

TSD SERIES SERVO AVR

USER & INSTALLATION MANUAL



About TSINE

TSINE Electronics Industries has been designing and manufacturing Power Quality and Power Conditioning Systems for worldwide markets.

TSINE and its team stands for the world-class quality and performance products, trouble-free robust operation and continuous access to clean, continuous power for all of its products.

TSINE sees its core business as research & development in power engineering and the outcomes are seen as reliable, innovative products and solutions for global partners.

TSINE presents single phase-three phase UPS Systems, both legacy transformer based, robust industrial topologies and high frequency, next-generation IGBT rectifier and inverter series which comes with online double conversion and three level highly efficient design; Servo and Static AVR systems, microprocessor controlled; up to 4000 kVA; inverter and rectifier/battery charger, DC power supply systems; Solar systems, telecom and railways AC & DC power solutions and other power quality solutions

Professional presales, sales and aftersales services, customer satisfaction at highest level environment and user friendly design approach are the keys for TSINE for its sustainable company management. Innovative solutions and industry leading approach in after sales makes TSINE a Reliable Partner in all of your power infrastructure requirements

TSINE is offering clean, continuous power to many countries in the world from Philippines to Egypt, from Iraq to Bangladesh, from Kosovo to Afghanistan, from Libya to Zambia globally.

TSINE sees the continuous investment to R&D and production facilities along with customer oriented approach as the key for its success.

We invite you to Enjoy The Power of TSINE Electronics Industries.

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Standard Features

- The TSD AVR is built in galvanised steel profiles and DKP metal sheets. It is processed with humidity-stainless proof chemicals and painted by electrostatic paint. The AVR is designed and assembles for an operation minimum noise.
- The protection class of the AVR is IP20. Live parts may cause health and electric shock risk. Autotransformers (variac) may cause death risk because of high voltage. DO NOT TOUCH TO LIVE PARTS OF THE AVR.
- Connection of the AVR and commissioning shall be done by authorized personnel only.
- Please follow all the instructions listed in User & Installation Manual to operate the AVR in the best conditions and safest way, to do the maintenance and repair works properly.
- Connecting and operating the AVR without following the instructions listed in the manual will leave the AVR out of warranty. The damages resulted from unproper installation and use can not charged from manufacturer.

Suitable Use

- Measure or contact with our authorized service center for site inspection of the electrical & load requirements of the installation site. If the capacity is not measured by our authorized staff, damages to the product or other devices sharing the same network; caused by overloading TSINE disclaims any responsibility.
- After the installation of the AVR, before connecting any additional load,contact with authorized technical service. Otherwise, the product shall be out of warranty terms.

Restrictions of Use

- Max. and min. voltages and max. power capacity is shown on the label. Before use, check these parameters
- Do not overload the device.

INPUT VOLTAGE	V AC
OUTPUT VOLTAGE	V AC
CAPACITY	KVA
NUMBER OF PHASES	
FREQUENCY	50 Hz.
DATE OF PRODUCTION	
MODEL	
SERIAL NUMBER	

Operational Safety

- Make sure the mains cables are connected to the AVR's input terminals. Neutral line shall be connected properly.

For three phase AVRs, make sure the loads for each phase is equally distributed.

- Make sure the connections of the AVR are properly done.

1- BRING THE AVR'S BREAKER IN MAINS POSITION.

After seeing that the input phases are available in the AVR,

2- BRING THE AVR'S BREAKER IN REGULATOR POSITION.

- Check the output voltages and TURN ON the devices/ loads connected to the AVR.

If the AVR output voltage is not within the right tolerances for your loads, DO NOT OPERATE THE AVR

- **Make sure earthing is properly done before connecting and operating the AVR**

- Read all the labels and instructions on the device carefully.

- Do not locate the device in over humidity, dusty places. Good air ventilation is a must.

Installation place shall give access to the authorized personnel at the times of maintenance and service.

- The top, front, side covers can only be opened by authorized technical staff.

- During maintenance and service, only authorized personnel can interfere with the device.

The covers shall carry warning labels, at the time of service, mains power to the AVR shall be Turned OFF.

- For a longer lifetime of the device, The AVR shall supply a load of maximum 75% to reduce the stress on the components and its parts.

- Input and output power cables shall be positioned in way which no object is put on it.

Make sure the cable is healthy with no crushing or folding.

- Warning signs and labels are important. It shall be checked and renewed when needed.

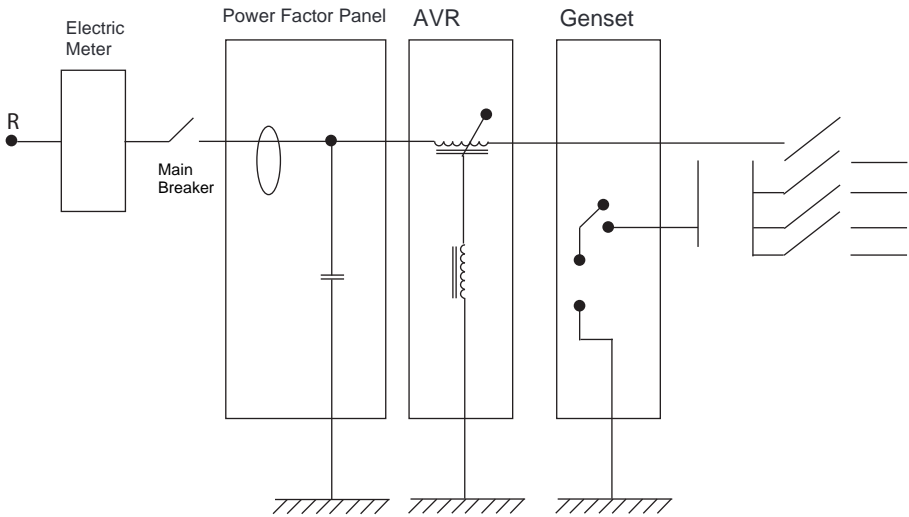
- The facilities with power factor compensation panels, capacitor banks, gensets, shall carry out the installation as per the diagram shown later on this manual.

- Keep the flammable materials and liquids away from the AVR. Avoid direct sunlight and heat sources.

- Fire-extinguishers shall be CO₂, carbon di-oxide type in case of a potential fire.

- **CUT THE INPUT POWER TO THE AVR AT THE TIME OF ANY SIGNS OF FIRE**

(SMELL, BURNT, FLAMES, SMOKE)

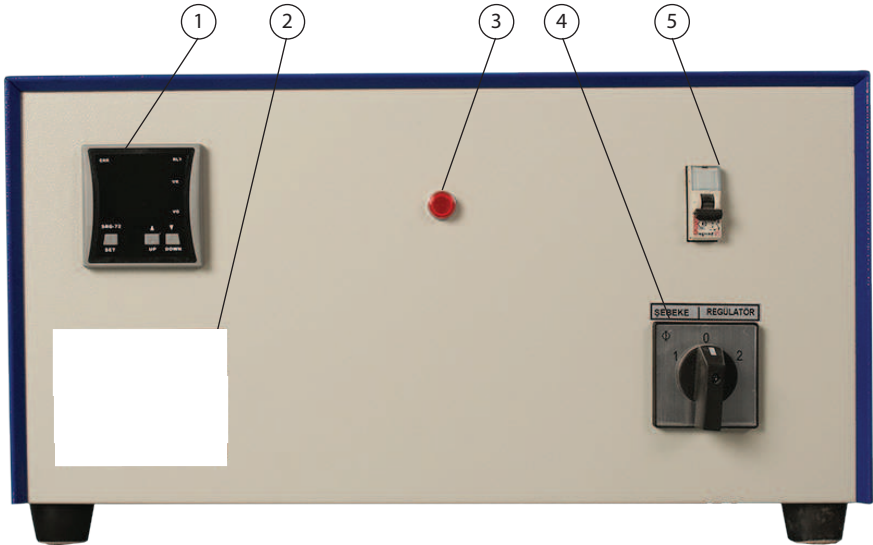


Single Line Connection Diagram for The Systems with Capacitor Bank & Genset

Use of AVR in Compliance with Safety Conditions

- The manufacturer rejects any responsibility for the cases, risks and potential damages of unauthorised use, for the use in the areas and applications which the AVR is not intended and specified in its design
- If any modification, replacement, changes is done on the AVR design or structure by an unauthorized personnel, the manufacturer disclaims any responsibility and such chances shall leave the device out of warranty.

TSD Single Phase Front Look and Introduction



Single Phase Servo AVR Front Look - 1 kVA - 15 kVA

- 1 - Controller board & digital LCD display
- 2 - Device label for capacity, serial and other electrical characteristics
- 3 - LED warning light for Regulator In Use
- 4 - Mains/ Regulator Selector Breaker for AVR
- 5 - Input power switch for AVR

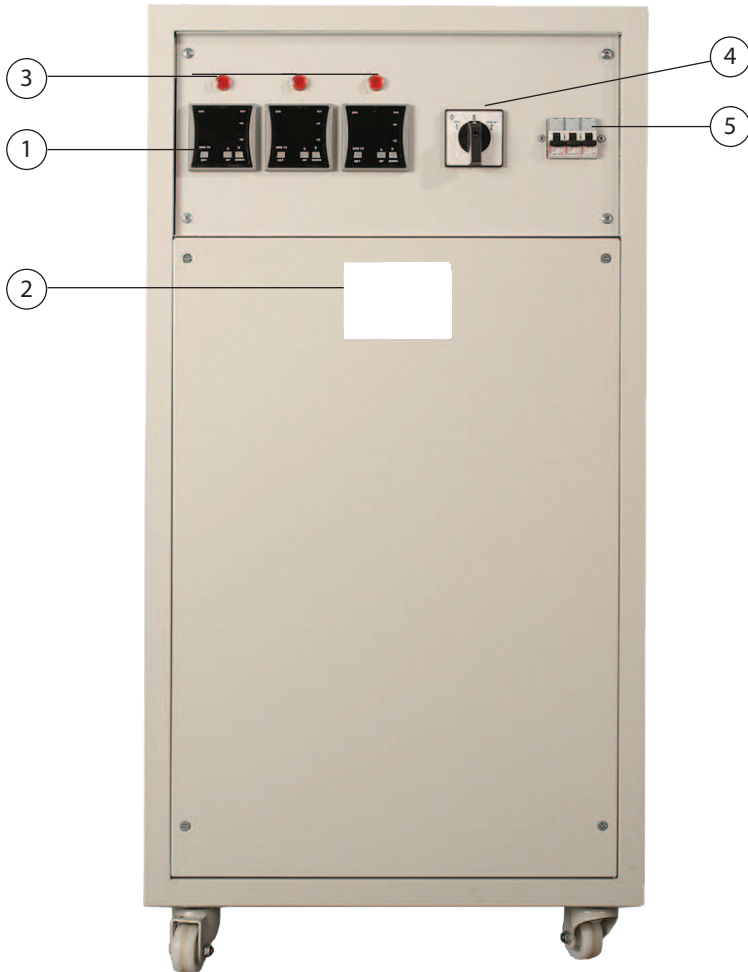
TSD Single Phase AVR Front Look and Introduction



Single Phase Servo AVR Front Look - 20 kVA - 50 kVA

- 1 - Controller board and digital LCD display
- 2 - Device label for capacity, serial and other electrical
- 3 - LED warning light for Regulator In Use
- 4 - Mains/ Regulator Selector Breaker for AVR

TSD Three Phase Servo AVR Front Look and Introduction



Three Phase Servo AVR Front Look - 10,5 kVA - 150 kVA

- 1 - Controller board & digital LCD display (for each phase)
- 2 - Device label for capacity, serial and other electrical characteristics
- 3 - Warning light for Regulator In Use
- 4 - Mains/ Regulator Selector Breaker for AVR
- 5 - Input power switch for AVR



TSD Three Phase Servo AVR Front Look and Introduction



Three Phase Servo AVR Front Look - 200 kVA - 3000 kVA

- 1 - Controller board & digital LCD display (for each phase)
- 2 - Device label for capacity, serial and other electrical characteristics
- 3 - Warning light for Regulator In Use
- 4 - Mains/ Regulator Selector Breaker for AVR

Dimensions & Weight


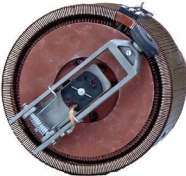


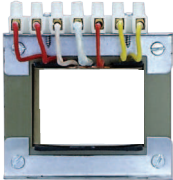

TSD Single Phase AVR Range

Capacity	Width	Depth	Height	Weight
1 kVA	28 cm	38 cm	23 cm	13 kg
2 kVA	27 cm	45 cm	23 cm	15 kg
3,5 kVA	45 cm	37 cm	26 cm	28 kg
5 kVA	54 cm	40 cm	29 cm	40 kg
7,5 kVA	54 cm	40 cm	29 cm	48 kg
10 kVA	54 cm	40 cm	29 cm	57 kg
15 kVA	60 cm	45 cm	30 cm	66 kg
20 kVA	50 cm	56 cm	85 cm	126 kg
25 kVA	50 cm	56 cm	85 cm	135 kg
30 kVA	60 cm	60 cm	85 cm	160 kg
40 kVA	60 cm	60 cm	85 cm	180 kg

TSD Series Three Phase AVR Range

Capacity	Width	Depth	Height	Weight
6 kVA	40 cm	41 cm	90 cm	59 kg
10,5 kVA	40 cm	41 cm	90 cm	96 kg
15 kVA	55 cm	48 cm	111 cm	130 kg
22,5 kVA	55 cm	48 cm	111 cm	165 kg
30 kVA	55 cm	48 cm	111cm	192 kg
45 kVA	60 cm	44 cm	123 cm	215 kg
60 kVA	86 cm	55 cm	131 cm	365 kg
75 kVA	86 cm	55 cm	131 cm	400 kg
100 kVA	89 cm	55 cm	131 cm	438 kg
120 kVA	89 cm	65 cm	148 cm	570 kg
150 kVA	156 cm	65 cm	148 cm	622 kg
200 kVA	130 cm	100 cm	152 cm	885 kg
250 kVA	130 cm	100 cm	152 cm	1000 kg
300 kVA	130 cm	100 cm	152 cm	1180 kg
400 kVA	180 cm	120 cm	145 cm	1630 kg
500 kVA	180 cm	145 cm	155 cm	1990 kg
600 kVA	180 cm	145 cm	155 cm	2140 kg
800 kVA	225 cm	170 cm	165 cm	3400 kg
1000 kVA	240 cm	210 cm	175 cm	4780 kg

AVR - Introduction to Parts

<p>Booster Transformer Provides making of necessary voltage for the output voltage to be 220/ 230/ 240 Vac</p>	
<p>Variac (Autotransformer) Servo motor is driven by the microprocessor. Carbon brush moves within the windings. Voltage change is done and output is supplied via variac.</p>	
<p>Servo Motor Controller board senses the voltage fluctuations at the input side and variac carbon is carried to the right direction on the variac for regulation.</p>	
<p>Switch There are two units on each variac. Feedbacks the controller board whether the voltage regulation shall be positive or negative.</p>	
<p>Circuit Transformer Supplies controller board with the necessary voltage for its operation.</p>	
<p>Controller Board Controls the servo motor to adjust the output voltage as preset value.</p>	

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Technical Specifications

Input Characteristics

Number of Phases	1 Phase
Input Voltage Range	160~250 Vac
Controller Board Min. Supply Voltage	75 V AC
100% Rated Load Operation	7 / 24
Operating Frequency	50 / 60 Hz.

Output Characteristics

Rated Voltage	220/ 230/ 240 Vac
Regulation Speed	20 ms for Freq= 50Hz, 50 ms for Freq: 60Hz
Output Precision	1~9%... Adjustable by Menu
Output Delay Time	1-10 seconds... Adjustable by Menu
Output High Voltage Shutdown	242 V AC.... Adjustable by Menu
Output Low Voltage Shutdown	75 V AC.... Adjustable by Menu
Overload Capacity	10 Saniye %200 Yükte
Efficiency	Full Load 98%

General Specifications

Manual/ Maintenance By-Pass	via Pacco Breaker
Automatic Bypass	Optional
Cooling	Forced Air Cooling by Fans
Harmonic Distortion	Neglectable
Input/ Output Voltage Measurement	TRUE RMS (Adjustable by menu)
Display	2x16 Lcd Display

Environmental

Operating Temperature	-10 C/ +50 C
Humidity	<%9 DIN
Altitude	< 3000 Meters
Audible Noise	< 50 dB

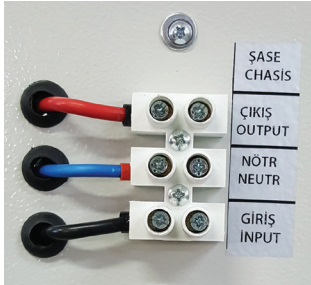
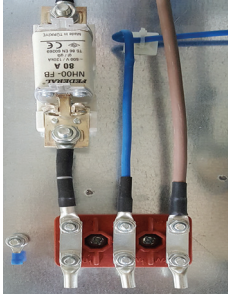
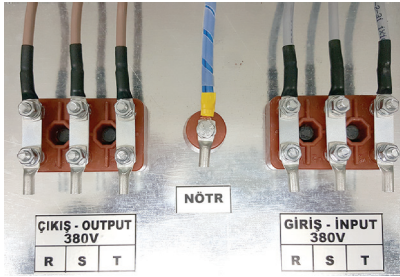
**Cable cross-section for AVR connections
For Single Phase AVR Range**

Input Fuse	By-Pass Breaker	Input Cable	Output Cable
10 A	16 A	2,5 mm ²	2,5 mm ²
10 A	16 A	2,5 mm ²	2,5 mm ²
16 A	16 A	4 mm ²	4 mm ²
25 A	25 A	4 mm ²	4 mm ²
32 A	32 A	6 mm ²	6 mm ²
40 A	40 A	6 mm ²	6 mm ²
50 A	50 A	10 mm ²	10 mm ²
63 A	63 A	16 mm ²	16 mm ²
80 A	115 A	25 mm ²	25 mm ²
100 A	115 A	35 mm ²	35 mm ²
125 A	125 A	50 mm ²	50 mm ²
160 A	160 A	70 mm ²	70 mm ²

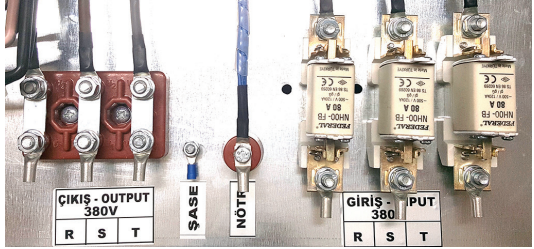


For Three Phase AVR Range

Input Fuse	By-Pass Breaker	Input Cable	Output Cable
16 A	16 A	3x4 mm ²	3x4 mm ²
25 A	25 A	3x4 mm ²	3x4 mm ²
32 A	32 A	3x6 mm ²	3x6 mm ²
40 A	40 A	3x6 mm ²	3x6 mm ²
50 A	50 A	3x10 mm ²	3x10 mm ²
63 A	63 A	3x16 mm ²	3x16 mm ²
80 A	115 A	3x25 mm ²	3x25 mm ²
100 A	115 A	3x35 mm ²	3x35 mm ²
125 A	125 A	3x50 mm ²	3x50 mm ²
160 A	160 A	3x70 mm ²	3x70 mm ²

Connection Terminals

<p>TSD Single Phase Servo AVR Connection Terminals (1 kVA - 15 kVA)</p>	
<p>TSD Single Phase Servo AVR Connection Terminals (20 kVA - 50 kVA)</p>	
<p>TSD Three Phase Servo AVR Connection Terminals (6 kVA - 150 kVA) Model 1</p>	

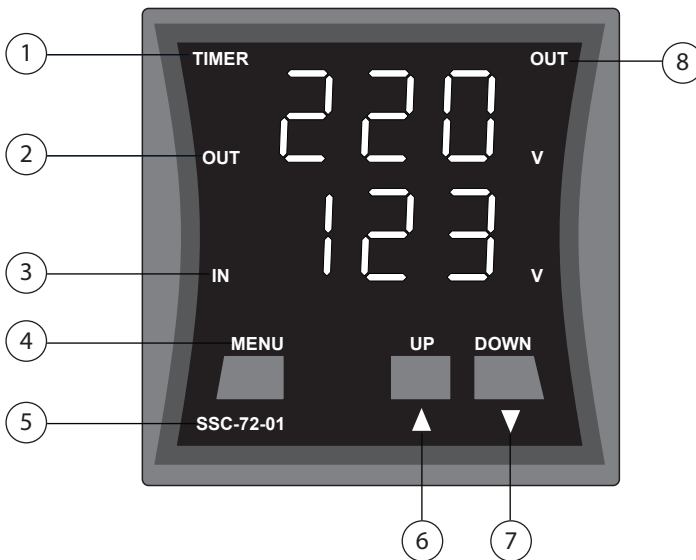
Connection Terminals

<p>TSD Three Phase Servo AVR Connection Terminals (6 kVA - 150 kVA) Model 2</p>	
<p>Trifaze Servo Voltaj Regülatörü Bağlantı Noktaları (200 kVA - 400 kVA)</p>	
<p>Trifaze Servo Voltaj Regülatörü Bağlantı Noktaları (400 kVA - 3000 kVA) 1 Faz için</p>	

Commissioning & First Start

- Bring breaker of the AVR and input power to the AVR in OFF position.
- Use proper cross-sectioned cables for connecting the device as per device rating.
- When connecting a three phase device, make sure the same colours of cables/ correct phase order are connected to input and output terminals of the device.
- Make the connections properly and tightly, do not leave any loose nuts/ screws on the device.
- Bring input power breaker of the device in ON position.

Displayed Parameters and Controller Board



- | | |
|---------------|----------------------------------|
| 1 - Timer | : Timing LED |
| 2 - Out V | : Output Voltage |
| 3 - In V | : Mains Voltage |
| 4 - Menu | : Entrance Button to Menu |
| 5 - XXX-XX-XX | : Controller Part Number |
| 6 - Up | : Menu UP Button |
| 7 - Down | : Menu DOWN Button |
| 8 - Out | : LED for Output Power Available |

Note :Menu access shall only be done by authorized personnel!

Interference without experience and knowledge may result serious problems with the operation of AVR.

Settings for Controller Board

220 223	<SET> Press SET button to enter PROGRAMMING
PRO 223	<SET> Press SET button to exit PROGRAMMING
PR1 220	<SET> Press SET button to activate PROGRAM 1 (PR1) USING "UP" AND "DOWN" BUTTONS, OUTPUT VOLTAGE IS ADJUSTED BETWEEN 192-242VAC.
PR2 224	<SET> Press SET button to activate PROGRAM 2 (PR2) USING "UP" AND "DOWN" BUTTONS, OUTPUT VOLTAGE HIGH VOLTAGE SHUTDOWN VALUE IS ADJUSTED BETWEEN 221~242 VAC.
PR3 216	<SET> Press SET button to activate PROGRAM 3 (PR3) USING "UP" AND "DOWN" BUTTONS, OUTPUT VOLTAGE LOW VOLTAGE SHUTDOWN VALUE IS ADJUSTED BETWEEN 198~219 VAC.
PR4 242	<SET> Press SET button to activate PROGRAM 4 (PR4) USING "UP" AND "DOWN" BUTTONS, OUTPUT VOLTAGE UPPER PROTECTION VOLTAGE VALUE IS ADJUSTED BETWEEN 220~250 VAC.
PR5 198	<SET> Press SET button to activate PROGRAM 5 (PR5) USING "UP" AND "DOWN" BUTTONS, OUTPUT VOLTAGE LOWER PROTECTION VOLTAGE VALUE IS ADJUSTED BETWEEN 180~210 VAC.
PR6 10	<SET> Press SET button to activate PROGRAM 6 (PR6) AFTER THE AVR SHUTS ITSELF DOWN BECAUSE OR OUT OF OPERATING VOLTAGE RANGE, PR6 ADJUSTS THE DELAY OF RESTART OF THE AVR AFTER THE INPUT VOLTAGE COMES BACK WITHIN THE OPERATING VOLTAGE. "UP" AND "DOWN" BUTTONS, 0~255 SECONDS.
PR7 3	<SET> Press SET button to activate PROGRAM 7 (PR7) PR7 ADJUSTS THE DELAY FOR OVERLOAD, BAD MAINS OR ANY FAULT WHICH MAY HAPPEN DURING THE OPERATION OF THE AVR. "UP" AND "DOWN" BUTTONS, 0~255 SECONDS.
PR8 40	<SET> Press SET button to activate PROGRAM 8 (PR8) PR7 ADJUSTS THE ROUND SPEED OF SERVO MOTOR. "UP" AND "DOWN" BUTTONS, 0~255
PT9 2	<SET> Press SET button to activate PROGRAM 9 (PR9) PR9 ADJUSTS THE DIRECTION OF SERVO MOTOR. "1" IS FOR RIGHT, "2" IS LEFT
PIO xxx	<SET> Press SET button to activate PROGRAM 10 (PR10) PR10 CALIBRATES THE MAINS VOLTAGE AND CONTROLLER BOARD' S INPUT VOLTAGE SENSING VALUE. WHEN THE TECHNICAL PERSON DOES THIS, TRUE RMS MEASUREMENT DEVICE SHALL BE USED.
PII xxx	<SET> Press SET button to activate PROGRAM 11 (PR11) PR10 CALIBRATES THE OUTPUT VOLTAGE OF THE AVR AND CONTROLLER BOARD' S VOLTAGE SENSING VALUE. WHEN THE TECHNICAL PERSON DOES THIS, TRUE RMS MEASUREMENT DEVICE SHALL BE USED.

MAINTENANCE

BEFORE STARTING THE MAINTENANCE WORK, INPUT POWER SUPPLY SHALL BE CUT.

- Periodical check up and preventive maintenance makes the device to operate safer, reliable and extends the lifetime of the AVR.
 - A comprehensive checks and test is done at TSINE facilities after the production, before the delivery of the devices.
 - TSINE recommends the first maintenance 6 months after the first start up.
- After the first maintenance work, depending on the load, environment and mains quality, preventive maintenance can be done in every 6-12 months periods.
- If the device is operating in harsh environments and loads, the periodic maintenance shall be scheduled in every 3-4 months.

General Maintenance Checklist

- All the connections and terminals are examined visually. Protective parts and connections are checked carefully. (Tightening of screws, leakages, terminals)
- All moving parts and operating parts shall be carefully tested whether they are in good condition or not.
- Operation of variac switches and their positions are visually examined.
- Driver gears are cleaned and oiled if found necessary. Carbon connection cylinder and arm shall never be oiled
- Cylinder moving the carbon connection point and arms are checked whether they are freely moving or not.
- Windings must be cleaned with a soft dry swab if found necessary
- Never use sandpaper. This may cause arcs and permanent damages on the device.

Bazı Arıza Durumlarında Yapılması Gerekenler

Problem	Possible Cause	What To Do
Visible smoke or smell from Variac or Booster Transformer	Over heating	Call Service Center
Burning of Variac or booster transformer windings	Overloading	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Kömürde aşınma, sargıların bir kısmının yanması	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Booster Trafo ve/veya Varyakta kopukluk	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Fault in motor and switches.	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Fault in controller board	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Fault in controller board transformer.	Bring the breaker in MAINS position Call Service Center
No regulated power at output	Disconnecting of Neutral Wire	Check the connections.
No regulated power at output	Powercut in one of the phases	Check the connections
Automatic Shutdown of AVR in the models with Protection Equipment	Output voltage gets out of controllable voltage range	When the mains voltage is in predefined voltage range the AVR continues to operate

Warranty Card

Manufacturer Information:

Ünvan : TSİNE ELEKTRONİK SAN. VE TİC. LTD. ŞTİ.
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Tel : +90 216 365 7049
Fax : +90 216 365 7049
Mobile : +90 543 521 1992
TAX OFFICE: ULUÇINAR
TAX NUMBER: 859 062 0450

DEVICE INFORMATION:

Input Voltage Range :V AC /V AC
CAPACITY :kVA
PROTECTION UNIT :
Serial Number :
Date of Installation :/...../20.....

SELLER' S

NAME & COMPANY INFO :

Address :

Phone :

Fax :

E-mail :@.....

Signature & Stamp