RS 400 / RS 400 with ESU

Thyristorised MMA Welding Power Source

Instruction manual

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THYRISTORISED MMA WELDING POWER SOURCE

Instruction manual
For
Installation, Operation & General maintenance

CONTENTS

SAFETY

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.

Trained personnel well acquainted with the operation of the welding equipment must carry out all the work. Incorrect operation of the equipment may lead to hazardous situations, which can result in injury to the operator and damage to the equipment.

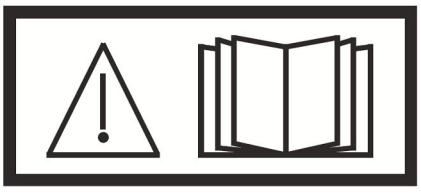
1. Anyone who uses the welding equipment must be familiar with:
   - its operation
   - location of emergency stops
   - its function
   - relevant safety precautions
   - welding

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

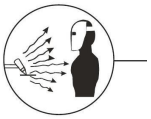
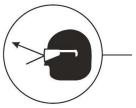
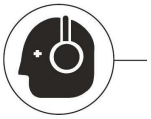
4. Personal safety equipment
   - Always wear recommended personal safety equipment, such as safety glasses, flameproof clothing, and safety gloves.
   - Do not wear loose—fitting items, such as scarves, bracelets, rings, etc., which could become trapped or cause burns.

5. General precautions
   - Make sure the return cable is connected securely.
   - Only a qualified electrician may carry out work on high voltage equipment.
   - 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.

	*ELECTRIC SHOCK – Can kill* • Install and earth the welding unit in accordance with applicable standards. • Do not touch live electrical parts or electrodes with bare skin, wet gloves or wet clothing. • Insulate yourself from earth and the workpiece. • Ensure your working stance is safe.
	*FUMES AND GASES – Can be dangerous to health* • Keep your head out of the fumes. • Use ventilation, extraction at the arc, or both, to take fumes and gases away from your breathing zone and the general area.
	*ARC RAYS – Can injure eyes and burn skin.* • Protect your eyes and body. Use the correct welding screen and filter lens and wear protective clothing. • Protect bystanders with suitable screens or curtains.
	*FIRE HAZARD* • Sparks (spatter) can cause fire. Make sure therefore that there are no inflammable materials nearby.
	*NOISE – Excessive noise can damage hearing* • Protect your ears. Use earmuffs or other hearing protection. • Warn bystanders of the risk.
	MALFUNCTION – Call for expert assistance in the event of malfunction. PROTECT YOURSELF AND OTHERS!
	CAUTION! *This product is solely intended for arc welding*

	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

ASSEMBLLING

The complete installation should consist the following items:

	Description	Type	Quantity
1.	Welding Power Source	RS 400 Power Source	1
2.	Remote Controller (Optional)	RCU RS-400	1

ACCESSORIES LIST FOR THYRISTORISED WELDING RECTIFIER RS 400

Fuse, element 1A	1 piece
Instruction Manual	1 piece

RATING OF RS 400 THYRISTORISED MMA WELDING POWER SOURCE

CHARACTERISTICS	CONSTANT CURRENT TYPE
Input:	
SUPPLY VOLTAGE, PHASE & FREQUENCY	415± 10%, 3 Phases, 50 Hz, AC
RATED INPUT CURRENT	27 A
RATED RATING	19.4 KVA
Output:	
OUTPUT CURRENT RANGE	DC 10-400A (Single Range)
OPEN CIRCUIT VOLTAGE (NOMINAL)	95 V DC
TYPE OF WELDING CURRENT CONTROL	STEPLESS
CLASS OF INSULATION	'H'
COOLING	FORCED AIR COOLED
APPROX DIMENSION (LxWxH) IN MM	825 x 695 x 1070
WEIGHT (APPROX)	195 KG.

CAUTIONS FOR INSTALLATION

a) **Capacity of Equipment**

Input Voltage	AC 415 V ±10%
Number of Phase & Frequency	3 phases, 50 Hz
Capacity of Fuse (B Class)	63 Amps
Input Cable	More than 10 mm^2
Output Cable	More than 50 mm^2

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

a) Installation place

- Install in the place where less moisture and dust exist. Avoid direct sunlight and rain, and maintain ambient temperature within -10^{o} to $+45^{o}$ 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:

a) In case of the area being more than 300 square meters (per unit), no ventilation is required, provided the room is not completely airtight.
b) In case of the area being less than 300 square meters and the welding is continuously performed, adequate ventilation is recommended with the help of vent fan or exhaust duct.
c) While performing the grounding work, it is recommended that a skilled electrician does the work.

ITEMS FOR INSTALLATION

No.	Item	No.	Item
1.	Remote Control Unit RS 400 (Optional)	8.	Welding cable
2.	Work Piece	9.	Welding cable
3.	Switch Box (Input)	10.	Input Cable
4.	Connector for Remote Control Unit	11.	Electrode Holder
5.	Negative Terminal	12.	Electrode
6.	Positive Terminal	13.	Terminal Block input
7.	Control Cable for RCU RS 400	14.	ON OFF Switch

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'. Turn on "Power ON/OFF switch" on the rear panel. The green lamp on the panel of the Power Source will 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.

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.

Load Voltage / Open Circuit Voltage

Operate the "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.

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 an experimental arc.

Welding with Cellulosic Electrode

- Put Normal/Cellulosic Switch to Cellulosic Position depending on the size of the electrode.

- Keep the main potentiometer around the middle position of the scale & do the welding.

Working Principle of Energy Saving Unit:
Energy Saving Circuit is an **optional feature** in the RS 400 Machine. Working principle of the ESU is explained below:

The extra items fitted in RS 400 having the Energy Saving feature comprises of:

a) Control Transformer for ESU
b) Control PCB for ESU
c) Line Contactor- ESU

The unit, when energized provides an auxiliary low 55-60 VD.C to the output of the main Welding Rectifier.
On attempting to strike the welding arc, the output is sensed by the PCB, which triggers on the coil of the main line contactor. The contactor (3 pole) provides the 3-phase A.C supply to the welding machine.
The machine is enabled, and welding can be done as usual. The contactor stays ON throughout the welding period by current sensing circuit (provided by Hall Sensor in the Machine)
When the welding is stopped, the output of the rectifier reaches the O.C.V of the machine (about 100 V D.C). The PCB senses this and the disables the main contactor to switch off the supply to the Machine, and once again the low voltage of 55-60 V DC appears across the welding terminals, which is a low safe voltage.
In the no-weld condition, the line contactor remains disabled, and the Main Transformer also remains unconnected, thereby reducing the no-load losses of the machine to a very low value

MAINTENANCE & INSPECTION

The maintenance and inspection should be carried out only after the switches in the Main switch box certainly turned OFF.

Try to maintain and inspect the set regularly as per the following guide lines.

a) Regular Inspection

Every 3-6 months, depending on operation frequency:

Inspection Portion	Inspection Point	Maintenance Method
Fuse Box	Fastening & Looseness at the Connection. Confirmation of proper fuse	Refer to the Equipment capacity
Input and Output Connections	Fastening & Looseness at the Connection. Confirmation of Installation	Faster first and Tape
Interior of Welding Power Source	Sedimentation of Dust. Trace of Overheat.	Blow off dust with Compressed Air.

b) Cautions to Insulation Voltage – Proof Test & Insulation Resistance Measurement Test:

Careless execution of Dielectric Strength test and Insulation Resistance Measurement will cause damage to the power source since thyristors, transistors and other semiconductor parts are used in the unit. While conducting these tests in accordance with the by-laws of your company, the following steps should be performed first: -

- Take of 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 positive and negative output of Rectifier bank with three AC terminals of rectifier bank.
- Use 500 V Megger only.
- Go back to original conditions removing short-circuit etc. once the test is over.

AFTER SALES SERVICE

In case of any abnormality observed during usage of the equipment, which could not be rectified at site, please contact immediately Area Sales Manager of the nearest unit of ESAB INDIA LIMITED with the following details:

1) Serial Number of the equipment & type

2) Nature of the complaint with the relevant details, if possible and the details of Input Supply.
3) Date of purchase of the equipment and the date of commissioning.

The qualified and trained service teams of ESAB INDIA LIMITED, located of the zonal head quarters render the after sales service to the customers and also assist in intelligent selections of Welding Equipment & consumable for various applications.

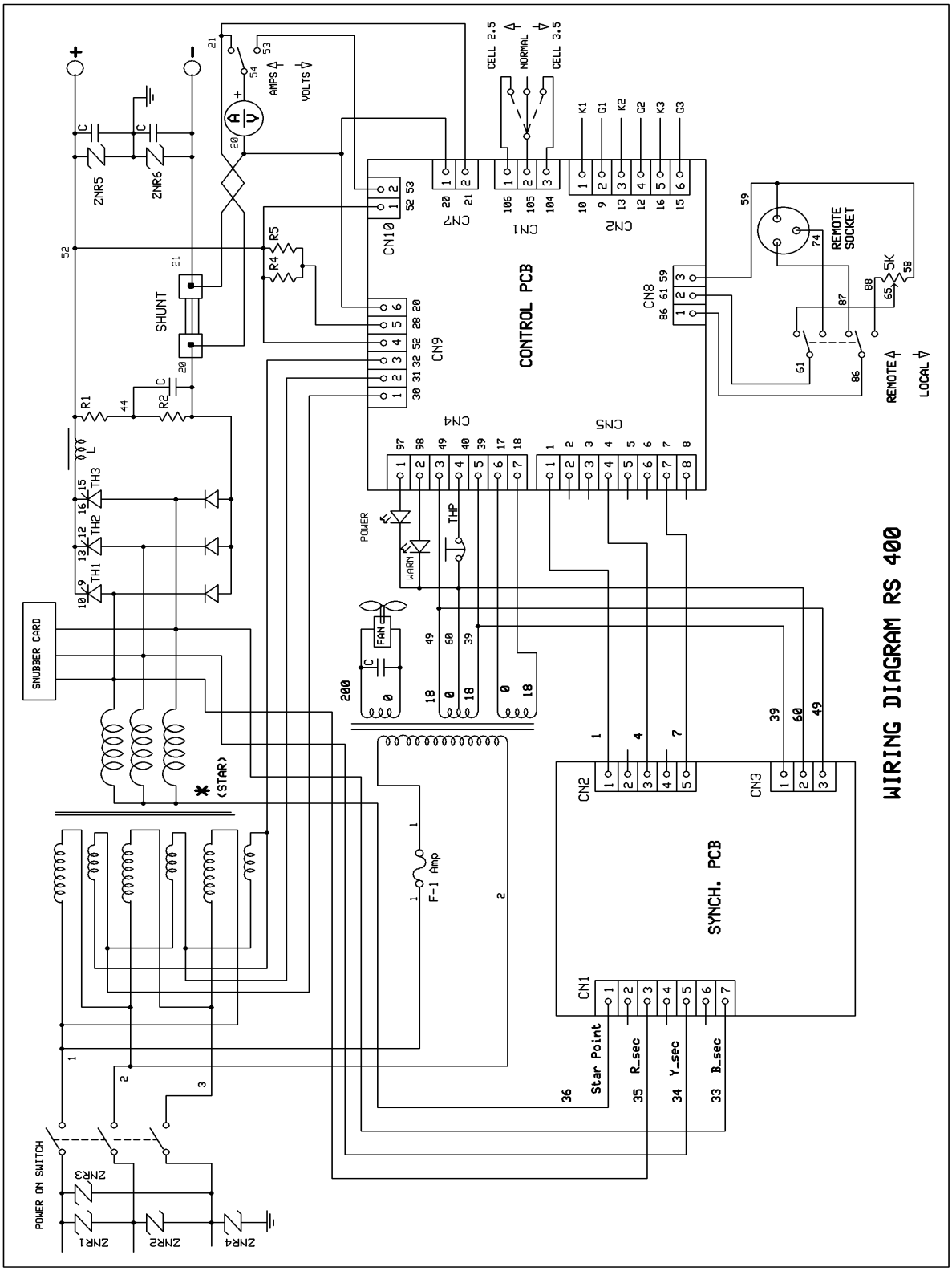
FAULT FINDING

Abnormality	Possible Cause	Corrective action
Welding automatically stops and the WARN LAMP glows	The equipment is over loaded	Wait and keep the power switch 'ON' to keep the fan running at no load. The Warning Lamp should get off within 10-15 minutes. Only after that has happened. adjust Welding Current and / or duty cycle to lower levels and restart welding
		Avoid welding operation if the indicator 'WARN' gets repeatedly on
The current adjustment does not work in Remote mode only	Loose Connection in the Remote plug & socket or any interconnection wire disconnected or Remote Pendant Potentiometer faulty	Fasten the plug & Socket firmly, check for wire discontinuity and rectify, check Remote unit potentiometer and replace if necessary
The current adjustment does not work	Faulty potentiometer of current control on the front panel of the power source	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 PCB	Replace PCB
	One phase is missing.	Check and rectify input supply voltage.
	Rectifier bank damaged	Replace Rectifier bank
Fan does not rotate when Power Switch is On	Fault in AC Supply	Check 3 ph input AC supply voltage
	Fault in control transformer	Check 0-200 V winding
OCV less than 60V when Power Switch is On	Fault in AC input	Check 3 ph input AC
	Fault in PCB	Replace PCB
Welding Current can not be controlled	Fault in PCB	Replace PCB
	Fault in potentiometer on front panel	Check & Replace
	Shunt connection to PCB disconnected	Check and rectify
Unstable arc	Supply voltage fluctuations (greater than ± 10%)	Check and rectify
	Wrong polarity used for the electrode	Check and rectify
	Damaged main Rectifier bank	Replace the rectifier bank
	One phase missing	Check and rectify

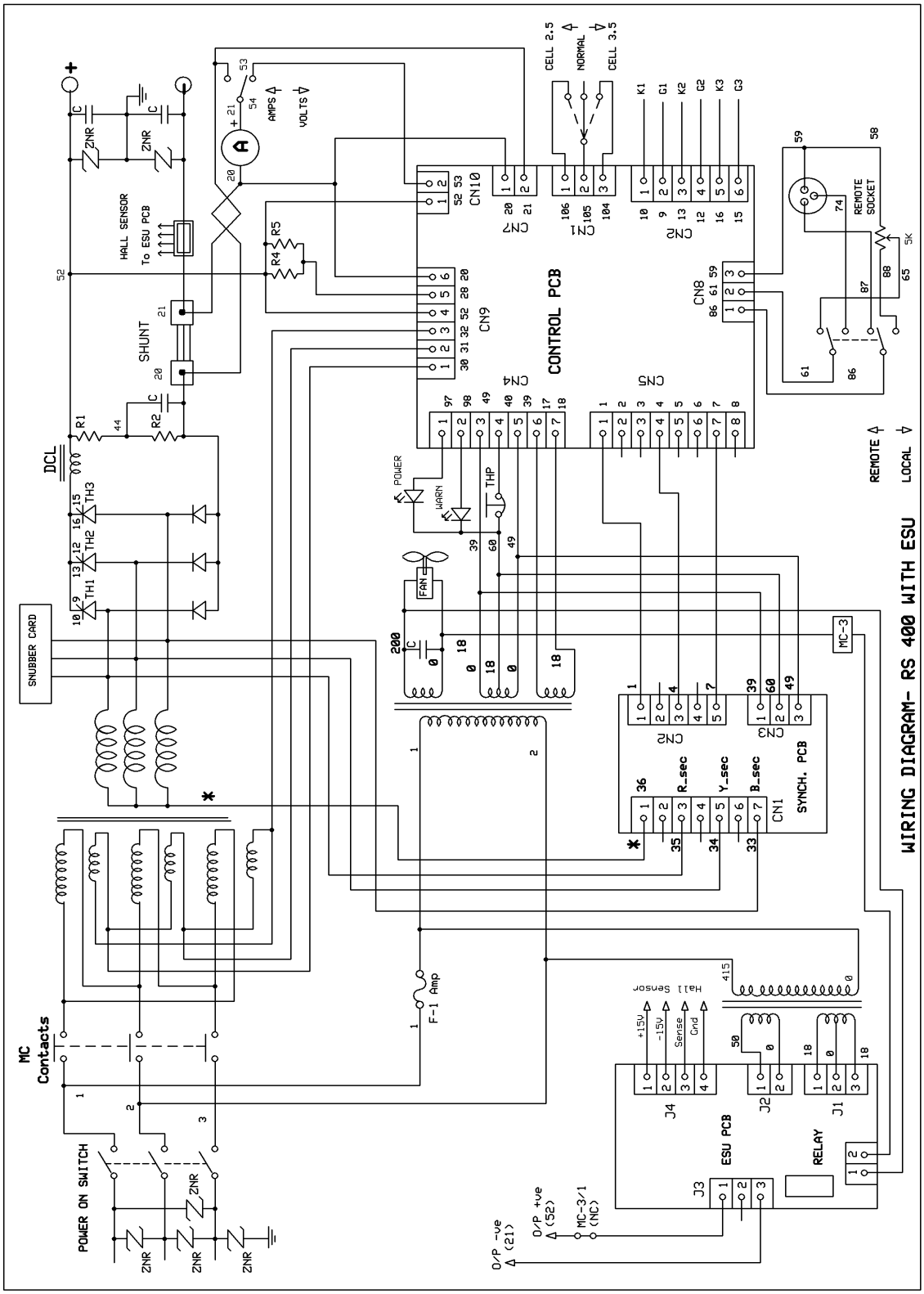
ADDITIONAL FAULT FINDING FOR MACHINES WITH ESU

Abnormality	Possible Cause	Corrective action
Arc striking can not be done	Faulty Line Contactor	Check and replace
	Faulty ESU PCB	Check and replace
	Faulty ESU Control Transformer	Check and replace
Line Contactor does not get off after a certain delay after welding is stopped	Faulty ESU PCB	Check and replace
Line Contactor always remains ON (OCV does not reduce to 55-60 V level within 50-60 seconds after welding has been stopped)	Faulty ESU PCB	Check and replace
Welding can be started, but erratic current control, arc drops down	Faulty ESU PCB	Check and replace
	Hall Sensor faulty	Check and replace

WIRING DIAGRAM- RS 400 (Standard)



WIRING DIAGRAM- RS 400 (with ESU)

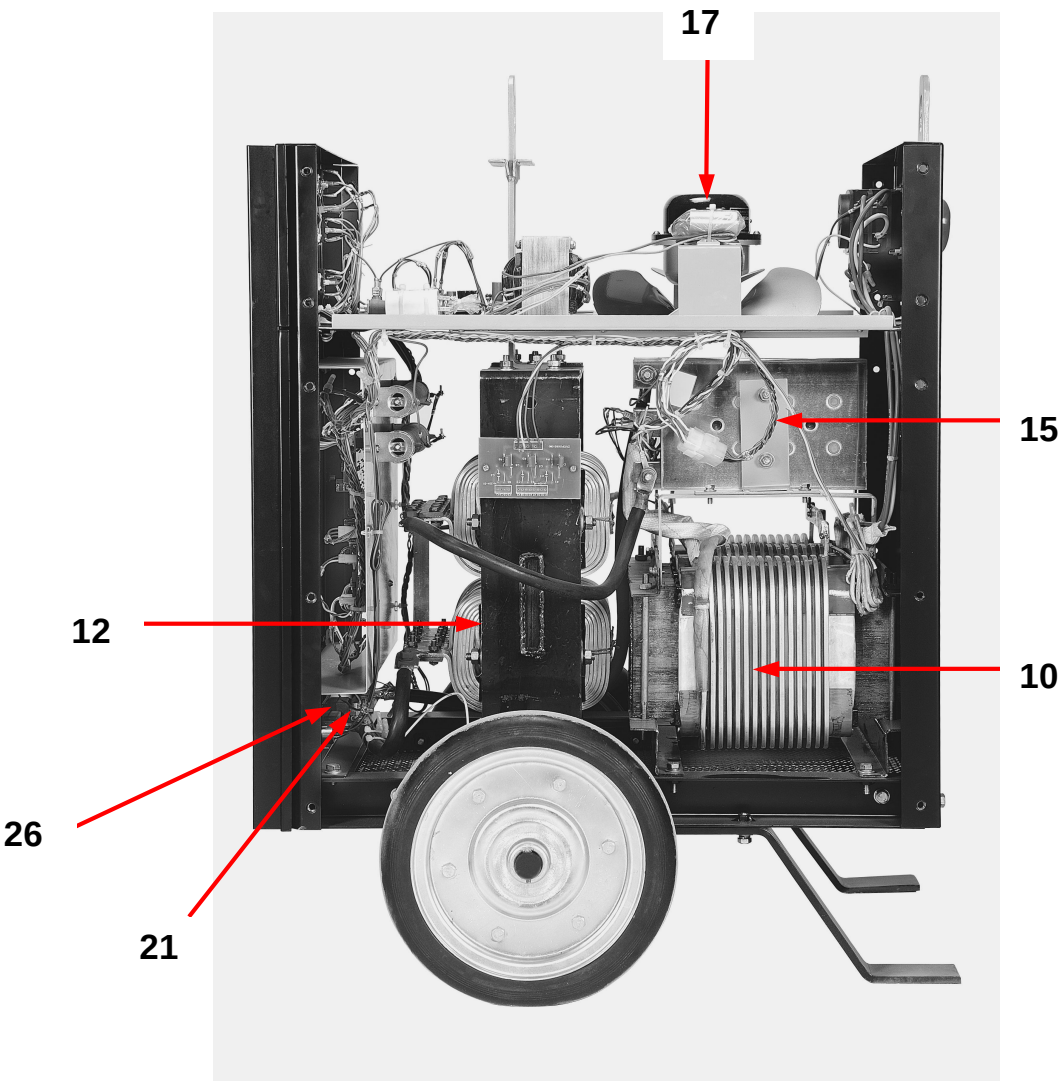


TEST POINT VOLTAGES IN RS 400 CONTROL PCB
All voltages except Gate- Cathode measurements are to be measured with respect to TP1 (0V point on Control PCB)

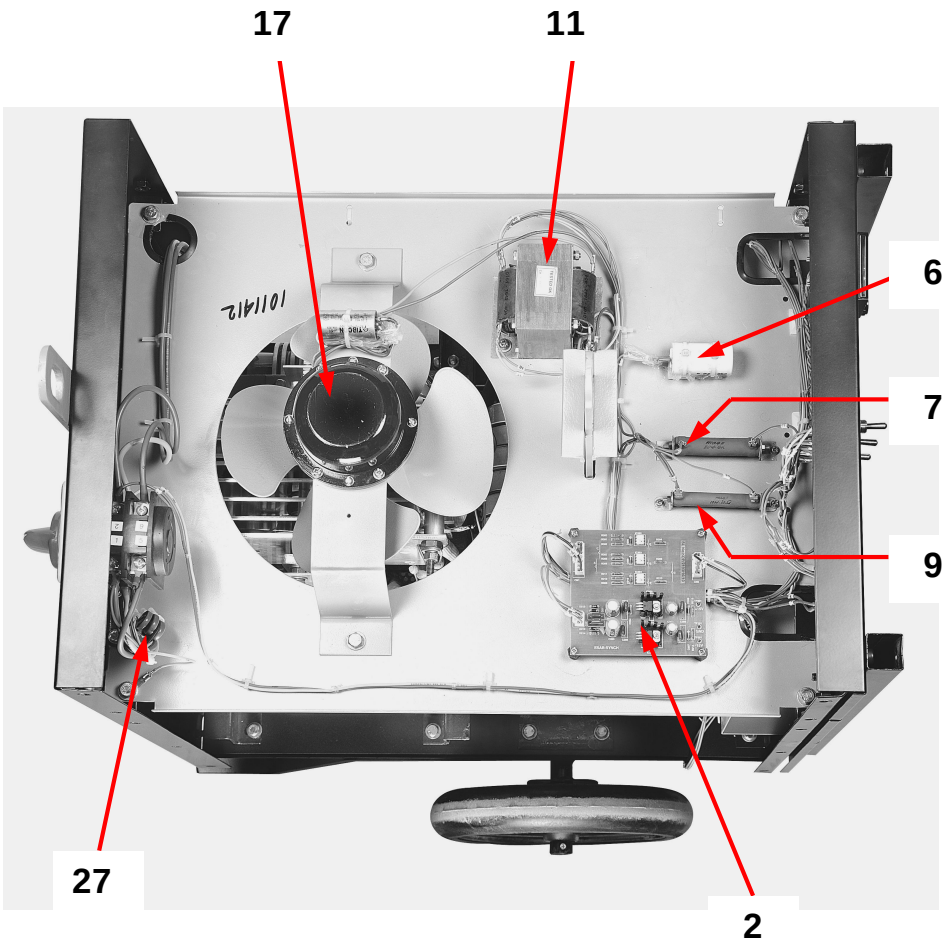
TEST POINT	VALUE
TP2	+15 V ± 0.2 V DC
TP3	-15 V ± 0.2 VDC
TP5	+12 V ± 0.2 VDC (Current control potentiometer at max. setting)
TP5	+6 V ± 0.2 VDC (Current control Potentiometer at 200 A setting.)
TP10	+9.5 VDC (Current control Potentiometer at minimum setting)
TP10	+ 10.44 VDC (Current control Potentiometer at maximum setting)
TP11	8.4 V ± 0.05 VDC (Current control Potentiometer at maximum setting)
TP12	0 – 18 V AC
TP17	
TP22	
TP13	7.5 VDC
TP18	
TP23	
TP14	7.5 VDC
TP19	
TP24	
Gate- Cathode voltages measured at connector CN2	
Ferrule numbers 9-10	0.039 V ± 0.01 V at no load
Ferrule numbers12-13	
Ferrule numbers15-16	

SPARES IDENTIFICATION OF RS 400

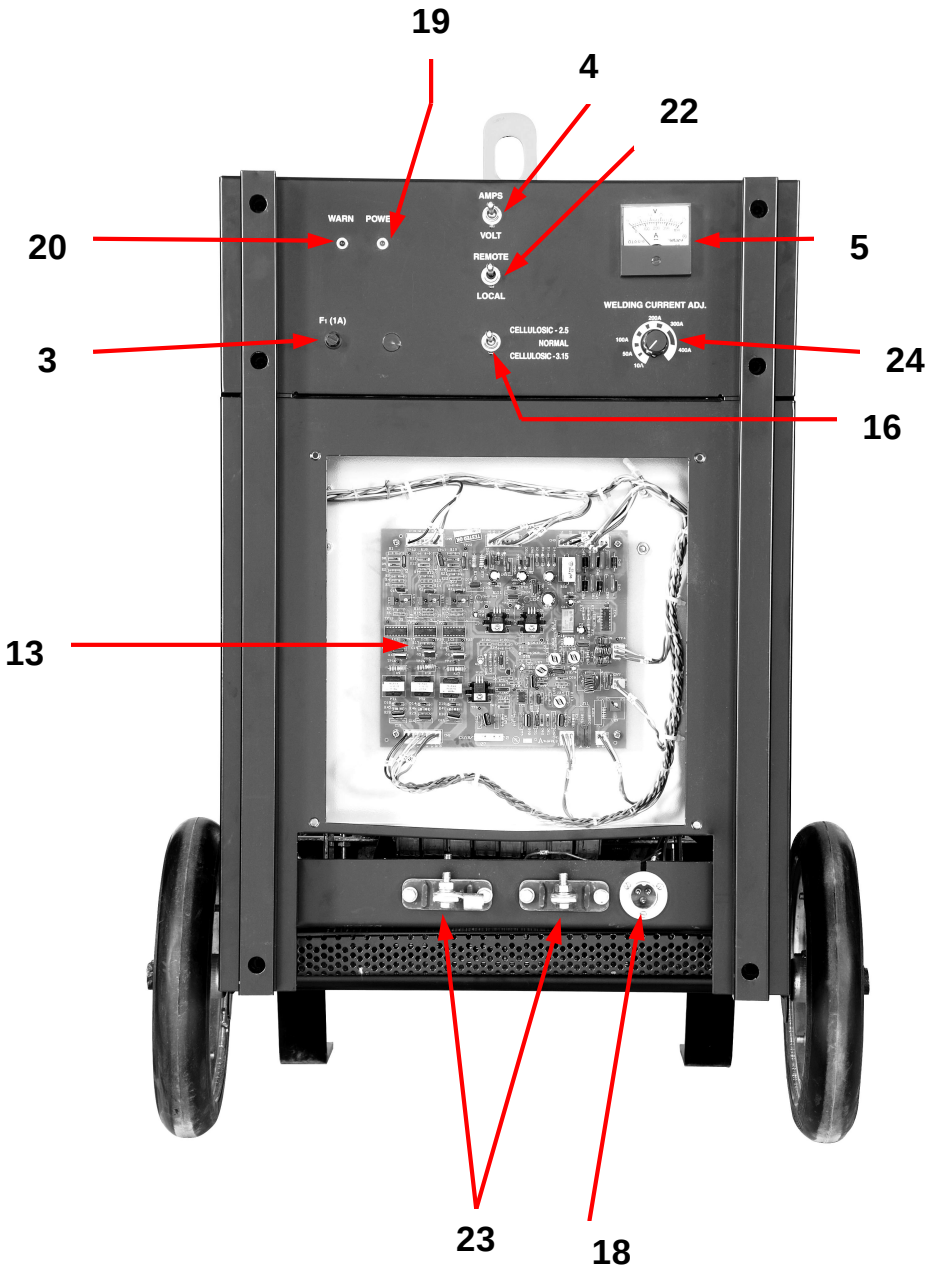
RS 400 SIDE VIEW



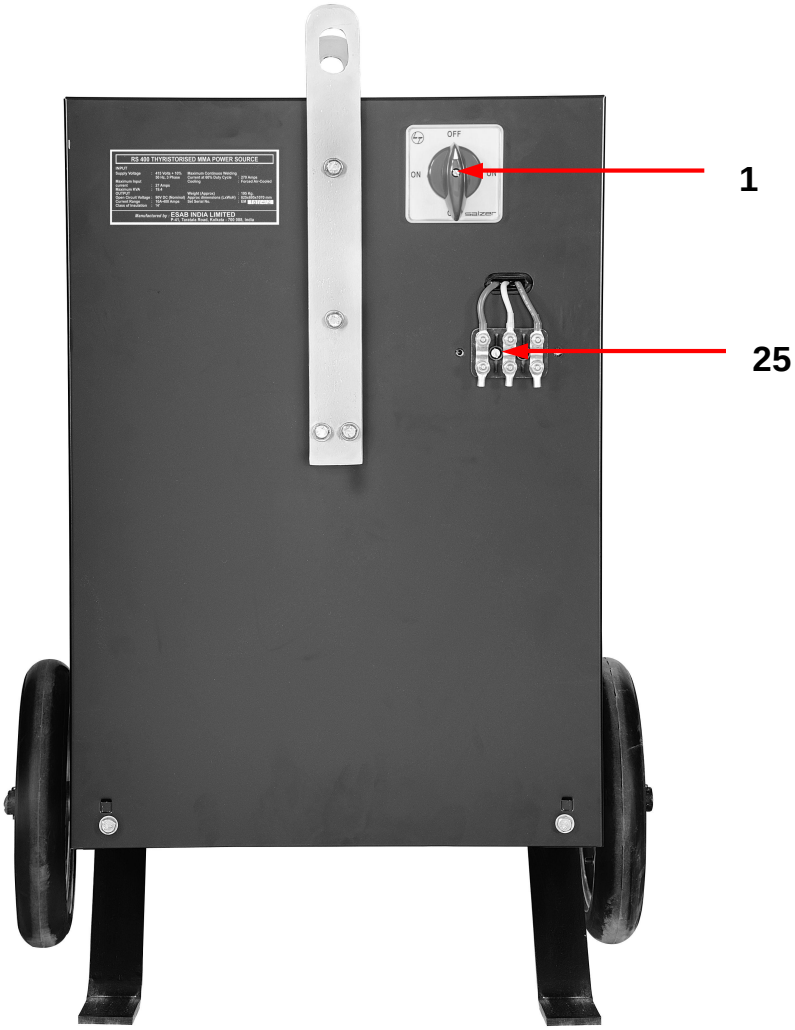
RS 400 TOP VIEW



RS 400 FRONT VIEW



RS 400 REAR VIEW



RECOMMENDED LIST FOR SPARE SPARTS

SL. NO.	ITEM CODE	DESCRIPTION	Recommended Holding	
			1-10	Above 10
1	1611621199	On-Off Rotary Switch	1	2
2	1611621300	Synchronizing PCB	1	2
3	1611642019	Fuse Element 1 A	2	4
4	1611642020	Amp/ Volt Selector Switch	1	2
5	1611642021	Dual Scale Ammeter + Voltmeter	1	2
6	1611642023	Filter Capacitor 8 µF	1	2
7	1611642024	Bleeder Resistor 10 Ω /10W	1	2
8	1611642026	Power Resistor 50 Ω / 200W	2	4
9	1611642050	Bleeder Resistor 10KΩ / 20W	1	2
10	1611642403	Main Transformer	-	1
11	1611642404	Control Transformer	1	2
12	1611642420	DC Choke	-	1
13	1611642430	Control PCB	1	2
14	1611642431	Snubber PCB Assy. (with Harness)	1	2
15	1611642441	Rectifier Bridge (SCR)	-	1
16	1641675046	Electrode Type selector switch	1	2
17	1651684041	Cooling Fan	1	2
18	1651685035	3 Pin Connector for Remote Unit	1	2
19	1651685051	LED Light (Green)	1	2
20	1651685052	LED Light (Red)	1	2
21	1651685078	Shunt 400 Amps	1	1
22	1651685117	Local / Remote Selector Switch	1	2
23	1651685125	Output Terminal	1	2
24	1651685206	Potentiometer 5 KΩ	1	2
25	1651685236	Input Terminal Block Assy.	1	2
26	4651685033	Output ZNR Assy.	1	2
27	4651685040	Input ZNR Assy.	1	2

SPARE LIST FOR ADDITIONAL ITEMS IN MACHINES FITTED WITH ESU

ITEM CODE	DESCRIPTION	Recommended Holding	
		1-10	Above 10
1611642302	ESU PCB	1	2
1611642651	Control Transformer-ESU	1	2
1651684056	Line Contactor	1	2
1651683020	HALL Sensor	1	2

ESAB INDIA LIMITED

Registered and Head Office

13, Industrial Estate, III Main Road
Ambattur, Chennai - 600058
Telephone: + 91 44 42281100
Fax: + 91 44 4228 1107
Email: info@esab.co.in

Web: www.esabindia.com