position)
SW3-B UTS override	-down=sensor input
SW3-C Skip delay override	-down=override
SW3-D Pwr demand 0-10v/4-20ma	-up=0-10v, down=4-20ma

SECTION 9

PARTS LIST FOR CSR110 - 200

DESCRIPTION	PART NUMBER
INVERTER CONTROL PCB (STATE GENERATOR SIZE WHEN ORDERING)	301.3061
CSR110-200 FRONT PANEL/DOOR	
LAMP/LED:	
LED 1,2,3,4 GREEN LED	123.0067
LED 5-10 RED FLASHING LED	123.0074
PUSHBUTTON:	
P/BUTTON BLUE (RESET)	123.0072
P/BUTTON GREEN (ALARM)	123.0073
P/BUTTON DOUBLE HEADED OPERATOR	122.0144
POTENTIOMETERS:	
RV1-4 10 TURN 5K POTENTIOMETER	101.0089
RV1-4 DIAL MECHANISM	202.0049
METER DM1-3	125.0018
TERMINALS:	
SAK 2.5	127.0014
ISOLATOR + SHAFT CSR110/200	122.0159

CABINET ASSEMBLY

11-20KW INVERTER HEATSINK	103.0203
TRANSFORMERS:	
CURRENT TRANSFORMER	111.0111
T1 PSU TRANSFORMER	111.0107
T2 VOLTAGE FEEDBACK TRANSFORMER	111.0125
L1 INDUCTOR CSR110-200	111.0119
CIRCUIT BREAKER:	
CIRCUIT BREAKER CB1 CSR110/200	122.0160
CAPACITORS:	
C1 0.22uf CAPACITOR	102.0029
RESISTORS:	
R1/2/3 100R 100W	101.0163
R4 1K 100W	101.0164
FUSES:	
FS1 2AMP	123.0076
FS2 1 AMP	123.0012
FS3/4 500mA	122.0068
FUSE HOLDER	123.0058
CONTACTORS/RELAYS:	
K1/2 CONTACTOR	122.0129
K2 AUX CONTACT BLOCK CSR110/200	122.0124
K3 CONTACTOR	122.0164
K4/5/6 24V RELAY	122.0131
K7/8 24V ALARM RELAY	122.0133
K2 AUX CONTACT BLOCK DIL4M	122.0153

PLUGS AND SOCKETS:	
SK2 ROTATION SENSOR SOCKET	121.0029
SK4 INTERLOCKS 14 WAY SOCKET	121.0010
SK5 ALARM 7 WAY SOCKET	121.0014
PL4 INTERLOCK 14 WAY PLUG	121.0056
PL5 ALARM 7 WAY PLUG	121.0015
HT TRANSFORMER:	
HT8 x 2	111.0079
5V POWER SUPPLY CSR110-200	111.0120
MAINS FILTER CSR110/200	103.0205
MAINS INPUT TRANSFORMER CSR110/200	111.0116
TERMINAL SAK 16 CSR110/200	127.0031
TERMINAL SAKG28 HT CSR110/200	127.0128

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