

REMI GROUP

REMI ELEKTROTECHNIK LTD

INSTRUMENT DIVISION

USERS MANUAL

BENCH TOP CENTRIFUGE

R 5S Plus

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Bench Top Centrifuge - R-5S PLUS**User Manual (Operating & Maintenance Manual)**

1. INTRODUCTION

Congratulations for purchasing the R-5S Plus Bench Top centrifuge!

We are the largest manufacturers of all types of centrifuges in India for the last 50 years. We have more than 35 different centrifuge models, configured as per applications with and without refrigeration.

Centrifuges are widely used in auxiliary laboratories, hospitals, industries, research institutes, medical and pharmaceutical laboratories etc. They are also suitable for determination of settlement of paints, cosmetics and food products.

This Centrifuge falls under category I of Medical Devices Directive and complies with all the safety requirements as specified in the directive. In order to get maximum utility from the instrument purchased, we request you to use Centrifuge as per guidelines mentioned in this manual.



CE DECLARATION OF CONFORMITY

Manufacturer's Name : **REMI ELEKTROTECHNIK LTD.**

Manufacturer's Address : Building "B", Survey No 65/1, Village- Valiv,
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Product Description : Laboratory Centrifuge

Model : R-5S Plus

This product conforms to the following Directive and Standards:

2006 / 95 / EC
2004 / 108 / EC

EN 61010-1
EN 61010-2-020
EN 61326-1

European Representative

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Declaration Date:

For **REMI ELEKTROTECHNIK LTD,**

Mr. Bhavin Das
Designation: Head QA

SPECIAL FEATURES

- ❖ Table top model.
- ❖ Micro-processor based speed control & timer operation.
- ❖ 7-segment bright LED display panel with feather touch keypad.
- ❖ Maintenance free brushless motor.
- ❖ Frequency controlled induction drive.
- ❖ Stepless speed regulator with smooth ramp.
- ❖ Stable speed output even under unstable voltage conditions.
- ❖ Digital count down timer of 99 minutes.
- ❖ Imbalance and inverter fault protection with auto shut down.
- ❖ Electronic safety door interlock with open lid detection to Prevent cover opening during centrifugation.
- ❖ Dynamic brake for quick deceleration.
- ❖ Double armored break proof-protection for inner chamber.
- ❖ Truly versatile unit with wide choice of rotor heads and adaptors.



SPECIFICATIONS

Maximum speed	5250 rpm
Maximum RCF	4280 g
Connected load	0.325 kw
Timer	99 minutes
Speed meter	5250 rpm
Power supply	220/240 Volts, $\pm 10\%$ / 1 \emptyset 50 Hz AC
Noise level	<53 db(A)
Glass fuse	2 amperes
Width	332 mm
Depth	395 mm
Height	275 mm
Weight (Net)	22 kg
Weight (Gross)	28 kg
Operating temperature	25, ± 2 °C
Operating humidity	55, ± 5 %
Operating altitude	Up to 1000 meters above MSL

N.B. Specifications are subject to change without notice.

INSTALLATION

➤ AMBIENT CONDITIONS

This centrifuge has been made to operate under indoor laboratory conditions with ambient controlled temperatures of around $+25^{\circ}\text{C}$, $\pm 2^{\circ}\text{C}$ and ambient humidity of around 55%, $\pm 5\%$ within an altitude of 1000 meters. In extreme cases, non-condensing humidity up to around 80% will still cause the unit to function normally. Condensing humidity can be harmful to the electrical and electronic circuitry, in which case the centrifuge must be removed from its power socket and left to dry under forced air conditions for at least half a day.

This centrifuge has not been designed to work under cold room conditions.

➤ UNPACKING

Take the centrifuge including the accessories out of the carton box and remove all the packing. To begin with, install the unit in a room with dust free and non-corrosive environment. Allow at least about 1.1 sq. meter of clearance area around the unit. The surface used to mount this centrifuge should be very strong, sturdy, flat and level so as to support the weight of this centrifuge. Place the unit in such a way that it can be operated easily by the user and if required can be moved around easily for routine maintenance. Ensure the stability and leveling of this centrifuge for vibration free performance. Since this a small tabletop model screw type leveling jacks have not been incorporated in the bottom plate of the unit. Small hard rubber pads of around 1 mm thickness can be place under the solid rubber feet of the centrifuge to give proper level to the centrifuge. This is a small centrifuge can be carefully lifted physically to be shift from one location to another.

➤ ELECTRICAL FITTING

Connect the 3-pin plug provided with the centrifuge unit to a suitable 3-pin 220/240 Volt AC power load socket having proper EARTH connection. Ensure that the electric mains supply cable has adequate capacity of at least 5 amperes to avoid any voltage drop during operation. The 3-pin plug and socket on the wall should be fitted in close vicinity of the unit and also clearly visible to the user.

This will ensure that prompt action can be taken in case of any emergency. It is recommended that other similar units be connected to a circuit breaker situated in a junction box outside the room.

➤ CONSTRUCTION

This centrifuge is housed in strongly fabricated sheet steel body and finished with powder coating. The MS housing is made of two parts, namely the top plate with a big circular hole and the bottom body.

The brushless motor is mounted to the bottom of the body with three solid metal studs. These studs also act as shock absorbers to the motor in case of undue shaking. The inner chamber bowl of the centrifuge is made of Aluminum and is mounted on the top plate surface cutting collar. This bowl bottom has a big circular hole through which the brushless motor pushes in. The motor is covered around the shaft from the top by a sloping aluminum cover which extends all the way to the side of the bowl. The bowl at the bottom has an upwards bent collar which helps in collecting the spilled liquids that flow down or broken fragments that drop down over the sloping aluminum cover inside the chamber.

The centrifuge chamber in which the rotor rotates is completely isolated from the motor compartment and the same has been made explosion proof and thus the danger of inflammable vapors being ignited electrically is eliminated.

All the electrical components namely the transformer, the imbalance switch, the junction card and the frequency drive are mounted on the bottom of the body. Front plate houses the control circuit and the speed setting potentiometer. The reset and mains switch along with the mains fuse and mains input point is placed on the right side panel.

The unit is equipped with a timer indicator along with the frequency drive controlling the speed of the brush less induction motor. When the centrifuge is connected to the power supply the display glows indicating power available to the centrifuge.

➤ LID LOCK

The centrifuge door has to be opened manually by the user to check samples. The unit door has been provided with a safety interlock. Improper door locking prevents the rotor from turning. But once the door is locked and the centrifugation started, the safety interlock system will block the door opening till the rotor speed is less than 2m/sec. The LID LOCK indicator on the front panel will indicate the oPEn lid.

➤ ROTOR INSPECTION

Every rotor must be checked thoroughly for corrosion and damages. Rotors sometimes kept for too long without cleaning or kept aside with samples in it can get corroded due to the chemical action of the sample on the rotor body. Any kind of spillage on the rotor can also cause corrosive action. Improper handling or rough handling of the rotor can cause the rotors to get dented or defaced at different places. This again can give unbalancing or wobbling when in operation and cause spillage of the sample. Every steel tube in the rotor is lined with a rubber cushion at the bottom to protect the glass or polypropylene tubes from getting damaged at high speeds. If any of these rubber cushions gets damaged or cut or dislodged from the stainless steel tubes, it can cause immediate unbalance during operation. Clean the rotor and all the tubes with soft cloth before continuous use.

➤ ROTOR

Rotors supplied along with this R-5S model are namely angle head rotor. The angle head rotor is made from solid aluminum bar. These rotors are of the open type without individual rotor covers. All the rotors are dynamically balanced and functionally tested at speeds higher than rated speeds. Angle head rotors should be used for high speed operations.

Stainless steel tubes are supplied along with these rotors. In these tubes are placed either the glass test tubes or the polypropylene tubes. Glass tubes are liable to break at high speeds when used with angle head rotor, hence all the angle head rotors are supplied with ok polypropylene tubes. These tubes can be sterilized by clinical methods, dry heat or autoclaved up to 121°C. .

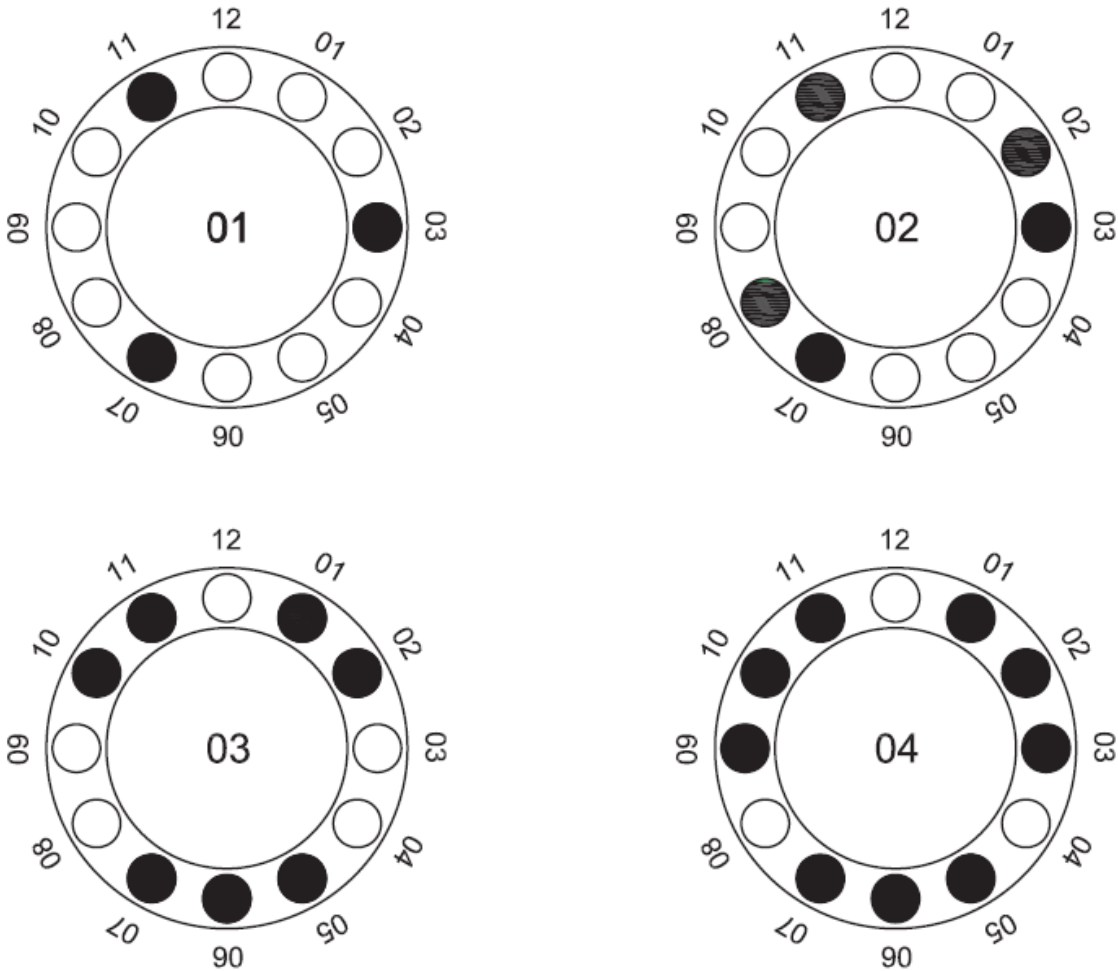
Place the rotor on to the centrifuge motor shaft, which is conical in shape and has left hand threads for fixing rotors. Fix the rotor by means of the captive nut supplied which will tighten when moved in clockwise direction. Use the fixed spanner supplied for this operation.

The material being centrifuged must not exceed a density of 1.2 g/ml at maximum rotational speed. All the tubes must be of the best standard material. It should be made of thick walled glass or plastic and inspected for defects. Tubes tend to get hot under continuous centrifugation hence check the temperature limits of the tubes before use. Seal the tube lids tight before centrifugation to protect from spillage of samples. The use of inflammable materials, explosive material or materials giving a violent chemical reaction is strictly forbidden.

➤ ROTOR BALANCING

Normally all the tubes are filled with sample and placed in the rotor before centrifugation. It is also recommended that all the metal tubes be placed in the rotor even if all of them are not needed for centrifuging. This will provide symmetry of balance and smooth acceleration. If the centrifugation has to be done on a few samples, not all the tubes are required to be loaded. In such cases when the loaded tubes are placed in the rotor, always balance them by distributing the tubes symmetrically around the rotor axis thereby avoiding destructive vibrations. In the case of swing out rotors, each swinging bucket in the rotor should be symmetrically balanced with the tubes.

BALANCING AN UNEVEN NUMBER OF TEST TUBES



Centrifuge loads must be balanced by placing the tubes of equal size, shape and containing equal volumes opposite to each other. Do not over load the centrifuge.

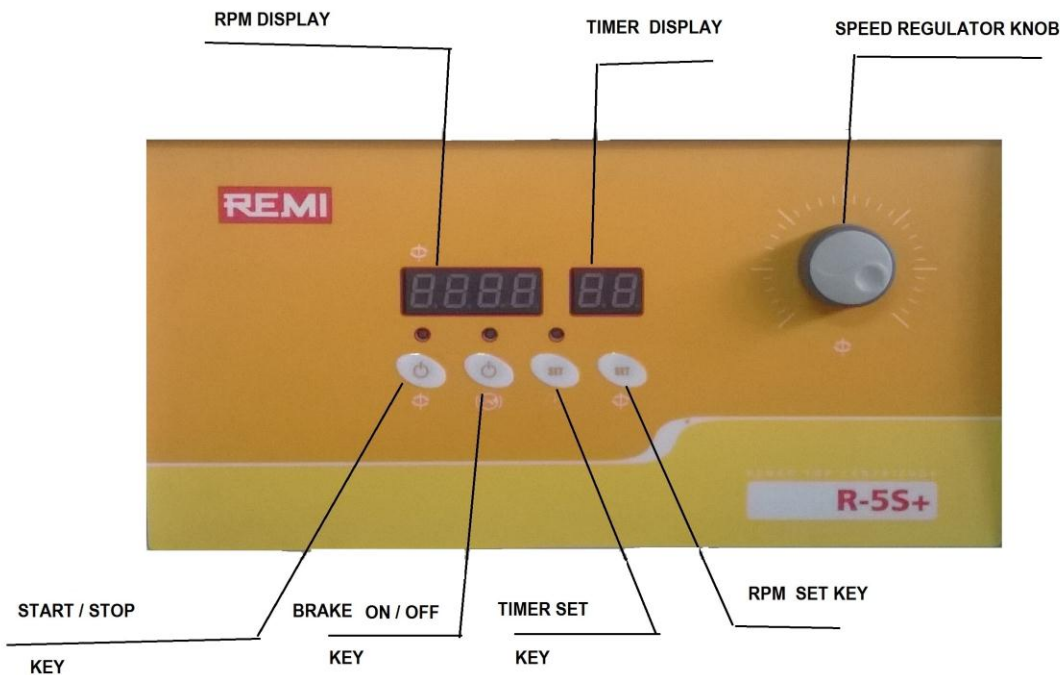
FUNCTIONS

➤ INDICATORS

- ❖ **RPM ON/OFF LED** : Indicates whenever centrifuge is in running or stop condition.
- ❖ **BRAKE ON/OFF LED** : Indicates whenever the brake mode is made ON / OFF.
- ❖ **IMBL on Display** : Indicates whenever there is imbalance of rotor.
- ❖ **LID OPEN on Display** : Indicates whenever the centrifuge door is open.

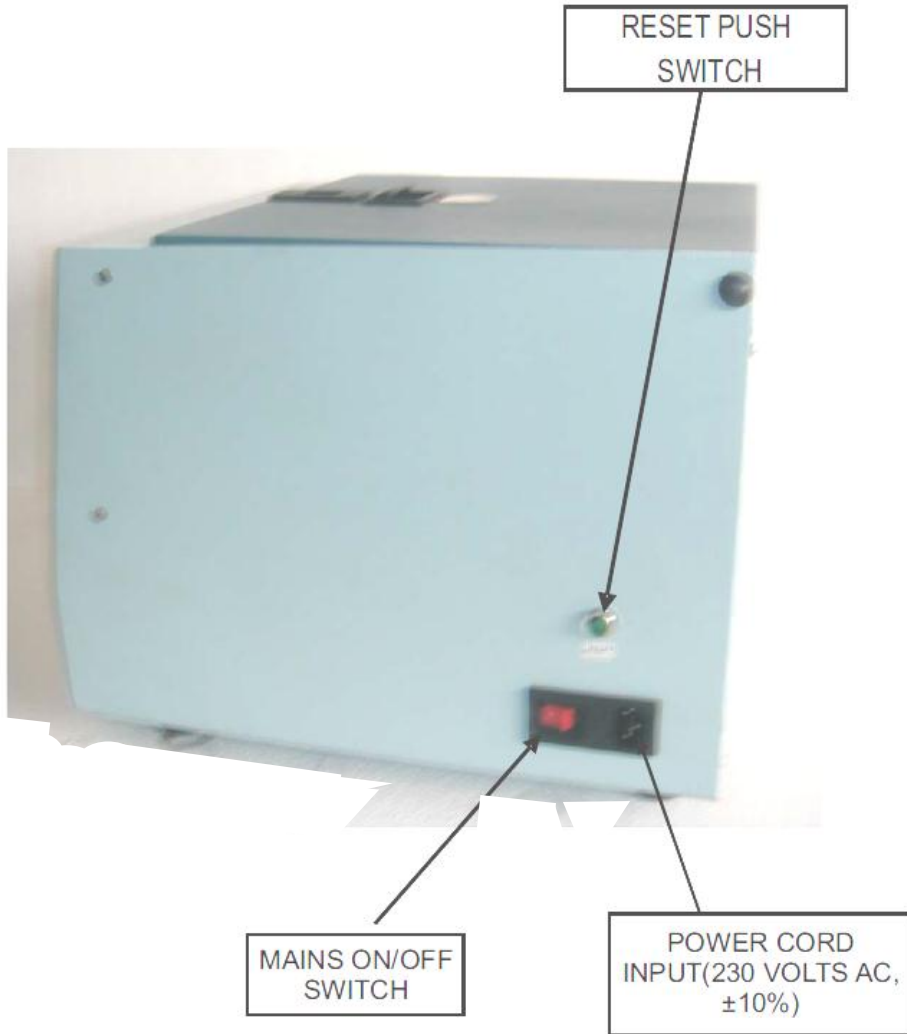
➤ SWITCHES

- ❖ **START / STOP** : To start the centrifugation the motor ON.
- ❖ **BRAKE ON / OFF** : To activate the brake feature and stop the rotor quickly.
- ❖ **RPM SET** : Press this switch and set the required speed by turning speed regulator on the display.
- ❖ **SET TIME** : Press this switch to set the required time for centrifugation.



CONTROL PANEL

RIGHT SIDE CONTROLS



OPERATING INSTRUCTIONS

1. Insert the Mains cord into Power socket and turn ON the supply.
2. Solenoid lid lock operates and display is tested by the micro-controller. All the segments of display including dots blink and the LEDs blink green & red simultaneously.
3. The display shows last run parameters i.e. RPM & time.
4. Timer can be set in the range of 1 minute to 99 minutes. Push Timer SET key and the timer display starts increasing till 99 then again comes to 1 and so on.
5. After the time of centrifugation is selected, press and hold RPM SET key. The dot of the last RPM digit starts blinking, now turn the speed regulator knob to the desired RPM. Clockwise rotation of knob increases displayed value and Anti-clockwise rotation decreases the value.
NOTE : While the centrifugation is ON or running, neither timer nor RPM setting can be changed. For this, the process has to be aborted or in STOP condition.
6. Once the desired RPM & time is selected, press the START/STOP key to turn the operation ON & OFF indicated by RPM ON/OFF LED. In running condition, timer and RPM SET keys are disabled.
7. In order to stop the rotor instantly, select the brake ON/OFF key and on press the BRAKE LED glows green. By default, the brake is always in OFF condition indicated by red glow of BRAKE LED.

NOTE : The brake feature is applicable only when motor is decelerating due to timer or manual stop command.
8. If during the centrifugation, user wants to terminate the process in between, then it can be done by pressing the START/STOP key and RPM LED comes red.
9. During operation, if an imbalance situation occurs then “**IbaL**” is displayed with alarm beep and the centrifugation is terminated automatically. Correct the tube placement and press the Reset switch provided above the power socket.
10. In case the lid of the centrifuge is open when START is commanded, “**Lid OPEN**” appears on display till the lid is closed.
11. When centrifuge is in stop condition, then the set RPM can be viewed by pressing the RPM SET key once.

➤ **RELATIVE CENTRIFUGAL FORCE (RCF)**

Minute solids in a liquid suspension get separated on the application of Relative Centrifugal Force (RCF). This effective force increases exponentially with speed of rotation and directly with the distance from the axis of rotation to outermost point of the tube. This RCF is also referred to as the g-force. This applied force resulting from the spinning action is perpendicular to the axis of rotation. Force is relative to the earth's gravitational force and has no units. It is simply identified as xg (times gravity) or RCF. The gravity g is a universal constant that represents the natural pull or force of the objects towards the earth.

Normally in most of the processes, the centrifugation is done after taking into account the RPM of the rotor. But it has also been observed that in special cases, it is mentioned that the speed must be set in terms of the RCF value provided. To calculate this RCF value, the conversion formula has been given below.

$$\text{RCF (g)} = 1.118 \times \text{Radius (cm)} \times \text{RPM}^2 \times 10^{-5}$$

Where RPM is the maximum speed that is required, and Radius (cm) is the distance from the center of the rotor to the outer most point of the sample tube.

Since good separation is dependent on the g-force applied, it is important to run at the proper speed that results in the proper g-force. Speed of rotor will affect the amount of force applied to the sample. Selecting a rotor with a larger radius of rotation will provide higher g-force at a given speed.

➤ **INTERNAL WIRING CONFIGURATION**

The motor used is of an AC, 3 phase brushless type along with frequency drive. A power filter provided at the mains input of the unit blocks any stray EMI/RFI signals from escaping into the mains path. As long as the unit is mains powered the door solenoid will remain ON. It will only become OFF either when the rotor is in motion or when the centrifuge power supply is interrupted. This arrangement thus blocks the door from being opened when there is no power to the unit or when the rotor is in motion.

If the brake is selected through the front panel it will only get activated when the centrifuge goes to a stop either due to elapse of time on the timer or manual switch-OFF of the rotor.



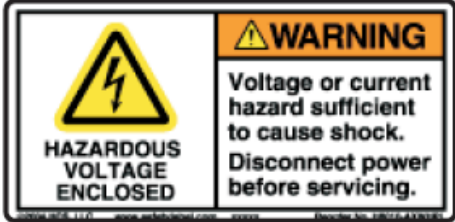
BIOLOGICAL RISKS






While in operation, the centrifuge can generate air suspended particles or aerosols. Since this R- 5S is not a refrigerated unit, it does not have its chamber totally sealed from outside air. This type of ventilated centrifuge helps in bringing down the excess heat created by the rotor air friction from the inner bowl. To minimize the risks of aerosols coming in direct contact with the person using this centrifuge, tubes with caps must be used. Glass tubes if used, must not be filled to the brim to avoid spillage. Also since the lid on the top has a gasket, it should be seen that this gasket is not damaged in any place. This will also prevent direct exposure of the user with the sample. It is also advisable to open the cover of the centrifuge 3 minutes after the unit stop completely. This will give time for the dispersed air particles to settle down.









Bioseals are a part of biological safety systems, which are not able to guarantee the safety of people and the environment on their own when handling pathogenic microorganisms. When working with pathogenic organisms of a higher risk group, more than one aerosol-tight bioseal must be provided for. If any specific liquids are spilled in the rotor or rotor chamber, the centrifuge must be thoroughly and professionally cleaned



SAFETY INSTRUCTIONS



	<p>Only trained personnel are allowed to operate this centrifuge. The person using this unit must go through the users manual and understand every aspect of this centrifuge. Every safety factor should be strictly adhered to, and in case of any malfunction, report the matter to persons concerned.</p>
	<p>This centrifuge must not be placed inside or connected electrically or mechanically to another unit. Only those rotors supplied along with this unit by this manufacturer should only be used with this unit. Rotors from this centrifuge must not be used on any other make centrifuge.</p>
	<p>Do not place samples that are flammable, chemicals with exothermic properties, toxic substances, radioactive materials, contaminated substances and effervescent or corrosive liquids for centrifuging inside this unit.</p>
	<p>No persons other than those authorized by the manufacturer are allowed to make changes inside the centrifuge after dispatch from the factory.</p>
	<p>Stop the use of this centrifuge unit if any damage / abnormal noise observed inside the unit. Report this matter immediately to the persons concerned. Since this centrifuge is double armored, there is no chance of the rotor or any other part of the rotor or its accessories from flying out of the unit. The impact will be absorbed from inside.</p>

	<p>Special caution should be observed when using dual sand witch tubes with internal filters. It has been observed that if the filter porosity is in all the tubes is not similar, it can lead to unbalance at high speeds thereby causing irreparable damage to the unit. All the tubes used must be of the best standard and material.</p> <p>Glass tubes when in use must not be run above its rated speed or else they will get shattered.</p>
	<p>When closing the centrifuge lid do not place your fingers between the lid of the centrifuge, otherwise it may cause physical harm.</p>
	<p>It is always advisable to change the rotor in the centrifuge while keeping unit power switched OFF. This operation of changing of rotor should be undertaken by trained technicians so as to minimize the chances of undue accidents.</p>
	<p>Do not start the centrifuge without balanced fill of tubes. Even slight difference in any of the tubes can cause the unit to unbalance and trip. For balancing, the weight of the entire tube, its cover and the contents within are taken into consideration.</p>
	<p>Tubes to be placed symmetrically on the rotor before start. This symmetry will be different for angle head rotor . Do not interchange the inner stainless steel tube holders of the rotors among other similar other models.</p>
	<p>The interior of the bowl should be inspected regularly for contamination and should be cleaned regularly.</p>
	<p>Do not make use of cleaning liquids or chemical substances that are corrosive in nature and can cause degradation of the unit exterior. Open the lid and clean the centrifuge bowl from the inner side with a dry cloth. Remove any impurities or foreign objects that are left inside the chamber.</p>
	<p>Never try to bypass safety and work on the unit by keeping the centrifuge lid open. This can lead to accidents. Switch OFF mains to carry out any type of cleaning of unit.</p>

ROUTINE MAINTENANCE



No Maintenance While Centrifuge in Use

- ◆ Before using any cleaning or decontamination methods except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not Damaged the equipment.
- ◆ Always unplug the power cord before cleaning or servicing the centrifuge.
- ◆ Wear protective gloves and clothing.
- ◆ Wipe the centrifuge housing, rotor chamber, rotor and rotor accessories with a neutral agent.
- ◆ After removing the profile rubber cushions powder them with talcum and very carefully Remove any glass splinters, which may be in the buckets before refitting the rubber.
- ◆ Periodically wipe the drive shaft with a slightly greased rug to prevent corrosion.
- ◆ Clean the powder finish of the centrifuge body with silicon or wax polish. Clean the control Panel with a moist sponge.
- ◆ If tubes break, all the pieces must be carefully removed using gloves, cleaning reagents and Strong disinfectant.
- ◆ With the help of trained technical personnel, open the front panel of the centrifuge and clean the inner side of the unit. Make use of the air blower to drive away any settled down dust and Solid particles.
- ◆ Apply some light colored touch-up paint on any surface where the powder coat finish of the unit has come off due to any abrasion or mishandling. This will prevent from corrosion taking Place on the exposed surfaces.

NOTE: It is also advisable to refer to the internationally recognized Laboratory Biosafety Manual, published in 1984 by the World Health Organization in Geneva, which gives information on decontaminants, their use, dilutions, properties, and potential applications. Local national guidelines should also be checked.

TROUBLE SHOOTING

- 1) Fuse blowing immediately at power 'ON'.
 - ⊙ Replace the blown fuse and restart. If fuse blows again immediately at power ON, there may be shorting in one or more of the centrifuge components. Report complaint to company service personnel.
- 2) The entire unit along with the circuit gives mild electric shock.
 - ⊙ Check the EARTH point on the wall socket. If absent refer to electrical personnel. If EARTH present in wall socket, check for continuity between the earth point of the unit mains cable and the entire unit. If continuity absent, report complaint to company service personnel.
- 3) Motor starts and stops immediately.
 - ⊙ Check whether the rotor gets imbalanced and then goes to stop mode. If imbalance found, rectify and restart.
If no unbalance found, in centrifuge STOP condition, in open lid condition, rotate the head slightly with the hand. If the rotor does not move freely, report complaint to company personnel.
- 4) Burning smell from the chamber.
 - ⊙ Stop the unit immediately as the moving rotor parts may be rubbing against the inside of the chamber during operation. There may be misalignment either with the rotor or with the motor. Check and rectify.
If fault still persists, report complaint to company personnel.

In case of any of the following faults

- ↻ Display showing garbage.
- ↻ Unit 'ON', but display parameters blank.
- ↻ Unit does not start.
- ↻ One or more segments of display are not glowing properly.

If any of these faults occurs, press RESET switch provided at the rear of the unit and start. If fault still persists, report complaint to company personnel.

ACCESSORIES

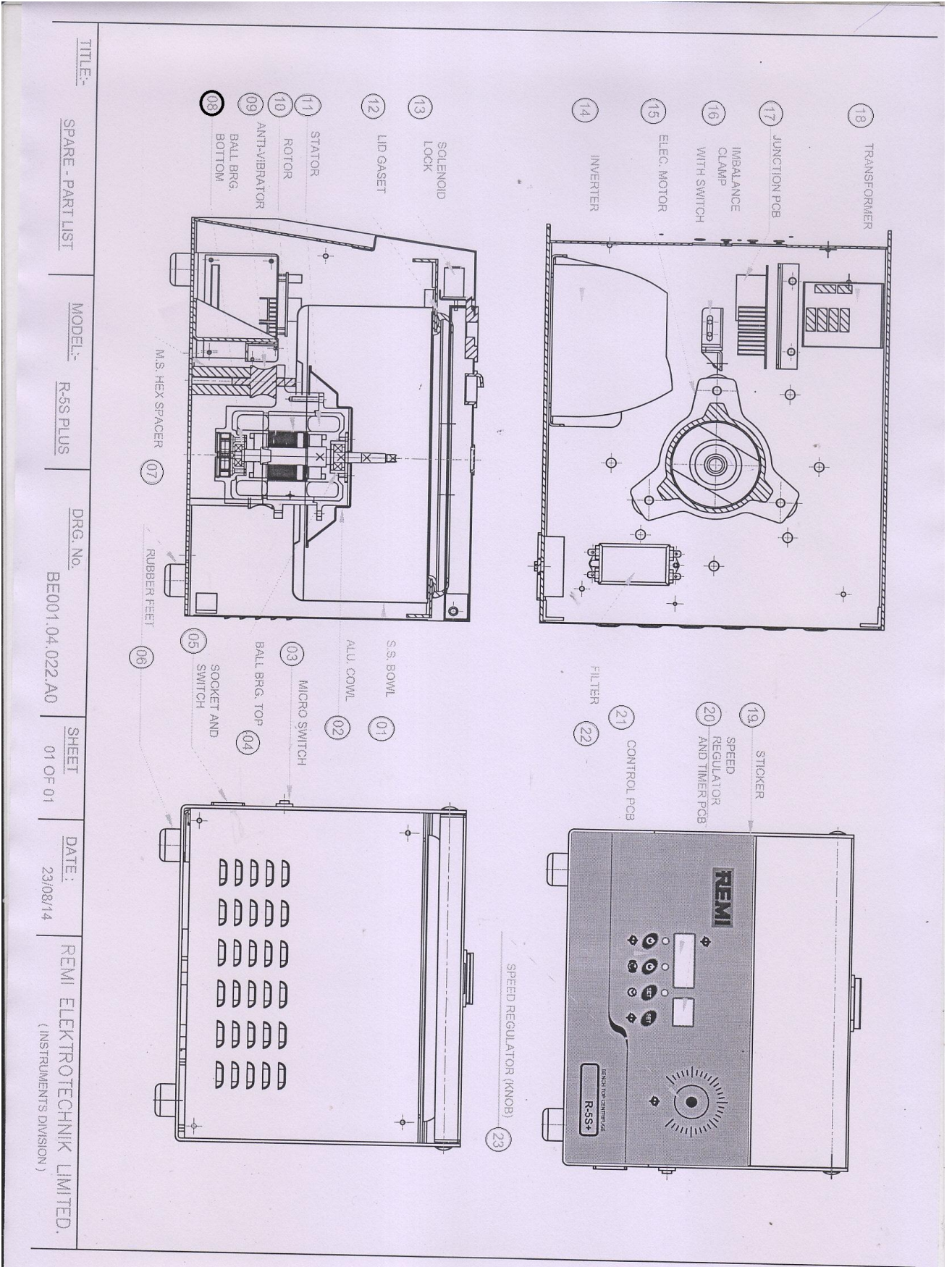
➤ ROTOR HEAD LISTING

Models	Capacity	Max. Speed RPM	Max. RCF 'g'	Radius in Cm
Angle Heads (with polypropylene tubes)				
R-83A	12 x 15 ml	5250	4280	13.9

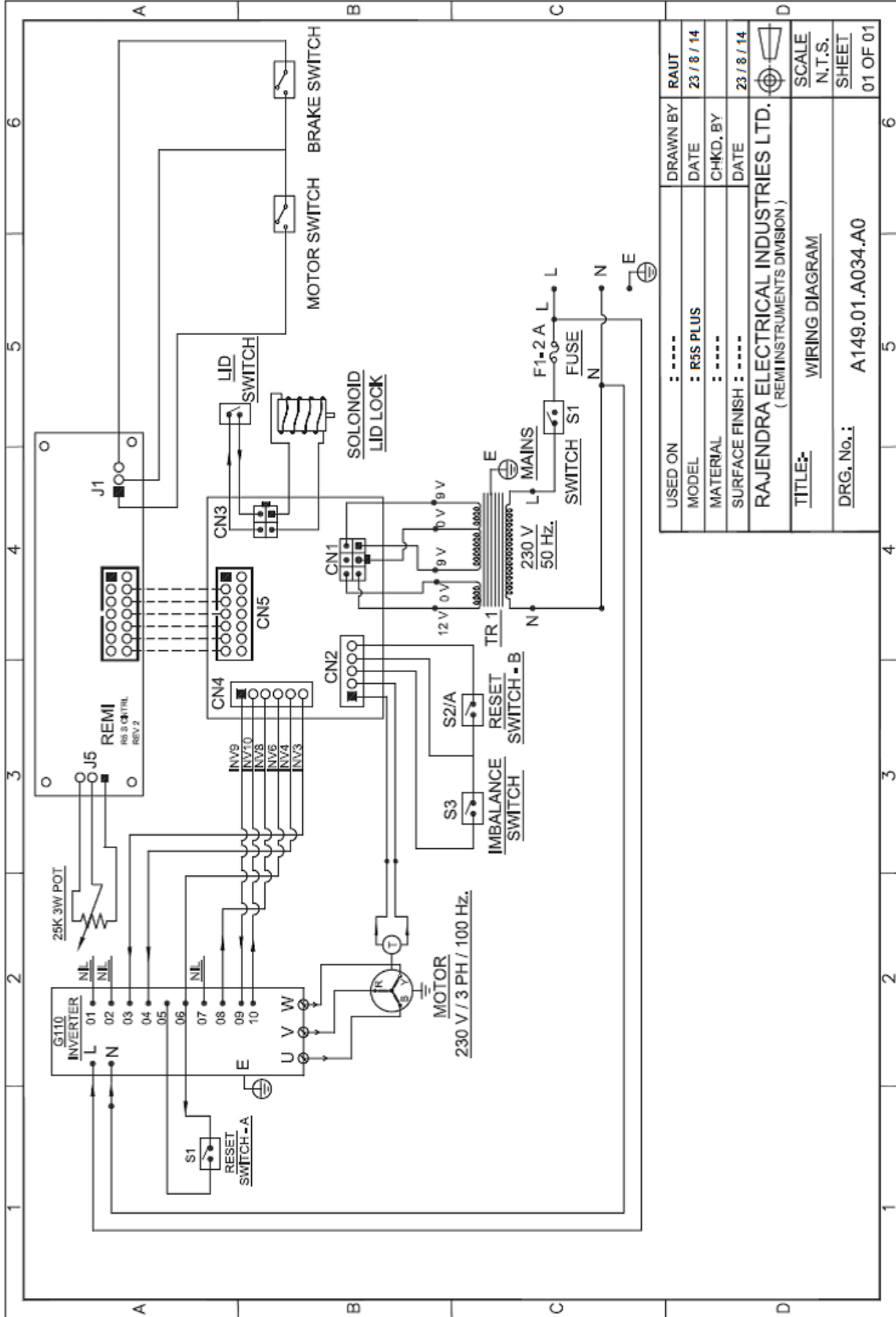
SPARE PARTS LIST

Sr.No	Description	R5S Plus
1	RUBBER FEET	L22000111
2	BRASS DOM NUT 5/16	L22000310
3	PLASTIC DOOR LOCK	L22000120
4	PLASTIC DOOR HANDLE	L22000119
5	PLASTIC LOCK PATTI	L22000445
6	DOOR HINGES SET	L22000118
7	DOOR ACRYLIC COVER	L22000454
8	PULLER SET	L22000202
9	SPANNER 12 X 13	L22000447
10	PVC KNOB	L22000117
11	SOLOINIED LOCK 12V	L22000025
12	TRANSFORMER BIG 0-12v 12-012v	L22000019
13	HI POT FILTER	L22000360
14	LID GASKET	L22000626
15	DRUM TYPE ANTIVIBRATOR SMALL	L22000581
16	IMBALANCE CLAMP	L22000614
17	5/16 RUBBER WASHER	L22000449
18	S S BOWL	L22000627
19	ALLU COWL	L22000628
20	INVERTOR	L22000352
21	POWER SOCKET 13 M/F	L22000604
22	POWER SOCKET 16 M/F	L22000605
23	SOCKET EMI 13	L22000606
24	MICRO SWITCH (GREEN)	L22000607
25	IMBALANCE MICRO SWITCH	L22000583
26	25K POT	L22000362
27	CORD WIRE 2 PIN (GERMAN)	L22000612
28	STICKER OF R-5SPPLUS	L22000631
29	POWER PCB VER -1	L22000616
30	CONTROL PCB VER -1	L22000617
31	MOTOR	ML25000169
32	USER MANUAL	L22000637

SPARE PART LIST DIAGRAM

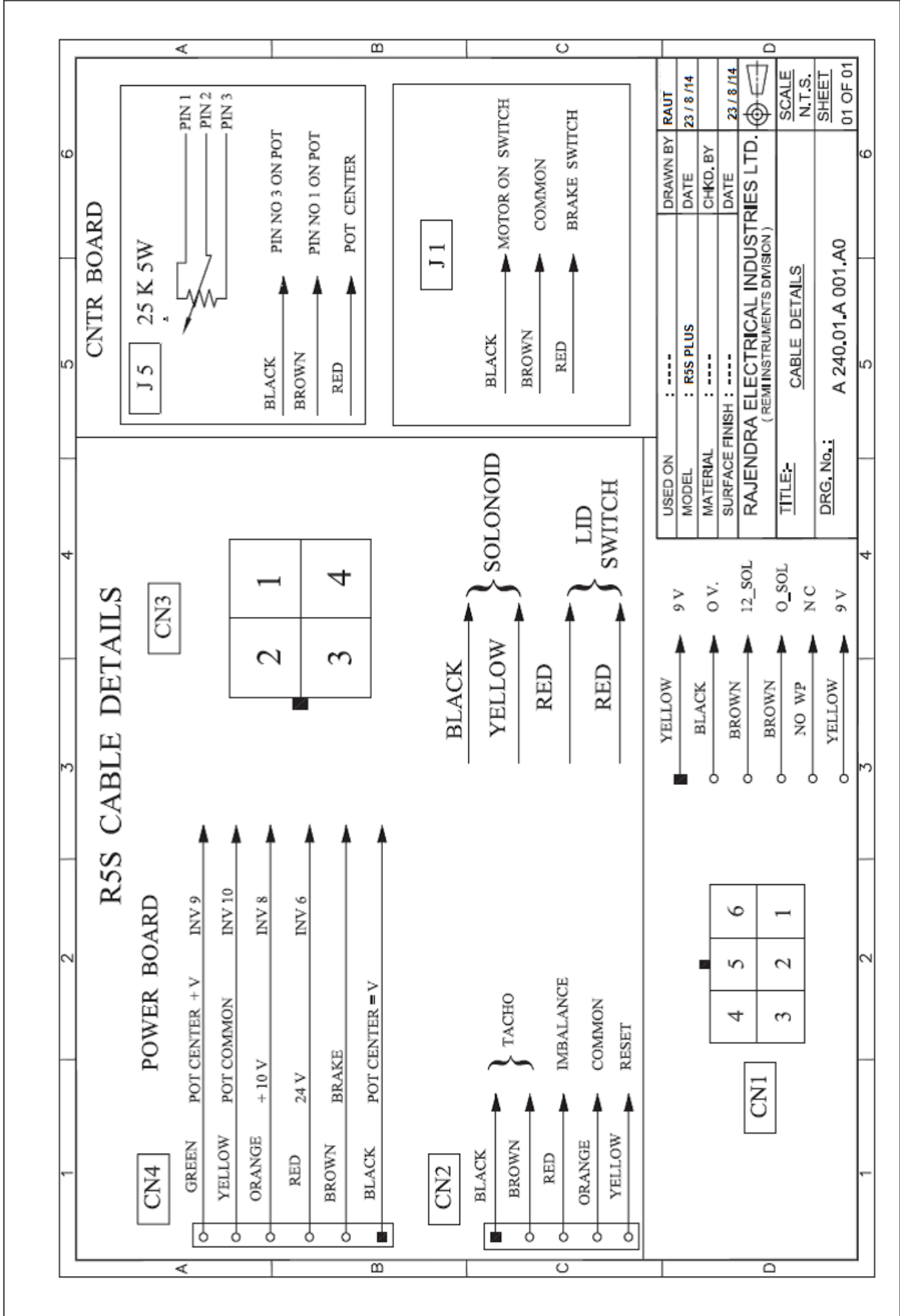


WIRING DIAGRAM



USED ON	: : : : :	DRAWN BY	RAUT
MODEL	: R5S PLUS	DATE	23 / 8 / 14
MATERIAL	: : : : :	CHKD. BY	
SURFACE FINISH	: : : : :	DATE	23 / 8 / 14
RAJENDRA ELECTRICAL INDUSTRIES LTD. (REMIINSTRUMENTS DIVISION)			
TITLE:-		WIRING DIAGRAM	
DRG. No.:		A149.01.A034.A0	
		SCALE N.T.S.	
		SHEET 01 OF 01	

CABLE LAY-OUT



FOR FURTHER ASSISTANCE

CONTACT OUR DEALERS, SALES & SERVICE

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