



## ***EASY-WELD SSR 400/600***

**Fully Thyristorised Welding Rectifier (MMA)**



# EASYWELD SSR 400, SSR 600

FULLY THYRISTORISED MMA WELDING POWER SOURCE



Instruction manual  
For  
Installation, Operation & maintenance

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# SAFETY

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Users of ESAB welding equipment have the ultimate responsibility for ensuring that anyone who works on or near the equipment observes all the relevant safety precautions. Safety precautions must meet the requirements that apply to this type of welding equipment. The following recommendations should be observed in addition to the standard regulations that apply to the workplace.

All work must be carried out by trained personnel well acquainted with the operation of the welding equipment. Incorrect operation of the equipment may lead to hazardous situations, which can result in injury to the operator and damage to the equipment.

1. Anyone who uses the welding equipment must be familiar with:
  - its operation
  - location of emergency stops
  - its function
  - relevant safety precautions
  - welding
2. The operator must ensure that:
  - no unauthorized person is stationed within the working area of the equipment when it is started up.
  - no—one is unprotected when the arc is struck
3. The workplace must:
  - be suitable for the purpose
  - be free from drafts
4. Personal safety equipment
  - Always wear recommended personal safety equipment, such as safety glasses, flameproof clothing, and safety gloves.
  - Do not wear loose—fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.
5. General precautions
  - Make sure the return cable is connected securely.
  - Work on high voltage equipment may only be carried out by a qualified electrician.
  - Appropriate fire extinguishing equipment must be clearly marked and close at hand.
  - Lubrication and maintenance must not be carried out on the equipment during operation.



Read and understand the instruction manual before installing or operating.  
 ESAB can provide you with all necessary welding protection and accessories.



**WARNING**

*Arc welding and cutting can be injurious to yourself and others. Take precautions when welding.*

*Ask for your employer's safety practices which should be based on manufacturers' hazard data.*

	<p><b>ELECTRIC SHOCK - Can kill</b></p> <ul style="list-style-type: none"> <li>• Install and earth the welding unit in accordance with applicable standards.</li> <li>• Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing.</li> <li>• Insulate yourself from earth and the workpiece.</li> <li>• Ensure your working stance is safe.</li> </ul>
	<p><b>FUMES AND GASES - Can be dangerous to health</b></p> <ul style="list-style-type: none"> <li>• Keep your head out of the fumes.</li> <li>• Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.</li> </ul>
	<p><b>ARC RAYS - Can injure eyes and burn skin.</b></p> <ul style="list-style-type: none"> <li>• Protect your eyes and body. Use the correct welding screen and filter lens and wear protective clothing.</li> <li>• Protect bystanders with suitable screens or curtains.</li> </ul>
	<p><b>FIRE HAZARD</b></p> <ul style="list-style-type: none"> <li>• Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.</li> </ul>
	<p><b>NOISE - Excessive noise can damage hearing</b></p> <ul style="list-style-type: none"> <li>• Protect your ears. Use earmuffs or other hearing protection.</li> <li>• Warn bystanders of the risk.</li> </ul>
<p><b>MALFUNCTION - Call for expert assistance in the event of malfunction.        PROTECT YOURSELF AND OTHERS!</b></p>	
	<p><b>CAUTION!</b>  <i>This product is solely intended for arc welding</i></p>

	<p>Do not dispose of electrical equipment together with normal waste!        In accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from the local representative. By applying this Directive you will improve the environment and human health</p>
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## RATING OF EASYWELD SSR 400, SSR 600

	<b>EASY WELD SSR-400</b>	<b>EASY WELD SSR- 600</b>
<b>CHARACTERISTICS</b>		
<b>INPUT:</b>		
SUPPLY VOLTAGE, PHASE & FREQUENCY	415 V ± 10%, 3 Phase, 50 Hz, AC	
MAXIMUM INPUT CURRENT	30 Amps	55 Amps
MAXIMUM RATING	21.6 KVA	40 KVA
<b>OUTPUT:</b>		
OUTPUT CURRENT RANGE	DC 10-400 A (Single Range)	DC-10A – 600A (Single Range)
MAXIMUM CURRENT AT 60% DUTY CYCLE	400 Amps DC	600 Amps DC
MAXIMUM CONTINUOUS CURRENT AT 100% DUTY CYCLE	310 Amps DC	470 Amps DC
OPEN CIRCUIT VOLTAGE (MAXIMUM)	100 Volts DC	
TYPE OF WELDING CURRENT CONTROL	STEPLESS	
CLASS OF INSULATION	'H'	
COOLING	FORCED AIR COOLED	
APPROX DIMENSION (L x W x H) IN mm	675 x 350 x 690	615 x 455 x 850
WEIGHT (APPROX)	130 Kgs.	160 Kgs.

## ASSEMBLING

The complete installation should consists the following instruments:

<b>Sl No.</b>	<b>Description</b>	<b>Type</b>	<b>Quantity</b>
1.	WELDING POWER SOURCE	EASYWELD SSR – 400 OR EASYWELD SSR – 600	ONE
2.	REMOTE CONTROLLER	RCU SSR 400 or RCU SSR-600	ONE

## ACCESSORY LIST

FUSE ELEMENT	3A	1 Piece
FUSE ELEMENT	1A	1 Piece

## INSTALLATION

### a) Capacity of equipment

	<b>EASY WELD SSR-400</b>	<b>EASY WELD SSR-600</b>
INPUT VOLTAGE	415 V $\pm$ 10% AC	
FREQUENCY & PHASE	50 Hz, 3 PHASE	
MAXIMUM RATING OF EQUIPMENT	21.6 KVA	40 KVA
CAPACITY OF FUSE (B CLASS)	32 Amps HRC	60 Amps HRC
INPUT CABLE	8mm <sup>2</sup> or more	22m <sup>2</sup> or more
OUTPUT CABLE	50mm <sup>2</sup> (Cu) Minimum	70mm <sup>2</sup> (Cu) Minimum

- Provide a Switch Box for every Welding Power Source, and use designated fuse
- Tolerance of Power Voltage Variation is  $\pm$  10% of rated input voltage.
- 100 Amps MCB to be used as alternative to SFU.

### b) Installation place

- Install in the place where less moisture and dust exist. Avoid direct sunlight and rain, and maintain ambient temperature within  $-10^{\circ}$  to  $45^{\circ}$  C as much as possible.
- Keep the welding power source at least 20 cm. away from the wall (if any).
- In case of installation of more two units side by side, a distance of more than 20 cm is recommended between the two power sources.
- Use a shield to protect the welding arc in case of excessive air draft.

### c) Ventilation

Adequate ventilation is recommended at the place of installation. For example the following guideline should be followed:

- In case of the area is more than 300 square meters (per unit), no ventilation is required, provided the room is not completely air tight.
- In case of the area is less than 300 square meters, the torch is used in fixed condition and the welding is continuously performed, adequate ventilation is recommended with the help of vent fan or exhaust duct.

### d) Installation Items

No.	Items	No.	Items
1.	Remote control Unit RCU-SSR 400 / RCU SSR 600	7.	Control Cable for RCU SSR-400 / Control Cable for SSR 600
2.	Work Piece	8.	Welding Cable
3.	Switch Box (Input)	9.	Welding Cable
4.	Connector for Remote Control Unit	10.	Input Cable
5.	Negative terminal	11.	Electrode Holder
6.	Positive Terminal	12.	Electrode
		13.	Terminal Block input

### REMARKS:

While performing a ground work, it is recommended that a skilled electrician do the work.



## **WELDING OPERATION**

Once the installation of the equipment is completed, connect the work Cable to the negative output terminal and the cable end of the electrode holder to the Positive output terminal. These cable connections should be tightened properly to avoid electrical heating due to loose connections. Put the Main Switch box in 'ON' position and turn on power ON/OFF switch. The green lamp on the panel of the Power Source will now glow and the fan will start rotating. Now the equipment is ready. Connect an Electrode with the Electrode Holder. The welding current can be controlled by the current control potentiometer mounted on the front panel of the Power Source or through Remote Controller as explained below.

### **a) WELDING CURRENT ADJUSTMENT**

Put the local/remote switch to 'Local' mode. Now set the DC output current as required with the help of the current control potentiometer and ignite an experimental Arc. For the fine tuning of the required current, set the parameters using the Ammeter mounted on the front panel of the power source.

### **b) LOAD VOLTAGE/OPEN CIRCUIT VOLTAGE**

Press and set Amps/Volts switch to volts position, the meter on the front panel will now indicate the output DC voltage. On releasing this switch, it will automatically come back to Amps position and the meter will read the output DC Welding current.

### **c) REMOTE CONTROLLER**

The output Welding current can be increased and decreased as desired from the operation point with the help of the Remote Controller unit as per the following guideline, even on load condition.

Set the Local/Remote switch to remote position and connect the remote controller to the socket provided in the power source. Now set the Welding current by turning current control potentiometer. Graduation of the current value mentioned on the Remote Controller Unit should be followed as guideline. However, for accurate output current, adjust the potentiometer to a proper value from the METER mounted on the Front panel of the power source after generating as experimental arc.

## MAINTENANCE & INSPECTION

The maintenance and inspection should be carried out only after the main fuse box in the 3-phase AC line is turned OFF or disconnected properly.

Maintain and inspect the set regularly as per following guidelines:

### a) Regular Inspection (Every 3-6 months, depending on operation frequency):

Inspection	Inspection Point	Maintenance Method
Fuse Box	Loose connection / damage	Repair if necessary, refer to Power Equipment Capacity
	Confirmation of proper use	
Input and Output Terminals	Proper tightening of connections	Tighten first and then insulate with tape
	Confirmation of insulation	
Line Contactor	Confirmation of abrasion at Contact points	Replace with new one
Inside the power source	Sedimentation of Dust	Blow out the dust using dry compressed air.
	Trace of overheating and damage to cables / wiring	Repair the damaged section and insulate properly. Replace with new wire / cable if damage is severe.

### b) Cautions to H.V. Test & Insulation Resistance Measurement Test

Careless execution of these tests will cause damage to the power source since thyristors and other semiconductor parts are in this unit. While conducting these tests according to the by-laws of your company, the following steps should be performed first:

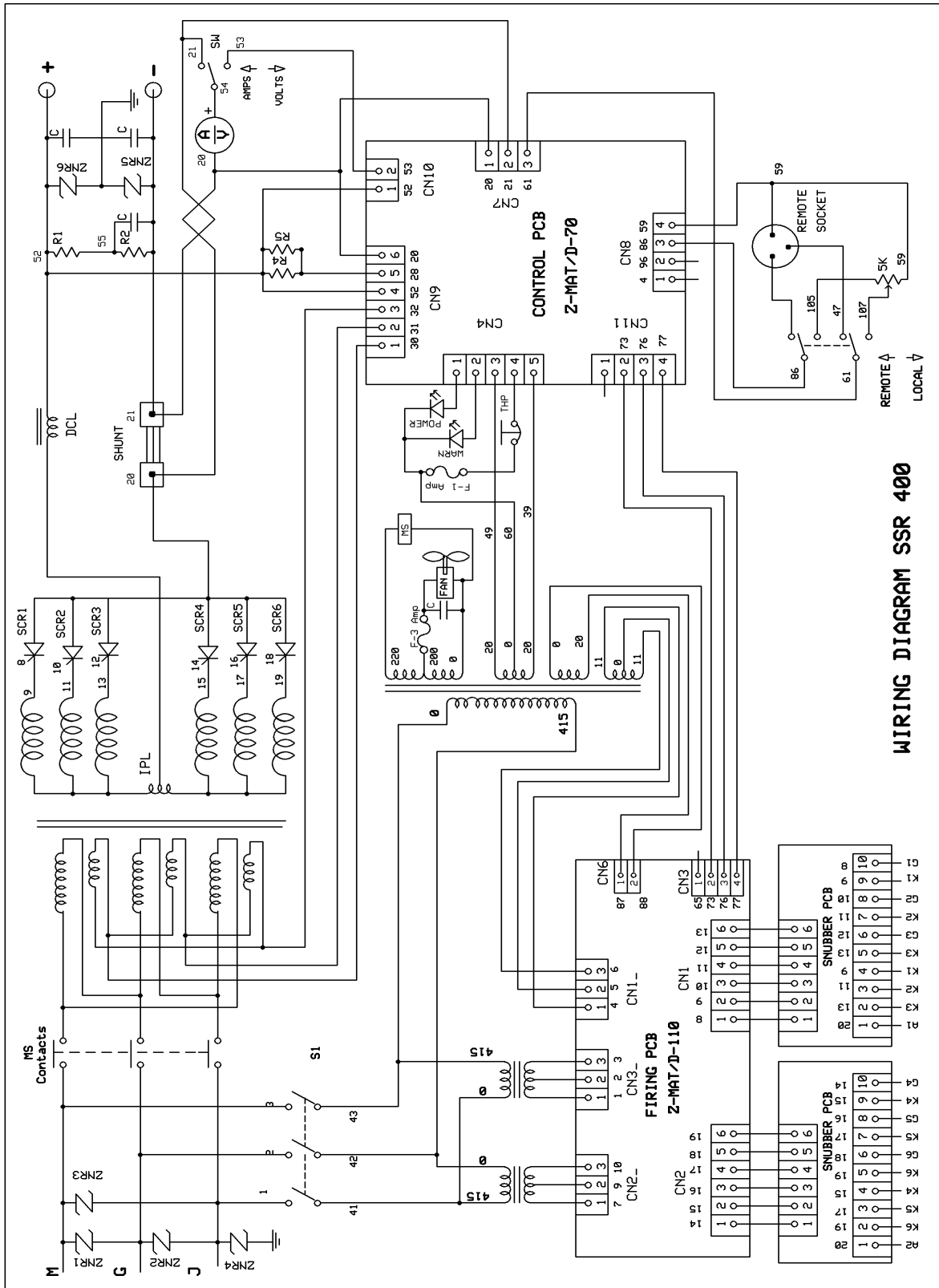
- Take off the cables from the switch box that are connected to the three input terminals and short-circuit the three input terminals.
- Take off the cable that is connected to two output terminals and short-circuit the two output terminals.
- Short circuit between anode and cathodes of thyristors SCR1-6.
- Remove the two ground conductors. (Take off the left side panel. Remove one conductor near the contactor on the upper panel and also the other conductor near to the leg of the reactor at lower front of the power source).
- Use 500 V DC Megger only.
- Go back to original conditions by removing short-circuit etc. once the test is over.

## FAULT FINDING

Abnormal Condition		Cause	Remedy
A.	Welding / automatically stops and the bottom WARN LAMP glows	Control fuse on the front panel blown	Replace with rated fuse
		The equipment is over loaded	In case of the equipment is being operated under duty cycle higher than that of specified and /or higher output current, the bottom WARN LAMP will glow. In such case, wait and keep the power switch 'ON' to keep the fan running at on load condition. After 5 to 10 minutes, the WARN LAMP will turn off and then adjust the welding current and /or duty cycle and restart welding.
			Avoid the Welding operation while Indicator lamp "WARN" is repeatedly 'ON'
B.	The current adjustment does not work	Loose Connection	Fasten the plug & socket firmly.
		Faulty VR1 variable potentiometer of current control on the front panel of the power source or remote controller unit.	Check with a multimeter, replace, if found defective.
		Remote / Local Switch not in proper position.	Check the position of the Remote / Local switch and position properly.
		Fault in control PCB (ZMAT/D-70 <b>OR</b> ZMAT/D-720)	Replace control PCB
		Fault in Firing PCB ZMAT D 110	Replace Firing PCB
		One phase is missing	Check and rectify input supply voltage
		Main SCR damaged	Replace SCR

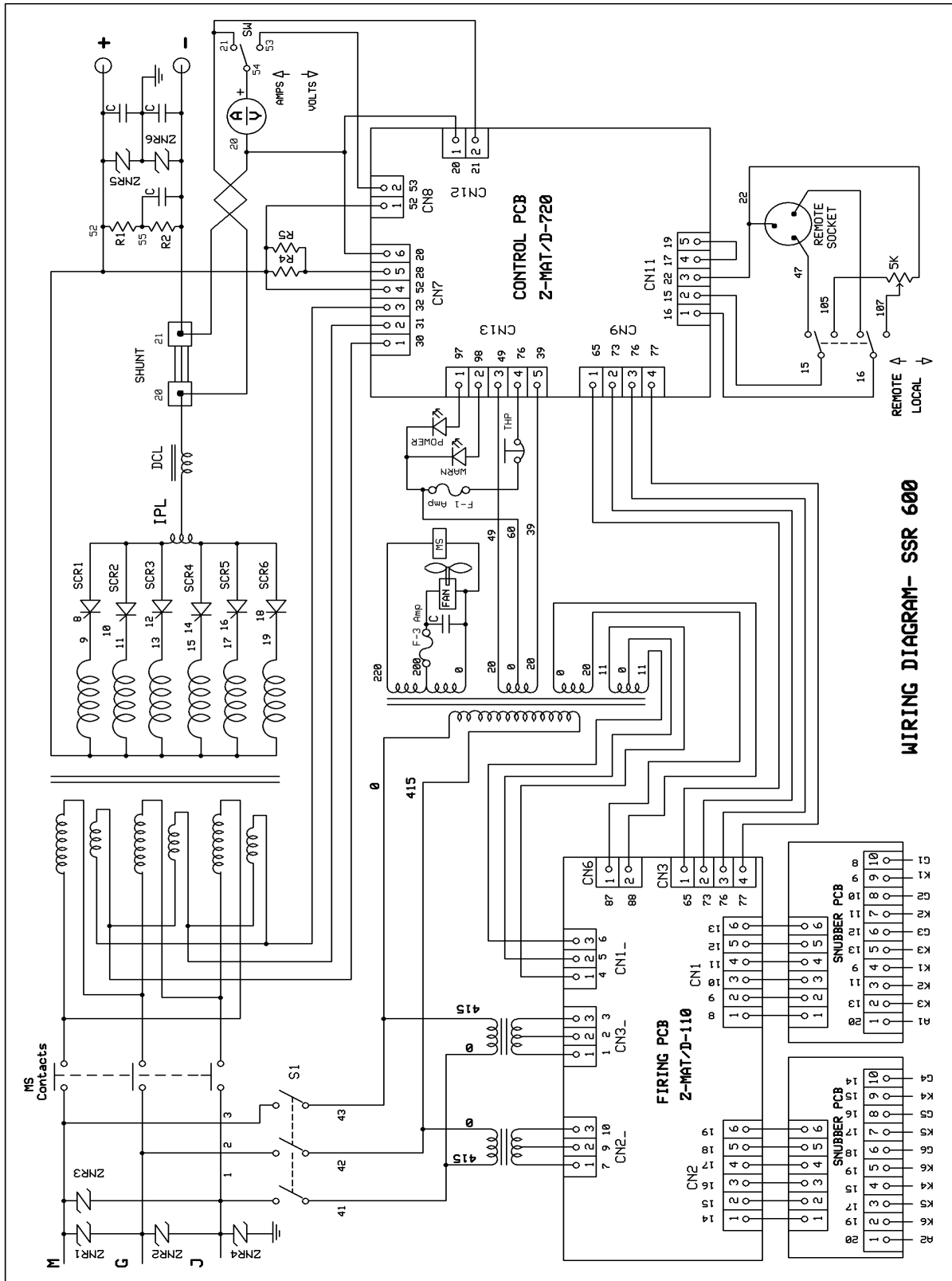
<b>Abnormal Condition</b>		<b>Cause</b>	<b>Remedy</b>
C.	FAN does not rotate while the Power Switch is ON	Fault in AC input supply.	Check the three-phase input AC supply and current.
D.	Open circuit voltage is less than 60 Volts DC while the main power switch is ON.	Fault in 3 phase AC input supply	Check the input line and rectify.
		Fault in Control PCB	Replace the PCB
E.	The available welding current is maximum and cannot be controlled	Fault in Control PCB	Replace the Control PCB
		Fault in VR, control potentiometer	Check and replace
F.	Unstable arc	Supply voltage fluctuations (greater than + / - 10%)	Check and rectify
		Wrong polarity used for the electrode	Check and rectify
		Damaged main SCR	Replace the SCR
		One phase missing	Check and rectify
G.	Erratic Welding Current Output	Fault in control PCB or Firing PCB (ZMAT D110)	Check and replace
		Damaged main SCR	Check & replace
		One phase missing	Check & rectify

# WIRING DIAGRAM SSR 400



WIRING DIAGRAM SSR 400

# WIRING DIAGRAM SSR 600



WIRING DIAGRAM- SSR 600

## CHECK POINTS OF EASYWELD SSR – 400

In case of any fault observed which are not listed above, a guideline is provided to detect the fault within the equipment. Please ensure that the equipment is in 'NO LOAD' condition and the supply voltage is 415 Volts, 3- Phase 50 Hz, AC.

Test Point	Value (in DC) (Measured by a Digital Multimeter)	Position of Current Control potentiometer
A. Control PCB (ZMAT/D-70M) TP <sub>1</sub> is 0 Volt		
TP <sub>2</sub> ~ TP <sub>1</sub>	+ 15.0 V ± 0.2 V	Any position
TP <sub>3</sub> ~ TP <sub>1</sub>	- 15.0 V ± 0.2 V	Any position
TP <sub>11</sub> ~ TP <sub>1</sub>	+ 8.30 V ± 0.05 V	Fully anticlockwise
TP <sub>9</sub> ~ TP <sub>1</sub>	- 1.08 V ± 0.05 V	Fully anticlockwise
TP <sub>9</sub> ~ TP <sub>1</sub>	+ 6.16 V ± 0.05 V	Fully clockwise
TP <sub>10</sub> ~ TP <sub>1</sub>	+ 5.36 V ± 0.05 V	Fully anticlockwise
TP <sub>10</sub> ~ TP <sub>1</sub>	+ 10.3 V ± 0.05 V	Fully clockwise
B. Firing PCB (ZMAT/D-110) (TP <sub>1</sub> is 0 Volt)		
TP <sub>3</sub> ~ TP <sub>1</sub>	6.0 V + 0.1 V -0 V	Fully anticlockwise

Please note that the absolute values may vary with ± 10% and once this testing is over refit the top cover and tighten the top screws properly. In case of abnormalities, please refer to the nearest Area Sales Manager of ESAB INDIA LIMITED with the Serial No. of the equipment & date of purchase.

## CHECK POINTS OF EASY WELD SSR-600

In case of any fault observed which are not listed above, a guideline is provided to detect the fault within the equipment. Please ensure that equipment is in 'NO LOAD' condition and the supply voltage is 415 volts, 3 phase 50 Hz. AC.

Test Point	Value (in DC) (Measured by a Digital Multimeter)	Position of Current Control potentiometer
A. Control PCB (ZMAT/D-720) (TP <sub>1</sub> is 0 Volt)		
TP <sub>2</sub> ~ TP <sub>1</sub>	+ 15.0 V ± 0.2 V	Any position
TP <sub>3</sub> ~ TP <sub>1</sub>	- 15.0 V ± 0.2 V	Any position
TP <sub>11</sub> ~ TP <sub>1</sub>	+ 8.30 V ± 0.05 V	Fully anticlockwise
TP <sub>4</sub> ~ TP <sub>1</sub>	- 1.04 V ± 0.2 V	Fully anticlockwise
TP <sub>4</sub> ~ TP <sub>1</sub>	+ 6.90 V ± 0.2 V	Fully clockwise
B. Firing PCB (ZMAT/D-110) (TP <sub>1</sub> is 0 Volt)		
TP <sub>3</sub> ~ TP <sub>1</sub>	6.0 V + 0.1 V -0 V	Fully anticlockwise

Please note that the absolute values may vary with ± 10% and once this testing is over, refit the front cover and tighten the screws properly. In case of abnormalities please refer to the nearest Area Sales Manager of ESAB INDIA LIMITED with the Serial No. of the equipment & date of purchase.



## WELD DEFECTS AND POSSIBLE CAUSES

WELD DEFECT	POSSIBLE CAUSES
Excessive Convexity	Slow travel speed that allows weld metal to build up
	Welding currents too low
Insufficient Throat	A combination of Travel speed too fast and current too high
	Improper placement of weld beads when multiple pass welding
Undercut	Amperage too high
	Arc length too long increasing the force of the arc so that it cuts into corners
	Improper weld technique causing the corners to be left unfilled or cut into
	Groove joint not completely filled and overlapped
Insufficient Leg Size	Using the wrong electrode angle causing the weld to be deposited too heavily on one side
	Using the wrong angle on multiple pas welds Causing the welds to overlap incorrectly
Poor Penetration	Amperage too low
	Travel speeds too fast
	Using too large an electrode for the root of the joint
	Improper electrode angle at the root of the joint
	Improper weave technique
	Using the wrong electrode for the desired joint penetration: (using E-6013 instead of E-6010)
Poor Fusion	Amperage too low
	Travel speeds too fast
	Improper electrode angle at the sides of the joint
	Improper weave technique that does not allow enough time at the sides of the joint
	Using the wrong electrode for the application
Overlap	Amperage too low and /or travel speed too slow
	Electrode too large with low currents
Porosity	Dirty base metal painted or galvanized surfaces
	Arc length too long especially with E-7018 Electrodes
	Moisture in low hydrogen electrodes
	Wind or fans strong enough to break down the shielding gas
Slag Inclusions	Improper manipulation of the electrode especially with E-6013
	Improper cleaning and slag removal between multiple pass welds
Cracks	Using the wrong Electrode for the application
	Using Excessively high amperage on some metals
Excessive Spatter	Amperage too high
	Electrode angle too extreme
	Arc length too long

## RECOMMENDED LIST OF SPARES FOR SSR-400/ SSR 600

Item Code	Description	Recommended	
		1 to 5	5 and above
1611642635	FIRING PCB	1	2
1611642005	SSR 400 CONTROL PCB (Z MAT D 70)	1	2
1611642602	SSR 600 CONTROL PCB (Z MAT D 720)	1	2
1611642018	FUSE ELEMENT 3A	5	10
1611642019	FUSE ELEMENT 1A	5	10
1611642020	AMP / VOLT SELECTOR SWITCH	1	2
1611642021	AMP/ VOLT METER SSR 400	1	2
1611642623	AMP/ VOLT METER SSR 600	1	2
1611642024	BLEEDER RESISTER 10OHM 10W	1	2
1611642026	POWER RESISTOR 50E 200W	1	2
1611642050	BLEEDER RESISTANCE 10K 20W	1	2
1611642101	CONTROL TRANSFORMER	1	2
1611642102	CONTROL TRANSFORMER	1	2
1651685149	CONTROL TRANSFORMER	1	2
1651684041	FAN COOLING	1	2
4651685317	SCR MODULE WITH HEATSINK- SSR 600	1	2
4651685316	SCR MODULE WITH HEATSINK - SSR 400	1	2
1651685051	DIODE EMITTING LIGHT GREEN	5	10
1651685052	DIODE EMITTING LIGHT RED	5	10
1651685078	SHUNT 400 AMP- SSR 400	1	2
1651684050	SHUNT 600 AMP- SSR 600	1	2
1651685117	LOCAL / REMOTE SELECTOR SWITCH	1	2
1651685125	TERMINAL OUTPUT- SSR 400	1	2
1651684083	TERMINAL OUTPUT- SSR 600	1	2
1651685205	POTENTIOMETER 5K- REMOTE UNIT	1	2
1651685206	POTENTIOMETER 5K- MACHINE	1	2
1651685236	INPUT TERMINAL ASSEMBLY	1	2
1651685271	CONTROL SWITCH	1	2
4611642001	MAIN TRANSFORMER SSR400	-	1
4611642002	DCL/IPL SSR-400	-	1
4611642603	MAIN TRANSFORMER-SSR-600	-	1
4611642604	DCL/IPL -SSR-600	-	1
4651684122	INPUT ZNR ASSY. SSR 600	1	2
4651685040	INPUT ZNR ASSY. SSR 400	1	2
4651685033	OUTPUT ZNR ASSY. SSR 400, SSR 600	1	2

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