TECNOWARE 02.01.0042 Stabilizer Servo Assisted SCR with µP Electronic Control User Manual

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Contents

⚠ Safety Warnings

- Read this manual carefully and completely before installing and using the TECNOWARE Stabilizer, which, from here after, will also be referred to as AVR.
- This manual should be kept close to the AVR and read before the AVR is installed and used.
- The AVR must be used only by properly trained personnel. To ensure correct and safe operations, it is necessary that operators and maintenance personnel observe the general safety Standards as well as the specific instructions included in this manual.
- Risk of electric shock: do not remove the cover. The AVR contains internal parts which are at a high Voltage and are potentially dangerous, capable of causing injury or death by electric shock.
- The electric installation has to be done by qualified personnel. Follow all the Safety Standards (CEI Standards in Italy or IEEE elsewhere) for the Input/Output connections and for the right section of Input/Output cables.
- There are no internal parts in the AVR which are user serviceable. Any repair or maintenance work must be performed exclusively by qualified technical personnel authorized by TECNOWARE. TECNOWARE declines any responsibility if this warning is disregarded.
- It is compulsory to ground the AVR according to Safety Standards.
- ⚡ Risk of electric shock at the Output lines when the AVR is ON or in Bypass Mode.
- Risk of electric shock at the Output lines while the unit is connected to the AC utility line.
- We recommend to use a dedicate AC Input/Output power line for the AVR.
- Do not obstruct ventilation slots or holes and do not rest any object on top of the AVR.
- Do not insert objects or pour liquids in the ventilation holes.
- Install the AVR indoors, in a protected, clean and moisture-free environment.
- Do not expose to the direct sun light.
- Do not keep liquids, flammable gases or corrosive substances near the AVR.

Introduction

Principle of compensated AC Voltage Regulator

TECNOWARE Stabilizer is an AVR (AVR means Automatic Voltage Regulator): this product is the result of constant technological research aimed at obtaining the best performance at the lowest cost.

This product is a compensated type AC voltage regulator.

It consists of MCU control unit, voltage regulator unit, servo-assisted motor, and input/output protection components, etc. (see figure 1).

When the grid voltage is not stable, MCU control unit samples the output voltage, and according to the requirement of setting accuracy, keeps the output voltage within the desired voltage range, by means of adjustment of the voltage regulator unit.

AVR has a short response time, high efficiency, high reliability, can work continuously for a long time. It is applicable for all kinds of instruments, meters, communications, home appliances and work site.

⚠ This manual is a guide that enables you to correctly install and use your AVR. This manual includes important SAFETY instructions for the operator, for the AVR correct installation, and gives useful advice on the product maintenance. For any type oproblem, please refer to this manual before calling the customer service.

This manual includes the following models:

SINGLE-PHASE STABILIZERS

Code	Power
FSTESM4K5M	4.5 KVA
FSTESM7K5M	7.5 KVA
FSTESM10KM	10 KVA
FSTESM12KM	12 KVA
FSTESM18KM	18 KVA

THREE-PHASE STABILIZERS

Code	Power
FSTESM9KT	9 KVA
FSTESM18KT	18 KVA
FSTESM25KT	25 KVA
FSTESM50KT	50 KVA
FSTESC75KT	75 KVA
FSTESC100KT	100 KVA

In this manual Stabilizer will simply be referred to as AVR.

General Characteristics

AVR has all the advanced features which guarantee maximum reliability and safety:

- Output Voltage regulation ± 1%
- Protection from overload and short circuits
- Automatic restart after Blackout, once AC utility power comes back on.
- Graphic Display for visualization of the Input and Output Voltage measurements, output current value, alarms, overload and fault condition.
- Acoustic signals of various kinds indicating alarm situations
- High efficiency
- Maximum reliability
- Smart design and easy to use

Receipt and site selection

Carefully remove the AVR from its packaging, and carry out a meticulous inspection. We recommend keeping the original packaging in a secure place, in case you need to send the AVR for maintenance purposes. In case of transport damage, notify the carrier and dealer immediately.

We recommend paying attention to the below points in order to choose a correct placement for your AVR:

- The AVR is designed to operate in a protected environment (e.g. offices). We therefore recommend installing it in a place with very little or no humidity, dust or smoke.
- When the AVR is brought from a cold place to a warmer place, humidity in the air may cause condensation in the AVR. In this case, allow AVR to stand for two hours in the warmer place before beginning with the installation.
- In all circumstances, see the “Technical Characteristics” chapter for environmental specifications and check that the selected area meets these criteria.
- During normal operation the AVR discharges a minimal amount of heat. So it is necessary to leave at least 20 cm of unobstructed space all around the AVR in order to keep it properly ventilated.
- Do not obstruct ventilation holes.
- Do not insert objects or pour liquids in the ventilation holes.
- Do not rest any object on top of the AVR.
- Do not keep liquids, flammable gases or corrosive substances near the unit.
- Install the AVR on a properly tiled floor. Avoid the installation on a floor that is not tiled flat.

External Description

Front Panel

AVR informs the user about operating status, alarm conditions and measurements through a display on the front panel.

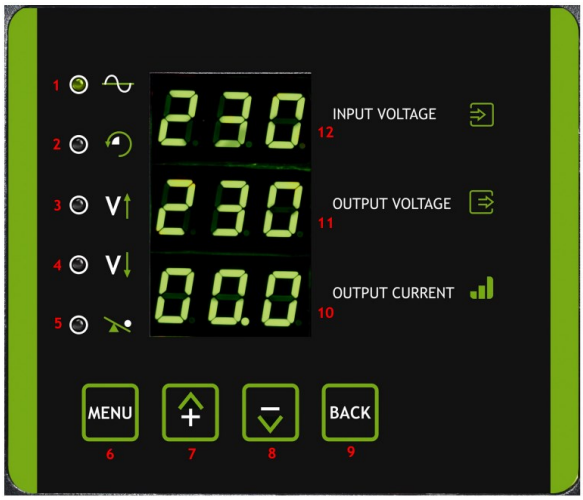


Figure 1 – Front panel display FSTESM4K5M, FSTESM7K5M and FSTESM10KM

1. Normal
2. Delay Time
3. Over Voltage Protection
4. Low Voltage Protection
5. Protection (fault Mode)
6. Menu Push Button
7. Up Push Button
8. Down Push Button
9. Back Push Button
10. Output Current
11. Output Voltage
12. Input Voltage

Figure 2 – Front panel display FSTESM12KM and FSTESM18KM

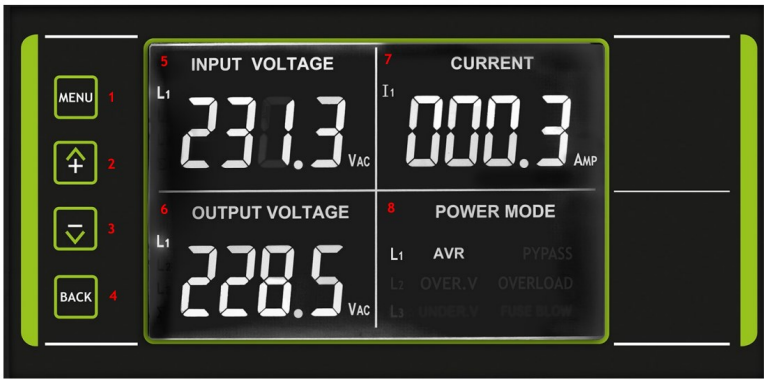
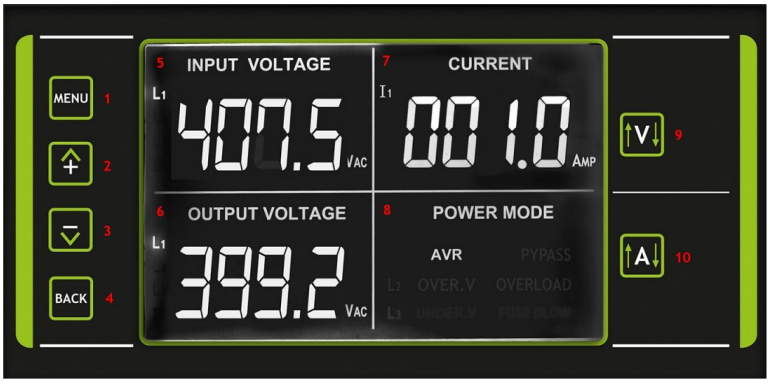


Figure 3 – Front panel display FSTESM9KT – FSTESM18KT – FSTESM25KT – FSTESM50KT – FSTESC75KT – FSTESC100KT



1. Menu Push Button
2. Up Push Button
3. Down Push Button
4. Back Push Button
5. Input Voltage
6. Output Voltage
7. Output Current
8. Status Mode
9. Volt Measure Push Button
10. Current Measure Push Button

Front Side and Rear Side

Single-Phase models

Figure 4 – Front and Rear side FSTESM4K5M, FSTESM7K5M and FSTESM10KM (1. Display, 2. Stabilizer Breaker, 3. Bypass Breaker, 4. Terminal Block Access Panel)

Figure 5 – Front side and rear side FSTESM12KM and FSTESM18KM (1. Display, 2. Stabilizer Breaker, 3. Bypass Breaker, 4. Terminal Block Access Panel)

Three-Phase models

Figure 6 – Front side and rear side FSTESM9KT – FSTESM18KT – FSTESM25KT – FSTESM50KT (1. Display, 2. Stabilizer Breaker, 3. Bypass Breaker, 4. Terminal Block Access Panel)

Figure 7 – Front side and left side FSTESC75KT – FSTESC100KT (1. Display, 2. Stabilizer Breaker, 3. Bypass Breaker, 4. Terminal Block Access Panel)

Input/output Terminals

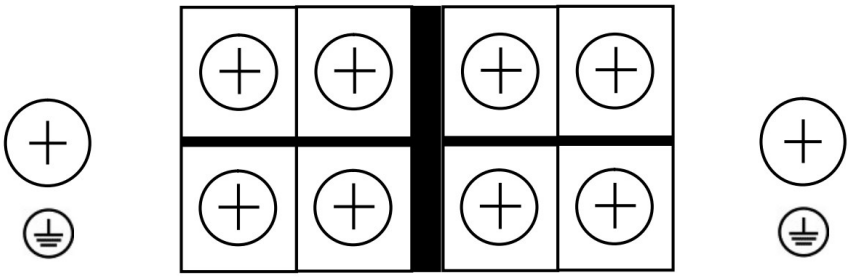
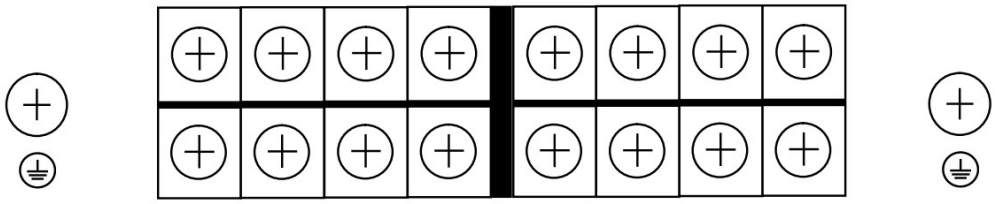


Figure 8 – INPUT/OUTPUT terminals for Single Phase Stabilizer

INPUT		OUTPUT	
L	N	L	N

Figure 9 – INPUT/OUTPUT terminals for Three Phase Stabilizer



Electrical Installation

⚠ The electrical installation has to be done by qualified personnel. Follow all the Safety Standards (CEI Standards in Italy or IEEE elsewhere) for the Input/Output connections and for the right selection of Input/Output cables.

We recommend to use dedicate AC Input/Output power lines for the AVR.

For safety we recommend using external circuit breakers between Input mains and AVRAC Input line and between AVR Output lines and the loads. The circuit breakers should be qualified with leakage current protective function (leakage current < 30 mA).

⚠ Before starting the installation procedure, be sure that:

1. The AVR is “OFF” (check the Stabilizer Breaker is in OFF position).
2. The AC Input Voltage for the AVR has been removed.

The following table shows the recommended size (cross section) for Input, Output and Ground (GND) wires.

Single-Phase Models

Rated Power (KVA)	4,5	7,5	10	12	18
Input Cable (mm2)	4.0	4.0	6.0	10.0	14.0
Output Cable (mm2)	4.0	4.0	6.0	10.0	14.0
Ground Cable (mm2)	4.0	4.0	6.0	10.0	14.0

Three-Phase Models

Rated Power (KVA)	9	18	25	50	75	100
Input Cable (mm2)	2.5	4.0	6.0	14.0	18.0	40.0
Output Cable (mm2)	2.5	4.0	6.0	14.0	18.0	40.0
Ground Cable (mm2)	2.5	4.0	6.0	14.0	18.0	40.0

⚠ We recommend using only flexible TRI-RATED cables. Otherwise if you use rigid cables, it will be difficult to move the AVR from initial positioning.

We recommend to use dedicate AC Input/Output power Lines for the AVR.

Installation

⚠ Connect the GROUND wire first when making wire connection. Disconnect the GROUND wire last when making wire disconnection.

Make sure that the wires are connected tightly to the terminals.

We advise you to follow the steps below explained:

1. **Single Phase models (see figures 4, 5 and 8)**
    1. Remove the metallic panel that covers the Input/Output terminals. The terminals are shown in figure 8. All the cables have to reach the terminals from the rear side using the proper holes in the stabilizer rear

side.

2. Connect the AC INPUT line (LINE, NEUTRAL and GROUND), paying attention to the right polarity, in accordance with figure 8, as explained below:
    - Connect INPUT GROUND wire to the GROUND terminal.
    - Connect INPUT LINE wire to the INPUT L terminal.
    - Connect INPUT NEUTRAL wire to the INPUT N terminal.
3. Connect the OUTPUT line (LINE, NEUTRAL and GROUND) as follow:
    - Connect OUTPUT GROUND wire to the GROUND terminal.
    - Connect OUTPUT LINE wire to the OUTPUT L terminal.
    - Connect OUTPUT NEUTRAL wire to the OUTPUT N terminal.
4. Reassemble the metallic panel that gives access to the Input/Output terminals.
5. Restore the AC Input mains Voltage to the AVR.

2. **Three Phase models (see figures 6, 7 and 9).**
    1. Remove the metallic panel that covers the Input/Output terminals. The terminals are shown in figure 9. All the cables have to reach the terminals from the rear side using the proper holes on the stabilizer. In power models above 75KVA the terminals are behind the front door.
    2. Connect the AC INPUT line (PHASE 1, PHASE 2, PHASE 3, NEUTRAL and GROUND), paying attention to the right polarity, in accordance with figure 9, as explained below:
        - Connect GROUND wire to the GROUND terminal.
        - Connect PHASE 1 wire to the INPUT L1 terminal.
        - Connect PHASE 2 wire to the INPUT L2 terminal.
        - Connect PHASE 3 wire to the INPUT L3 terminal.
        - Connect NEUTRAL wire to the INPUT N terminal.
    3. **Connect the AC OUTPUT line (PHASE 1, PHASE 2, PHASE 3, NEUTRAL and GROUND),** paying attention to the right polarity, in accordance with figure 9, as explained below:
        - Connect GROUND wire to the GROUND terminal.
        - Connect PHASE 1 wire to the OUTPUT L1 terminal.
        - Connect PHASE 2 wire to the OUTPUT L2 terminal.
        - Connect PHASE 3 wire to the OUTPUT L3 terminal.
        - Connect NEUTRAL wire to the OUTPUT N terminal.
    4. Reassemble the metallic panel that gives access to the Input/Output terminals.
    5. Restore the AC Input mains Voltage to the AVR.

It is compulsory to ground the AVR according to the Safety Standards.

The case of the AVR is internally connected to the ground terminal (GND) of the IN/OUT terminals, in order to guarantee safety to the user. To guarantee safety it is necessary to be sure that the local electric plant is supplied with GROUND (in compliance with the Safety Standards), and that a valid connection is guaranteed between the GROUND of the AVR and the GROUND of the local electric plant.

Any interruption of the GROUND conductor is absolutely prohibited.

We recommend to use dedicate AC Input/Output power Lines for the AVR.

⚠ Risk of electric shock at the Output lines while the unit is connected to the AC utility line.

Risk of electric shock: do not remove the cover. The AVR contains internal parts which are at a high Voltage and are potentially dangerous, capable of causing injury or death by electric shock.

There are no internal parts in the AVR which are user serviceable. Any repair or maintenance work must be performed exclusively by qualified technical personnel authorized by TECNOWARE. TECNOWARE declines any responsibility if this warning is disregarded.

Disregard for these warnings may lead to a risk of electric shock to operators.

Functioning

Turning ON and OFF

All models have a main breaker called Stabilizer.

Let’s see carefully the consequences of the switching of Stabilizer breaker.

When the breaker is moved to the ON position, the AVR performs a test of about 5 seconds during which the Delay led is active.

Then the AVR begins to work as a Stabilizer: the Output line is activated and all connected devices turn on.

Please check the following points:

1. The Normal led/indication is ON.
2. The Overload Protection led/indication must be OFF; otherwise it is necessary to remove part of the loads at the Output line.
3. The AVR gives no indication of alarm or anomaly.

When the breaker is moved to the OFF position, the AVR stops to work as a stabilizer and switches off immediately: the Output line is deactivated and all connected devices turn off

Load Control

The AVR indicates the Output Load current value by the display on the front side.

When the Output load is higher than nominal value the AVR warns of Overload condition as follow explained:

- the Overload Protection led/indication is ON.
- a continuous acoustic alarm is ON.

The AVR has the capability to accept an Overload less than 125% for 30 seconds and then the AVR turns off.
If the Overload exceeds 125%, the AVR switches off immediately

To turn on again the AVR after an overload shutdown, follow the steps below explained:

1. Disconnect the output loads that cause the Overload condition.
2. Move the Stabilizer breaker to the OFF position.

3. Move the Stabilizer breaker to the ON position.

Make sure that the AVR never indicates Overload condition.

⚠ Do not connect a load greater than rated value to the AVR (see POWER specifications in the chapter “Technical Characteristics”), as this may damage the unit. In this case the warranty is void.

Manual Bypass

There is another breaker called Bypass on the right of the Stabilizer breaker.
To enable Manual Bypass, the following steps must be taken:

1. Move the Stabilizer breaker to the OFF position.
2. Slide the metal lock on the Bypass breaker to the Stabilizer position.
3. Move the Bypass breaker to the ON position.

⚠ In Bypass mode, the AVR doesn’t work as a Stabilizer, but only as a Bypass between Input and Output power lines.

To disable Manual Bypass and return to the normal operation of the AVR, follow the steps below explained:

1. Move the Bypass breaker to the OFF position.
2. Slide the metal lock on the Stabilizer breaker to the Bypass position.
3. Move the Stabilizer breaker to the ON position.

Technical Characteristics

Type	AVR Model	Input Voltage	Output Voltage	Frequency	Output Power
Single- Phase	FSTESM4K5M	160-270 Vac	220/230/240(selectable) ±1%	50/60 Hz	4,5KVA
	FSTESM7K5M				7,5 KVA
	FSTESM10KM				10 KVA
	FSTESM12KM				12 KVA
	FSTESM18KM				18 KVA
Three-Phase	FSTESM9KT	260-470 Vac	380/400/415(selectable) ±1%	50/60 Hz	9 KVA
	FSTESM18KT				18 KVA
	FSTESM25KT				25 KVA
	FSTESM50KT				50 KVA
	FSTESC75KT				75 KVA
	FSTESC100KT				100 KVA

Phase	Three-Phase	Single-Phase
Over Temperature	If the temperature is high, the unit will shut down and alarm.	
Delay Time	5 seconds	
Manual Bypass	YES	
Overload Capability	(100÷125)% for 30 sec with acoustic alarm; > 125% for 100 ms	
Cooling	Fan Cooling	
Efficiency	98%	
Noise	≤65 dB	
Temperature	0°C to 45°C	
Humidity	20% to 90%	

Maintenance

AVR Cleaning

⚠ Before starting any cleaning operation, be sure that:

1. The Stabilizer breaker is “OFF”.
2. The AC Input Voltage for the AVR has been removed.

Use only a cloth dampened with water to clean the unit.

If AVR works in an environmental unusually dusty or dirty, remove the dirty from the ventilation holes.

Before restarting the AVR be sure it is completely dry. If any liquid gets inside the AVR, do not start the unit and contact Technical Service immediately.

Operator Safety

Whenever the AVR is not responding anymore to original characteristics, the AVR must be made non-operative and every usage not authorised must be avoided. After it will be necessary to refer to qualified technical personnel. Original safety characteristics might not be if, for example, the AVR has visible damage or irregular operation.

Service

For any malfunction in operation or failure please contact the Technical Service and provide the following information:

- Model and serial number of the AVR, which can be found on the nameplate on the AVR.
- Description of abnormal operation and alarm displayed on display.

⚠ Risk of electric shock: do not remove the cover. The AVR contains internal parts which are at a high Voltage and are potentially dangerous, capable of causing injury or death by electric shock.

There are no internal parts in the AVR which are user serviceable. Any repair or maintenance work must be performed exclusively by qualified technical personnel authorized by TECNOWARE.

TECNOWARE declines any responsibility if this warning is disregarded.

For any malfunction in operation or failure please contact:
TECNOWARE SERVICE
www.tecnoware.com

CE Conformity to the European Directives
TECNOWARE S.r.l. confirms that the product is comply with the requirements set out in: the Low Voltage (Safety) Directive 2014/35/EU and following amendments, the EMC (Electro-Magnetic Compatibility) Directive 2014/30/EU and following amendments.

Product Disposal

The product cannot be disposed as an urban waste, but must be treated as a separate waste. Any violation is indictable with financial sanctions as per in force regulations.

An incorrect waste disposal or an improper use of the same or of any parts can be damaging for the environment and for human health.

A correct waste disposal of products having the dustbin symbol marked by a cross help to avoid negative consequences to the environment and to human health.

TECNOWARE s.r.l.

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This manual has been printed and edited by TECNOWARE s.r.l. March 2021 Edition – Version 1.0 TECNOWARE s.r.l.
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	**TECNOWARE 02.01.0042 Stabilizer Servo Assisted SCR with µP Electronic Control** [pdf] User Manual 02.01.0042 Stabilizer Servo Assisted SCR with P Electronic Control, 02.01.0042, Stabilizer Servo Assisted SCR with P Electronic Control, Servo Assisted SCR with P Electronic Control, P Electronic Control, Electronic Control

References

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