MAKELSAN
Uninterruptible Power Supplies

AUTOMATIC VOLTAGE REGULATOR

User Manual
&
Maintenance Guide

THREE PHASE RANGE 1000 KVA - 3000 KVA

Makelsan Machine Chemistry Electronic Industry & Trade Co. Ltd
Tuzla Organize Deri Sanayi Sitesi,2.Yol , I-5 Parsel, Orhanli Mevkii,
34957, Tuzla, Istanbul/TURKIYE
Phone: +90 216 4286580 Fax: +90 216 3275164

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INTRODUCTION;

Thank you for chosing our product.The product is covered under a two year manufacturer's warranty.
To maintain safety standards, regular maintenance calibration and operation of this equipment by qualified personnel is essential. Read and understand Instruction manual completely before operating or servicing.

1.0 PURPOSE :

In this manual,it has been introduced the principles and conditions about how to handle,use and maintain MAKELSAN FULL AUTOMATIC TRIPHASE SERVO AC VOLTAGE REGULATOR that has been purchased for your needs.

2.0 SCOPE:

Covers power regulators with a power range between 1000 KVA –3000 KVA.
Until it is not contrarily proved by test reports,it has been applied TS EN 60076 or TS 1055 standarts. It includes domestic updated technical specifications.

3.0 RESPONSIBILITY:

The use or the responsible person of depicted product can safely handle and use it by simply following these instructions.

Please read carefully these instructions for the legalty of the warranty conditions and your safety.

Damages caused by misusage,shipment,short circuit,lightning impacts or any deviation from mentionned instructions are all out of warranty coverage.

The maintenance and repair of these regulators can only be made by an authorized technical service.

4.0 SERVICE AND SPARE PART SUPPLY:

Domestic repairings are fulfilled by one of our authorized technical services.
To announce any failure report,please contact with our Factory Technical Department. Our Customer Complaints section will make all useful observation and operations at your place,our factory or at technical service and will detect the cause of damage.
Spare part or any additional equipment can easily be provided by our factory or technical service.
The regulators have longer life span as long as their nominal power is not exceeded and operate in suitable working conditions as protected from short circuits and over burden impacts.

5.0 EFFECTS TO THE HUMAN AND THE ENVIRONMENTAL HEALTH

As all electric apparels,when the regulators break down,it's flame may cause fire.

Their surrounding should be isolated from people's living place.

Because it is an electrical apparel,it is not to be uncovered by unauthorized

people. When the covers are open,there is a high risk of life danger due to a possible electroshock.

The apparel energy should be interrupted.

6.0 CARRIAGE AND SHIPMENT

For products weighing more than 20 kg,they have not to be carried via man power but simply forklift pallets. During transportation it is necessary to avoid any fall or crash of the product.

ACKNOWLEDGE AND START UP REGULATOR

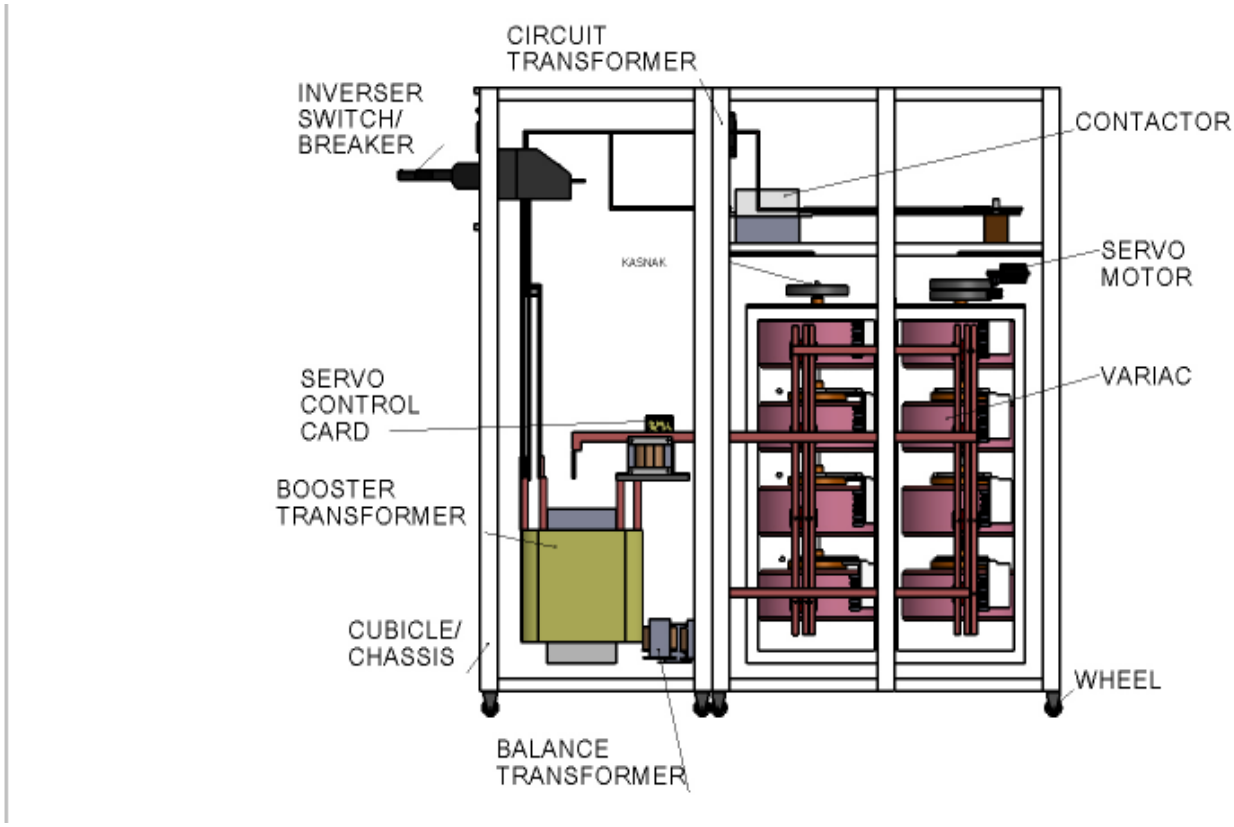
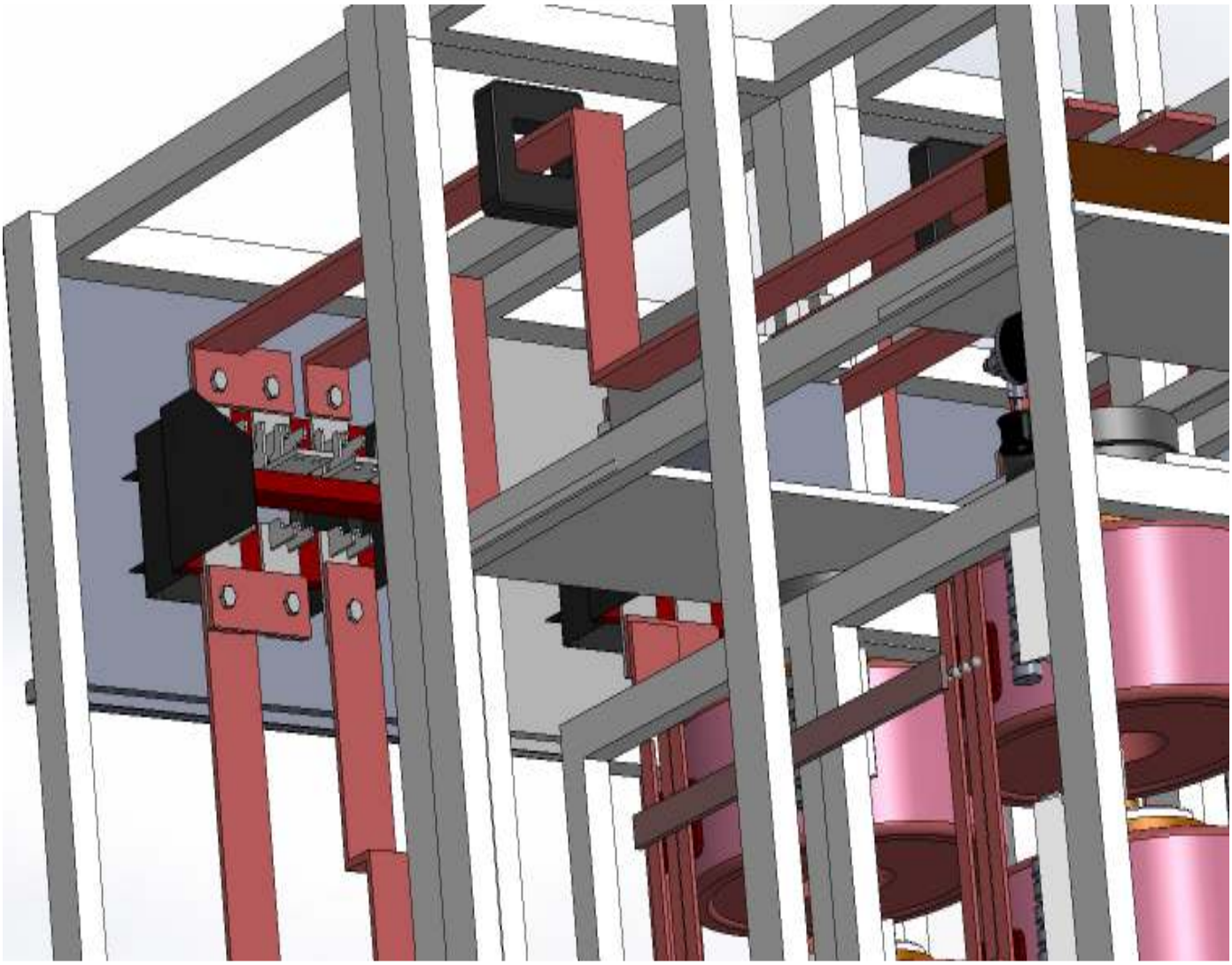


IMAGE - A	
3 KVA – 45 KVA	
NO	SEMI MANUFACTURED
1	Invertor switch/breaker
2	Contactor
3	Variac
4	Balance transformer
5	Servo motor
6	Cırcuıt transformer
7	Pulley
8	Cubucle/Chassis
9	Wheel

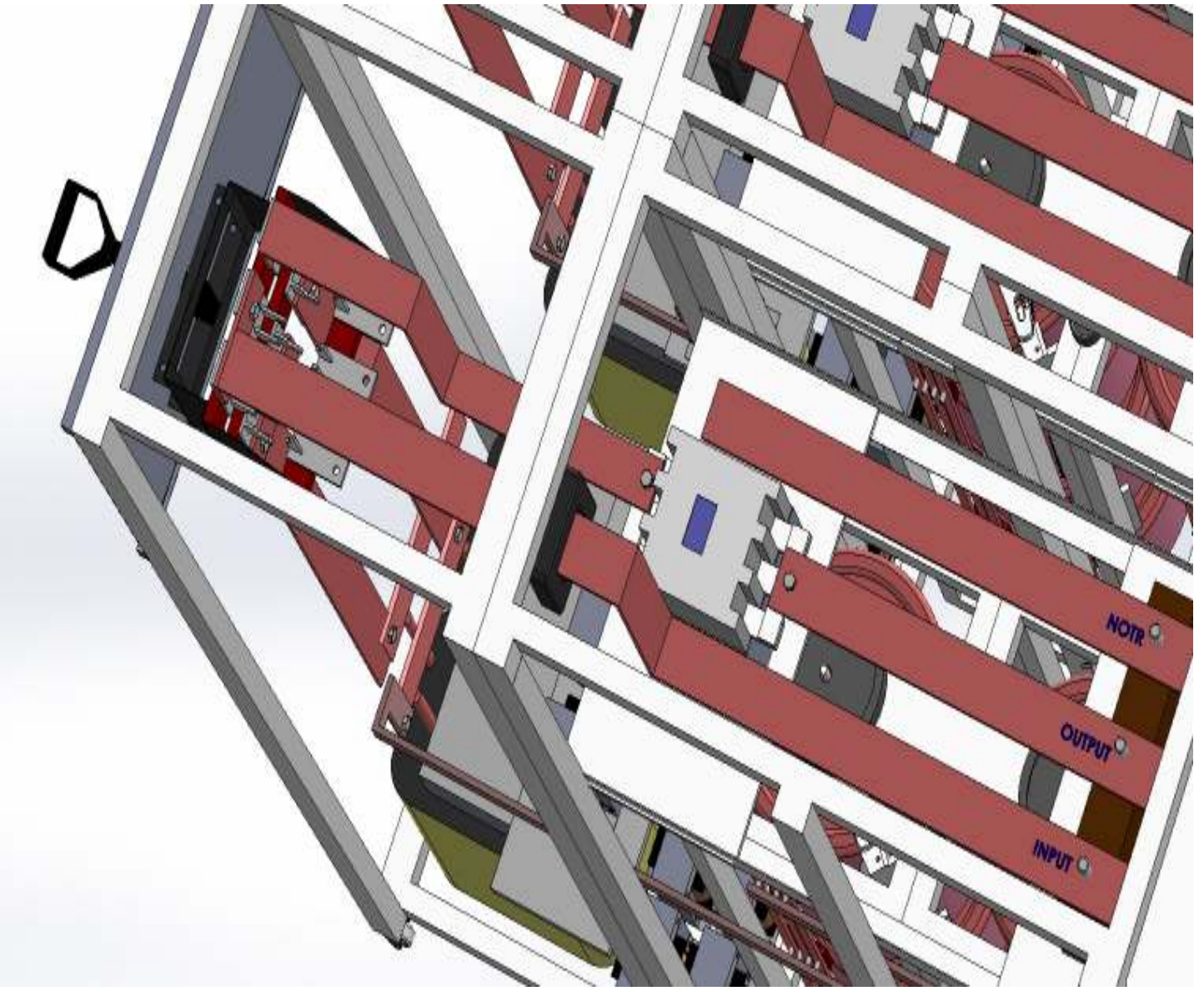
Picture-A

Protection against overload and short circuit by internal thermal relay limiting the available power to ……1000kva to 3000



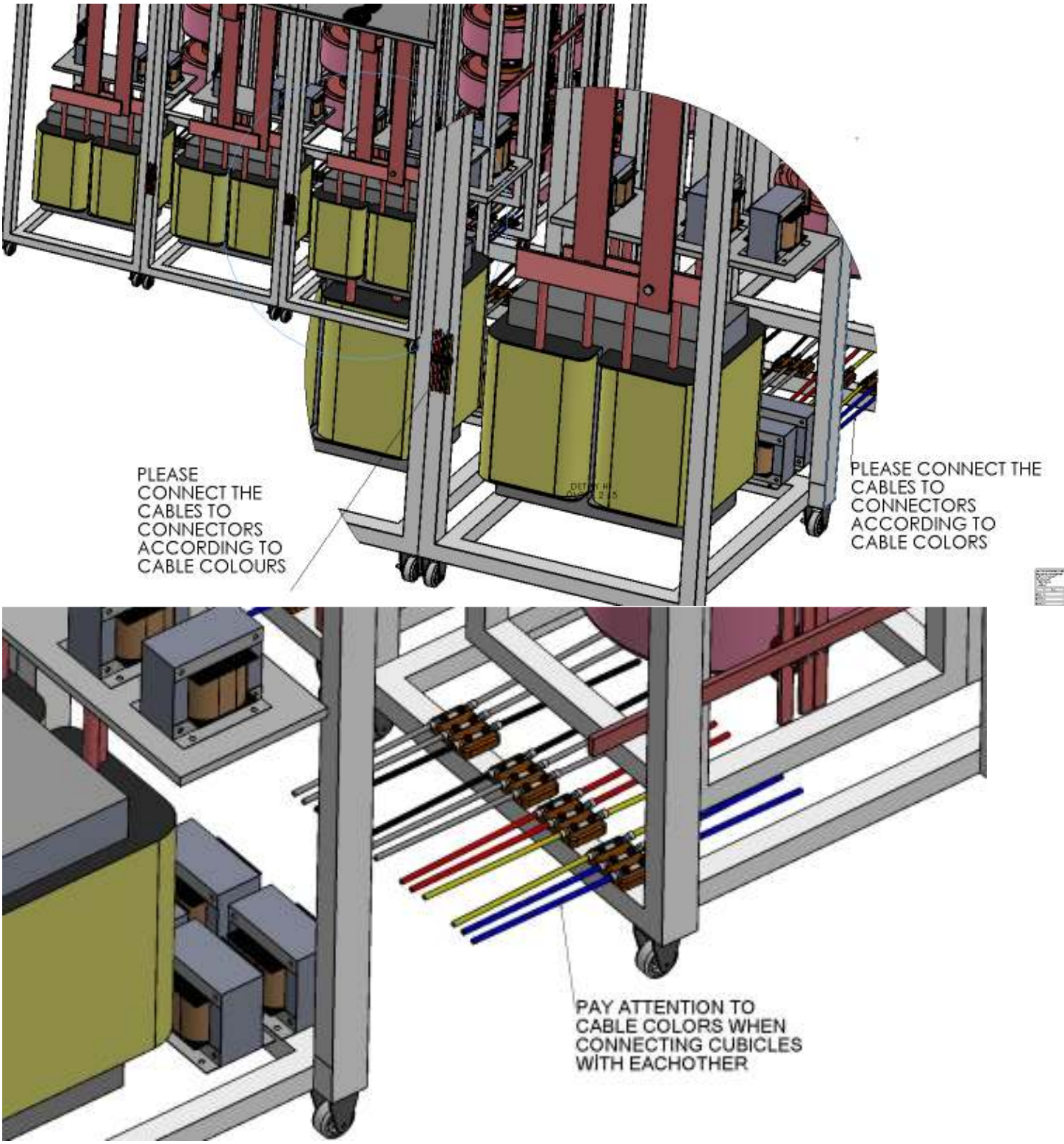
Picture-B

Connecting bars with invertor switch

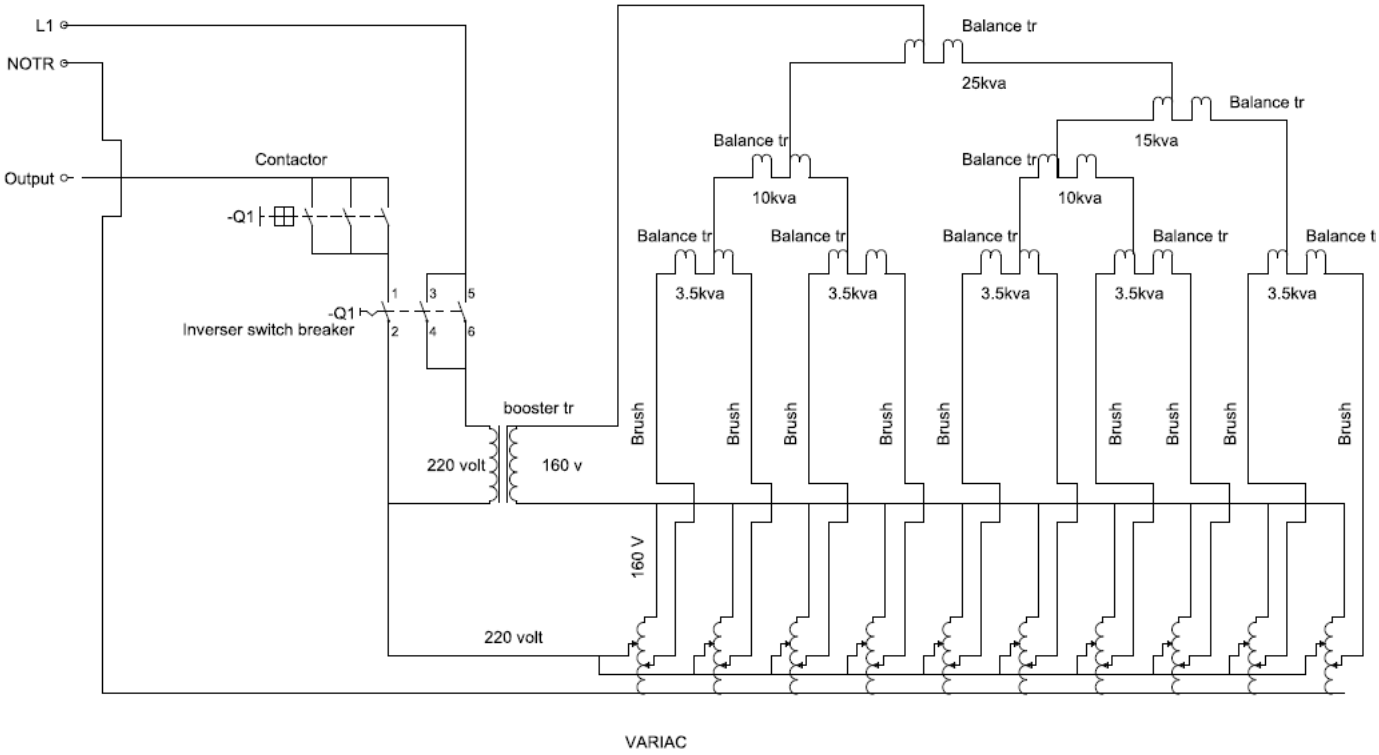


Picture-C

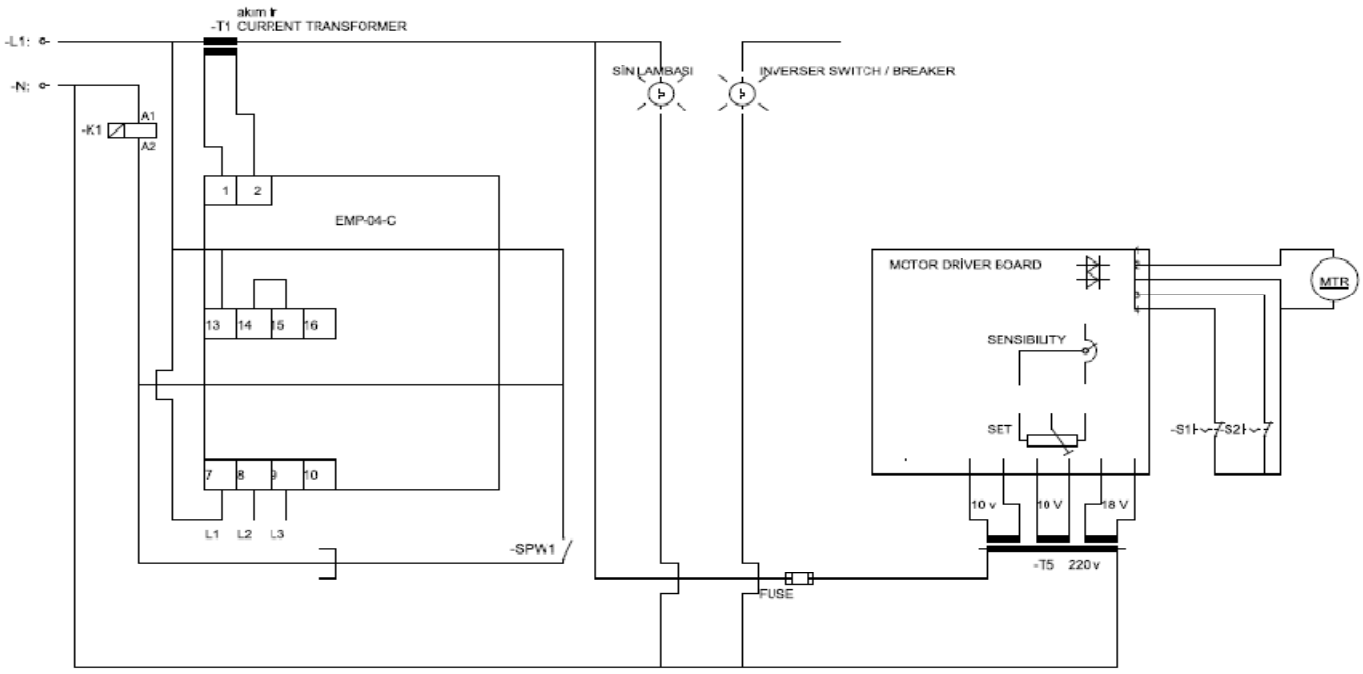
Connecting bars with contactor are perfectly visible as shown


PLEASE CONNECT THE CABLES TO CONNECTORS ACCORDING TO CABLE COLOURS
PLEASE CONNECT THE CABLES TO CONNECTORS ACCORDING TO CABLE COLORS
PAY ATTENTION TO CABLE COLORS WHEN CONNECTING CUBICLES WITH EACHOTHER

Picture-D



VARIAC

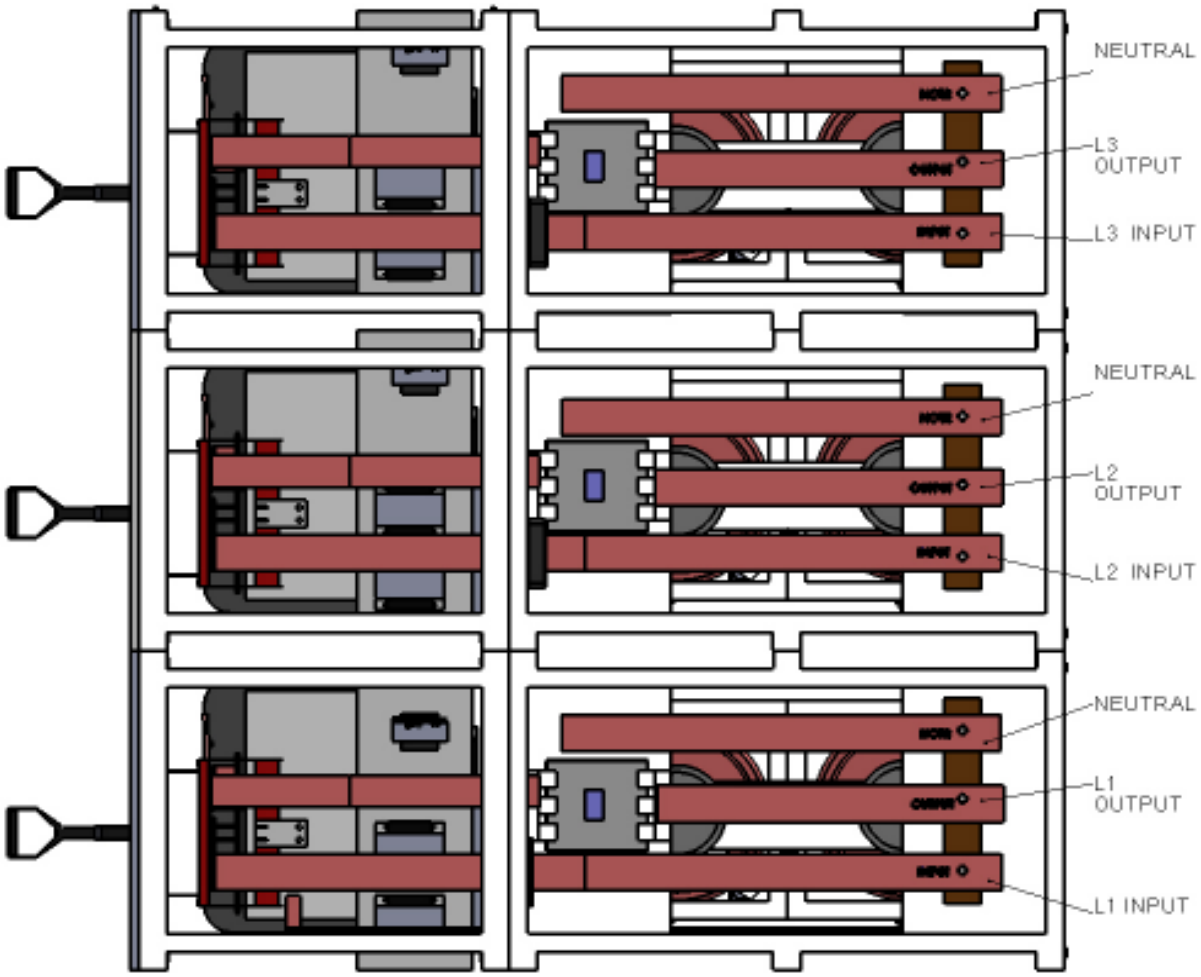


Picture-E
Control schema

6 PCS TRIPHASE SERVO REGULATORSinput/output
Electrical Connections SCHEMA

ApplyPhaseof inputs and outputsaccording to the image.

When you put in use every single phase interconnected with his own neutral phase.see image F



Picture-F

A) Only an authorised person can switch connections technical guidance according to instructions

B) Earth calling lines is obligatory on your regulator operation area, where designed to guard against any electric leak.

C) Plug in the Regulator to the system.use cross-section of cable when selecting , a top cross-section of cables you already determined

D) When starting up the regulator,switch down the the invertor switch

E) When you wish to use the city voltage by taking off the regulator from the circuit, Lift up the invertor switch

G)The power value mentionned on the Regulator sticker,is constituted of the sum of three different phases. That is why the total power in the installation that you will set up,should be divided into maximum number of equal phases. In unbalanced loads,the regulator will work unefficiently so it may seriously get harmed or even damaged.

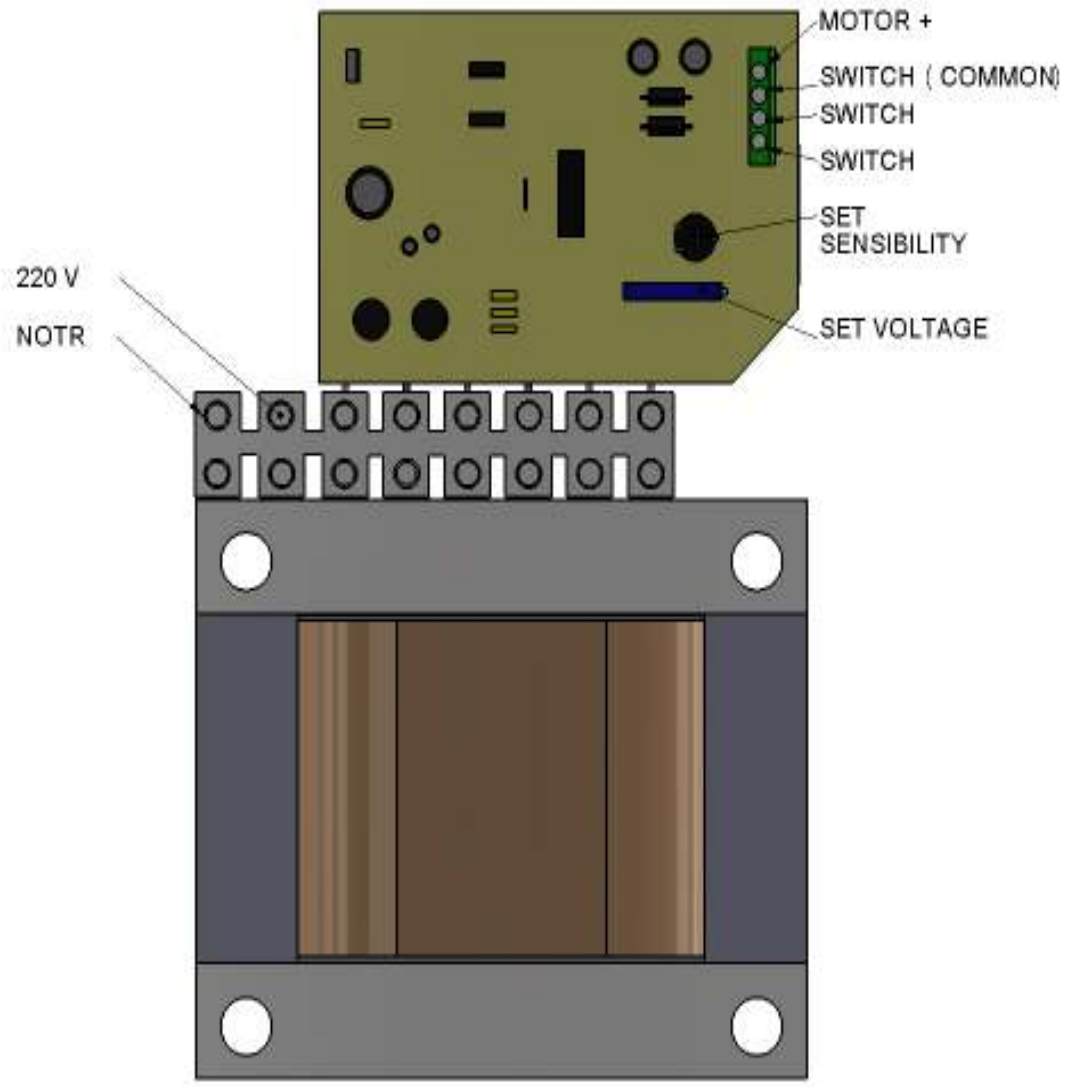
Warning !!!

Installers must be qualified to perform electrical installation work.

Settings of servo card connection and potence

Servo Card enables a two switches setting of the trimpot which control function of servo motor

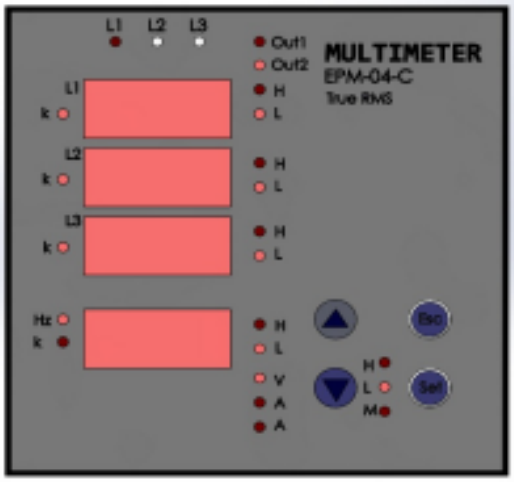
This card also render volt set and sensitivity settings of the regulator.This two trimpots default setting are 220 volts



Picture-E

EPM-04-C PRESENTATION AND USE

Device alternativly aremanufactured in-phase or current protectedover-currentload and whether one or both of the voltage missing in such circumstances;turn off the system prevents damage by stop feedingaccording tothe factorysettings power of the device mentionned voltage and phase values set o no further need to any different change



If you stillneedto replace first press to set bouton until 3 seconds pin code will be available (1234) writtenby pressingthe up arrowsign(curh1) entering thedevice to following max.voltage then press Esc buttton till yes letter is printed. Finally storedby pressingset button.

Voltage values factory settings to be adjustedlow voltage180 volt high voltage 245 volt.

These settings can be changed if required (spuolh1) here by pressingthe up and down voltage values re entered then pres Esc buttton till yes letter is printed then storedby pressingset button.

SERVO REGULATORS WORKING PRINCIPLE

MAKELSAN SERVO REGULATORSvariable voltage transformer allows to edit

(Variac – image A) a Servo Motor which commands the auxiliary transformer

and an Electronic Card which controls system according to the output voltage.

In case of normalmains inputvoltagefalls or rise thatthe control circuitdetects the preciseactivate quickly servo motor

Motor is coupled according to signal which received (T2) tuned trasformer

(Variac) by movingright or left(T1) booster trasformer prime

By giving voltage to winding in directionorthe opposite direction ,in secondary winding

Consist voltage main input voltage reflected in the addition or subtraction.

By the way voltagefluctuationsthat may occurat the entrancethe desired accuracy of output %+-1

trying to maintain theoutput voltagewith a tolerance ofsuch a safe operation of the device can be secured with other auxiliary equipment additional.

Control systemwithfast responsetime high initial tork DC motorsystemquickly corrects evensmallchangesin inputvoltage.

When Servo Motor input voltage working limits are exceeded,the output voltage is set to an automatically preferred level,and it is taken off from the circuit by the control circuit.

APPAREL SPECIFICATIONS AND BASIC DETAILS

MAKELSAN Servo Controlled Regulators formed by toroidal transformer allows to edit which ensures the voltage stabilization (variac),,a Servo Motor which commands the auxiliary transformer ,variabletransformer and an Electronic Card which controls system according to the output voltage.

Control system withfast responsetime ,high starting torque ,DC motor system ;even in case of small voltage changesat the entrance quickly corrects.

Servo Motor which disable control circuit automatically and adjuststhe output voltageto the desired valuewhen the input voltage is outside the borders.
When it is regulated with the help ofelectronic braking circuit engine power is cut off and works in silent mood.

1.Wide Power Range 2kVA - 50 kVA monophase, 6 kVA 3000 KVA triphase production.

2.Voltage field:

Standart; 160/250/220 V mono phase

275/450/380 V triphase

SPECIAL STABILIZER 140/240/220 V monophase

242/415/380 V triphase

120/240/220 V monophase

208/415/380 V triphase

3.Regulation speed rate: 80 V/sn.

4.Output deviation: Regulator does not have any deviation when it is not exceeded the original power limts.

5.Efficiency : MAKELSANregulators and transformers have more than >95 % of efficiency,because they are produced of high quality silica sheets and B class conductor matieral.

6.Operation Temperature:Regulators can go up to 50°C when the environment is not too acid or wet. Temperatures which are above that,require additional cooling system.

7.Over voltage and Phase protection Unit (Optional): In overburden fluctuations(low-high),it breaks down the output when one of the phases is gone.When requested voltage is found,it gives output again. If the user prefers,he/she can take the protection unit off the circuit via it's key.

8.By-Pass system: Regulators make by-pass via high quality switches.When some failure occurs,with help of 2x and 6x pole modifier switches,the regulator can be transferred to Line via Switch channel.

9.BASIC ADVANTAGES.

Silent mode.High efficiency

Output without distortion.

Determined and uninterruptible feding

Wide correction range.High sensibility.

10.APPLICATION AREAS

SNC equipment frameı.

Warming,Cooling,Air conditioner apparels.

Radio,TV, Emitter Stations.

Electric and Electronic medical equipments.

Rectifiers (Battery Chargers)

Electric motors.

Tele or other communication devices.

Automatical Welding Machines.

Magnetic Devices

Lightning equipments.

Printing machines and sensible electronic Matbaa makineleri ve sensitive electronic typsetting machines

precision photograph studio devices.

Induction heating devices.

Electro coating systems

All types of electronic touchscreen,embroidery and tricot frames.

Laboratory with Electric and Electronic devices

Test and search laboratories

Factory,hospital,hotel and building entrances.

Other locations and devices which require constant voltage.

11.Triphase Servo Regulator Technical Specifications

MODEL		MSR Series					
Power(kVA)		1000	1250	1600	2000	2500	3000
Input	Phase	3 Phase					
	Voltage	380 VAC					
	Operating range	275 VAC - 450 VAC / 225 VAC – 400 VAC					
	Frequency	50 Hz					
Output	Phase	3 FAZ					
	Voltage	380 VAC					
	Frequency	50 Hz					
FRONT\ REAR		FRONT\ REAR		FRONT/REAR		FRONT\ REAR	
Dimensions	width(cm)	70\70		90\ 90		140 \ 140	140\140

	depth (cm)	80\120		100\ 120		100 \ 150	100 \ 150
	height (cm)	185 \ 185		195 \195		175 \ 175	205 \ 205
Weight (kg)		3500	3750	4500	5500	7000	8500

GENERAL		
Efficiency under load		≥ % 95
Correction Speed		80 V/sn
Protection	Phase Loss	Phase protection Unit (Optionel)
	High/Low Voltage	Contactor (Opsiyonel)
	Overload	ACB ORFUSE
	By-Pass	Manuel
Noise Level		≤ 45 dB
Working Conditions	Temparature	-10 °C ~ +60 °C
	Humidity	0 - 90 % Condensed Humidity
Cooling		OPTIONAL- THERMOSTATIC

12.RULES FOR MAINTENANCE AND USAGE

A) Avoid to keep flammable and non heat prof material aqround the regulator.(above,beneath,right,left)

B) Prevent water leak with early detection and appropriate action to protect the product

C) The working environment must get rid off the bugs,rodent animals and insects.

D) The covers of the regulator are not to be opened by unauthorized personel.

E) The regulator is not to get exposed to high temperature,or impact which may cause deformation on outer case of the regulator.

F) The future replacement and renovations made on the apparel must be proper to the apparel's power. ,

G) The appearance of the apparel must be checked once in a month.

H) The paint of the apparel must be checked on annual basis.

İ) The switches and the cables of the apparel must be yearly checked

13. ERRORS CAUSED BY MISUSAGE

A) Check the earth line when leak occurs.

B) If the apparel is overloaded,overheating and some sort of smell can be felt. Check immediately the load which is fed

C) When a smell or heating is seen,avoid to use the apparel and contact with the service.

D) If liquid or similar substance penetrates into the apparel,cut off the apparel energy for security.

E) When the cables of the apparel are being damagedc by rodent animals or any other reason;avoid to use the apparel and make necessary changes in the cabel part of the regulator by authorized staff.

F) If the regulator does not give any signal,contact with the technical service for the energy.

14. POSSIBLE PROBLEMS, TROUBLE SHOOTING;

Problem	Reason	Solution
Voltmeter do not display correctly	Voltmeter failed,	Check the socket control via Digital Voltmeter.If it is analogue type,do you change it.
	Electronic card failed	Check the neutral connection,if the error is repeated,call the techni cal service.
There is odor coming from the device	Overburden	Check the phase loads,set the apparel to Line mode,and call the technical service.
The apparel doesn't not display voltmeter.	With protection	Control the contactor and the inverter switch.The phase may be cut off.Can't be neutral.The voltage is out of working range.
	Without protection	Invertor can be burnt out or the voltmeter can be broken.Call our technical service.
Out of standart On and Off Transitions	With protection	Check the neutrals and the phases.
	Without protection	Draws over current.Out of voltage current standarts.
There is Noise	Overburden,motor connection may be loose	Set the apparel to Line mode.Contact with our technical service or sales point.Transmit them these points. -Serial No and kVA, -Problems occuring date.
WARNING: Any intervention should be done by authorized people..		

In accordance with its policy of continuous improvement, MAKELSAN reserves the right to change specifications and designs without notice.

All illustrations, descriptions, dimensions and weights in this catalogue are for guidance and cannot be held binding on MAKELSAN.