

USER MANUAL

ATS-I



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Dal 1985

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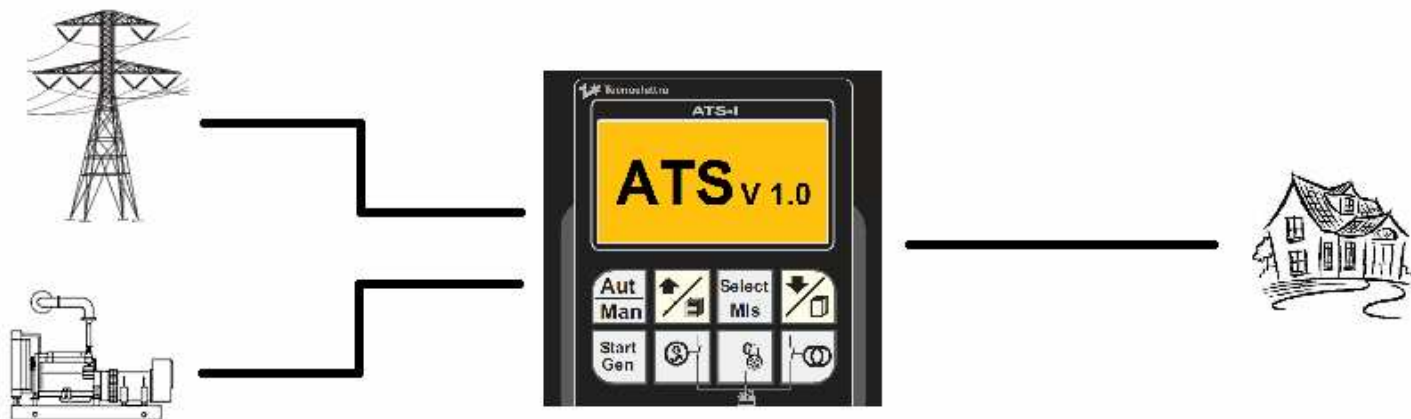
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General description

ATS-I controller allows an automatic transfer switch commutation between mains and generator.

When faulty mains conditions are detected, the board sends a remote start signal to the engine; when the generator is running, if voltage and frequency measurements are compatible with programmed values, the changeover switch is activated towards generator side.

When mains voltage returns back, transfer switch returns on mains side.



Electrical specifics

Supply voltage (isolated)	8 ÷ 30 Vdc
Voltage measurements	230Vac 1ph 230Vac 3ph 400Vac 3ph 440Vac 3ph
Frequency measurements	45 ÷ 65 Hz
Generator voltage range	0 ÷ 500 Vac
Mains voltage range	0 ÷ 500 Vac
Measurements precision	± 2%
Input LA	10 ÷ 30 Vdc
Input LM	10 ÷ 30 Vdc
Input LR	0 ÷ 500 Vac
Input LG	0 ÷ 500 Vac
Output START GEN.	5A, 10 ÷ 30 Vdc
Output TLR	5A, 230 Vac
Output TLG	5A, 230 Vac
Maximum reaction time for VF measurements	2 sec.
Maximum phase detection delay	1 sec.

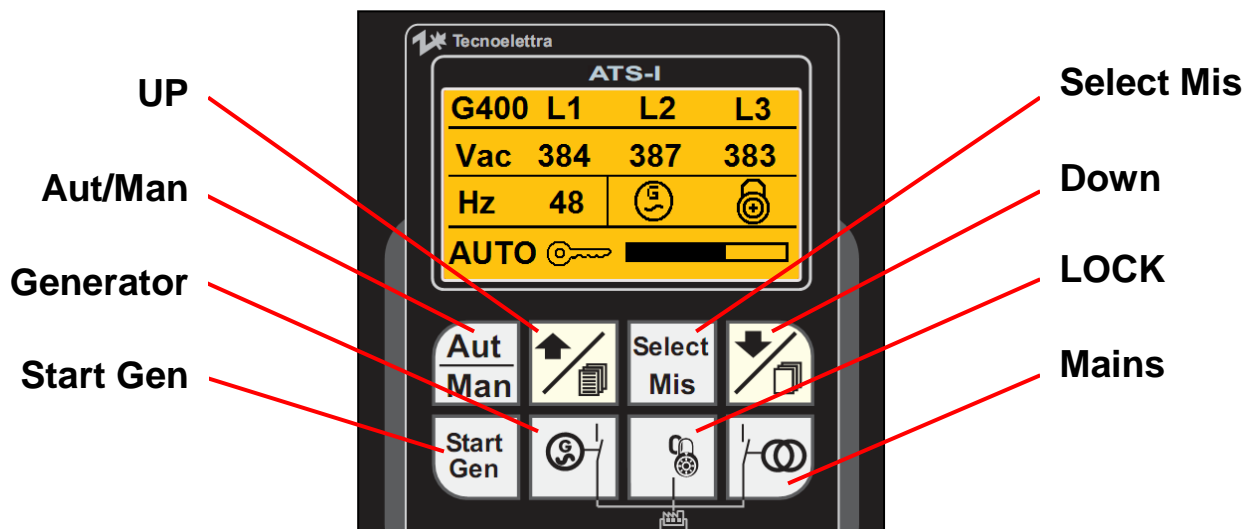
Device operative logic

There are two operative modes:

- **Manual**
- **Automatic**

At the startup, device selects automatically the correct operative mode in accordance with P13 parameter; “**Aut/Man**” key allows to change operative mode without restriction.

Front view:



Manual mode

In manual mode all system is controlled by ATS-I operative panel, on the left side of the display, a label shows the actual operative mode of the device (“MAN” or “AUTO”).

“**Start Gen**” button allows to start and stop the generator; in case of idle generator, when “Start Gen” button is pushed, a blinking key icon will appear near “MAN” indicator to signal a starting phase for generator; when running engine is detected, the key become permanent. To stop the engine “**Start Gen**” key must be pushed again (key icon will disappear).

To switch contactor status from mains to genset, push “**Generator**” key: Generator icon will appear near frequency indicator, if genset line voltages are not within programmed limits (P5 and P6 parameters), the icon will blink; otherwise the icon will be permanent.

Push “**Generator**” key a second time to disconnect generator line without switching; push “**Mains**” key to switch contactor status from genset to mains, a icon will appear near frequency indicator, if mains line voltages are not within programmed limits (P3 and P4 parameters), the icon will blink; otherwise the icon will be permanent.

On display is possible to check mains line voltages, generator line voltages and frequency.



To read mains voltages, push “**Select Mis**” key until “L” indication will appear on the left upper corner; at this point mains voltages will be showed on display. Push “**Select Mis**” again and “G” icon will appear; generator line voltages will replace mains measure. If generator is not running, “OFF” icon will appear which means unavailable genset measurements.

In manual mode, operative generator alarms are not detected, are available only indicators LA and LM.

Automatic mode

Automatic mode allows to manage engine and transfer switch completely by software logic, it's not possible to start the generator or force switching through operative board, “AUTO” indication will appear on the low left corner.

However with “**Select Mis**” is still possible to change displayed measurements from generator and mains. When controller commands switching on mains or generator, automatically values visible on display change in accordance.

Each phase is checked separately, so a phase failure will start the automatic intervention procedure.

Alarms

If mains measurements are selected, in case of alarm will be possible to see one of these messages on the left side of the display :

- “LOW VOLT” line voltage below programmed threshold (P3 parameter);
- “HIGH VOLT” line voltage over programmed threshold (P4 parameter);

Both alarms cause an automatic intervention procedure.

With running generator, after programmable timer (P8 parameter), the controller checks voltage status measured on alternator and in case of anomaly, one of these alarms will be showed on display:

- “ERROR 1” if generator’s phase voltage is out of limits. (P5, P6 parameters).
- “ERROR 2” if generator’s frequency is out of limits. (P12 parameter).
- “ERROR 3” if generator fails to start.

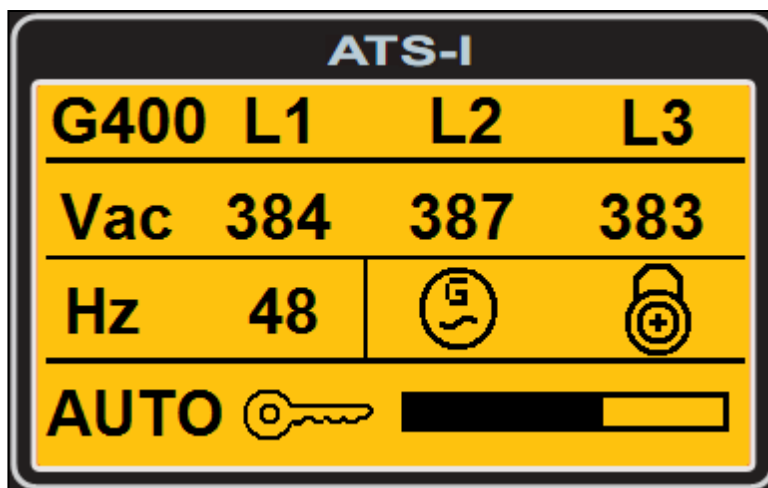
If generator is working correctly, “ERROR 1” or “ERROR 2” alarms are showed if voltage or frequency values are out of limits for the duration of programmed time (P15 parameter)

To reset an alarm on display must be used “**Aut/Man**” key. The device returns on mains position and restarts commutation procedure towards generator. If generator alarm is active and mains voltage returns back, automatically the commutation will be switched on mains side.



Display

Display shows following indications:








Line 1: (Example “G400 L1 L2 L3”) this code indicates which line is measured and the connection type for the device.



L230M	Mains, 230Vac single phase connection
L230	Mains, 230Vac three-phase connection
L400	Mains, 400Vac three-phase connection
L440	Mains, 440Vac three-phase connection
G230M	Generator, 230Vac single phase connection
G230	Generator, 230Vac three-phase connection
G400	Generator, 400Vac three-phase connection
G440	Generator, 440Vac three-phase connection

Below the code are displayed the values of measured line voltage.



Line 2: (Example “Vac 384 387 383”) On this line are showed the values of three measured voltages, at the beginning of the line is displayed the unit of measure .

Line 3: (Example “Hz 48 |   “) on this line is showed frequency value (Hz) measured on generator’s phase 1, then after separation bar “ | “ some status symbols are displayed.

	Generator symbol: is used when commutation is on generator side, the icon blinks if measured values are out of limits. Is alternative with Mains symbol.
	Mains symbol: is used when commutation is on mains side, the icon blinks if measured values are out of limits. Is alternative with Generator symbol.
	Pad lock symbol: is used when the keyboard is locked by “ LOCK ” button keep pushed for more than 5 seconds, to unlock the keypad, the procedure must be repeated.

	Symbol input LA active: the symbol is connected with LA input which usually means a generator alarm.
	Symbol input LM active: the symbol is connected with LMA input which means running engine.

Line 4: On this line are showed information about device's operative modes. All available information are listed below:

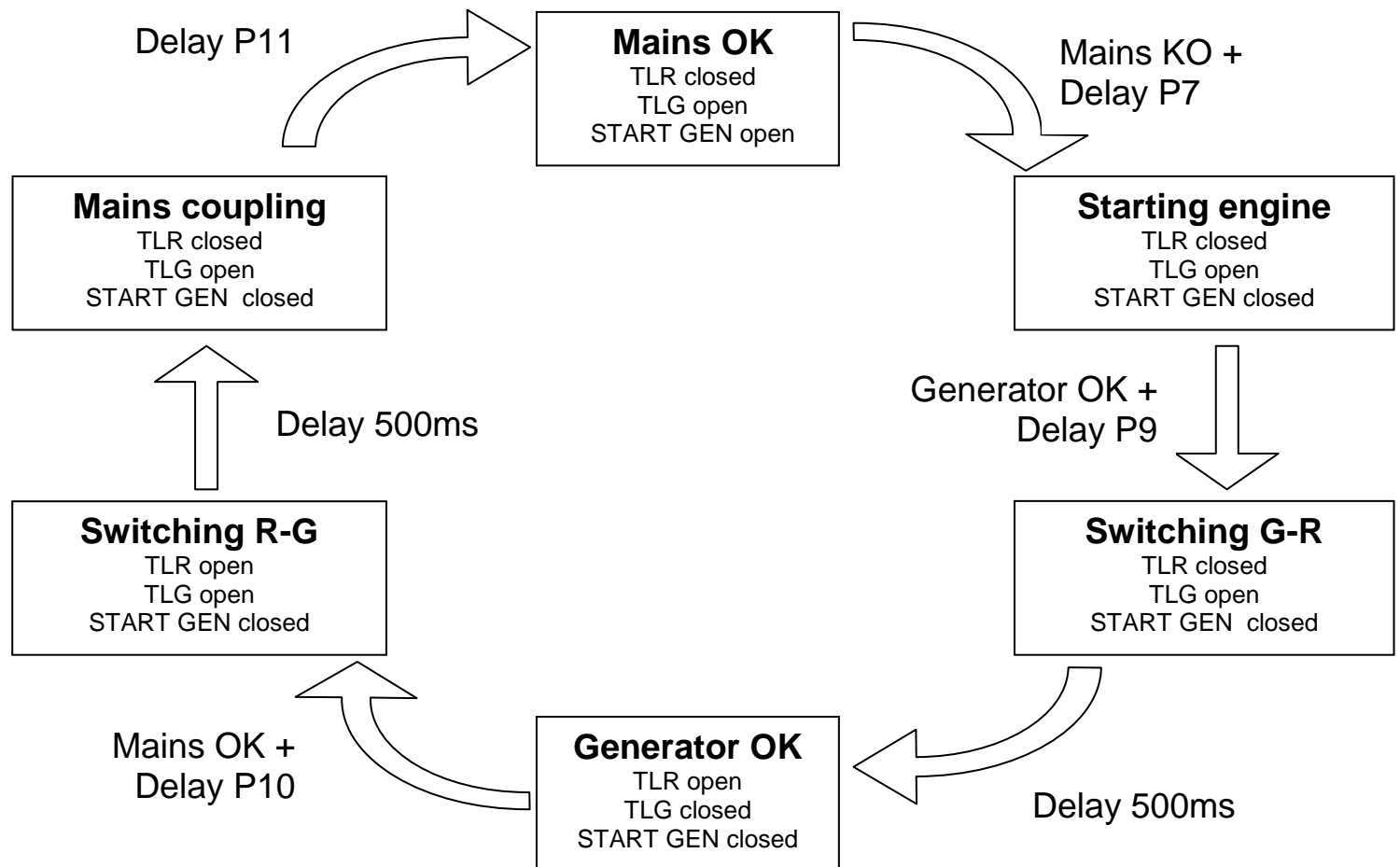
AUTO	Indicates automatic operative mode, alternative with MAN and PROG.
MAN	Indicates manual operative mode, alternative with AUTO and PROG.
PROG	Indicates programmation mode, alternative with MAN and AUTO.
	When MAN or AUTO modes are selected, indicates running generator, blinking during start phase.
	When AUTO mode is selected, indicates the programmed delay time between faulty mains and starting generator (P7 parameter) .
Pxx xxx:xxx	When PROG mode is selected, indicates parameter type "Pxx" and blinks to show that the parameter is going to be modified, the old values ("xxx:") is showed on the left side of the colon, the new one (":xxx") on the right side.
Error message	When AUTO mode is selected, alarm messages are displayed in accordance with chosen visualization: "L" or "G".

Automatic transfer switch procedure mains-generator, generator-mains

Initial configuration with mains OK (voltage values inside programmed thresholds)

R = Mains

G = Generator



When mains voltage is outside programmed limits (P3 and P4 parameters) for a delay time (P7 parameter), the intervention process starts; at the end of this period, the engine is started too and the controller waits for stable measurements for a delay time (P8 parameter), otherwise a "ERROR 3" message will be displayed.

With stable voltage and frequency values, after a delay time (P9 parameter) the commutation is switched on generator side; between mains contactor opening and generator contactor closure there is constant delay time of 500ms.

Transfer switch remains on generator side until mains voltage returns in a stable way in accordance with programmed delay time (P10 parameter).



With mains ok, generator contactor opens and after 500ms mains contactor is closed. After cooling time (P11 parameter) the generator is stopped.

With running generator, if voltage and frequency value are outside programmed thresholds (P5, P6 and P12 parameters) for a delay time (P15 parameter), the device will show an error message and the generator is turned off. In this case with “**Aut/Man**” key or when mains returns back, the device returns to the mains OK status where generator contactor is opened and mains contactor is closed.



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Parameters Programming

Parameters programming can be performed without operative mode restriction. Hold “UP” and “DOWN” keys at the same time for 5 seconds to open programming menu; the word “PROG” will be displayed with the indication relative to P1 parameter, with “UP” and “DOWN” keys is possible to scroll all parameters and select the one you need to change with “Select Mis” button. The chosen parameter begins to blink and will be possible to edit the value with “UP” or “DOWN” keys. Each increase/decrease command, the value will be modified by 1 unit. Hold the button to raise inc/dec speed by 1 unit every 500ms, and after 30 step, by 10 units every second. The old values (“xxx:”) is showed on the left side of the colon, the new one (“:xxx”) on the right side.

To confirm the new value push “Select Mis” key, the parameter finish to blink and will be possible to select another value. To exit programming mode and save changes made, hold “UP” and “DOWN” keys at the same time for 5 seconds.

Below a comprehensive list with all parameters.

Par.	Values range (unit)	Default values	Description
P1	230 _M , 230, 400, 440(V)	400(V tri phase)	Mains system type, shows nominal voltage and “M” symbol which indicates single phase system.
P2	50, 60(Hz)	50(Hz)	Mains nominal frequency
P3	0 ÷ -40(%)	-15(%)	Minimum mains voltage (percentage over nominal value)
P4	0 ÷ +40(%)	+15(%)	Maximum mains voltage (percentage over nominal value)
P5	0 ÷ -40(%)	-15(%)	Minimum generator voltage (percentage over nominal value)
P6	0 ÷ +40(%)	+15(%)	Maximum generator voltage (percentage over nominal value)
P7	1 ÷ 600(s)	5(s)	Generator start delay
P8	0 ÷ 600(s)	120(s)	Maximum engine running detection time
P9	1 ÷ 240(s)	5(s)	Switching on generator delay
P10	1 ÷ 240(s)	10(s)	Switching on mains delay
P11	1 ÷ 240(s)	30(s)	Generator cooling time
P12	1 ÷ 5(Hz)	5(s)	Generator frequency range
P13	0(Automatic) 1(Manual)	0	Operative mode selection at start up
P14	0(pad lock) 1(pad unlock)	0	Pad lock at start up
P15	1 ÷ 10(s)	3(s)	Faulty mains / faulty generator delay. An alarm generating condition must be detected for this time long.
P16	0(Enable) 1(Disable)	0	Phase detection function



Voltage threshold limits change with 1% step, delay time change with 1s step, frequency range change with 1 Hz step, all other parameters have editing step in accordance with their range values.



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Phase detection special function

Phase detection function can be enabled for both mains and generator three-phase systems with a special parameter (P16 parameter).

This function works only with manual mode and three-phase system; this function allows to check if each phase is detected correctly and if the phase sequence is the proper one. In case of anomaly on display will be showed this message: "PH.SEQ.ERR", this alarm disable the closure of respective contactor (G or L). To reset the alarm can be used "**Select Mis**" key. After the device repeats the whole control and switching procedure.

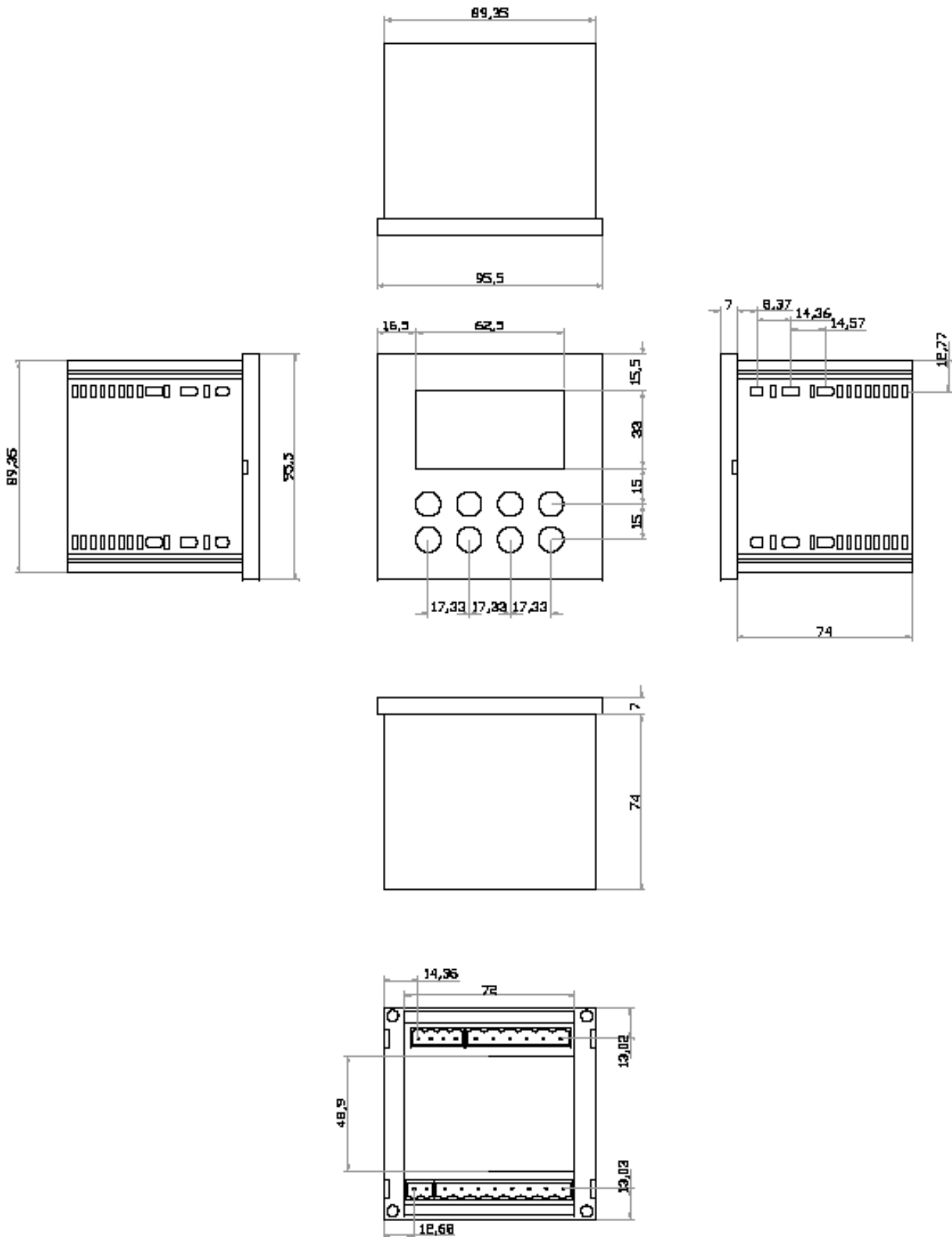


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Mechanical Sizing

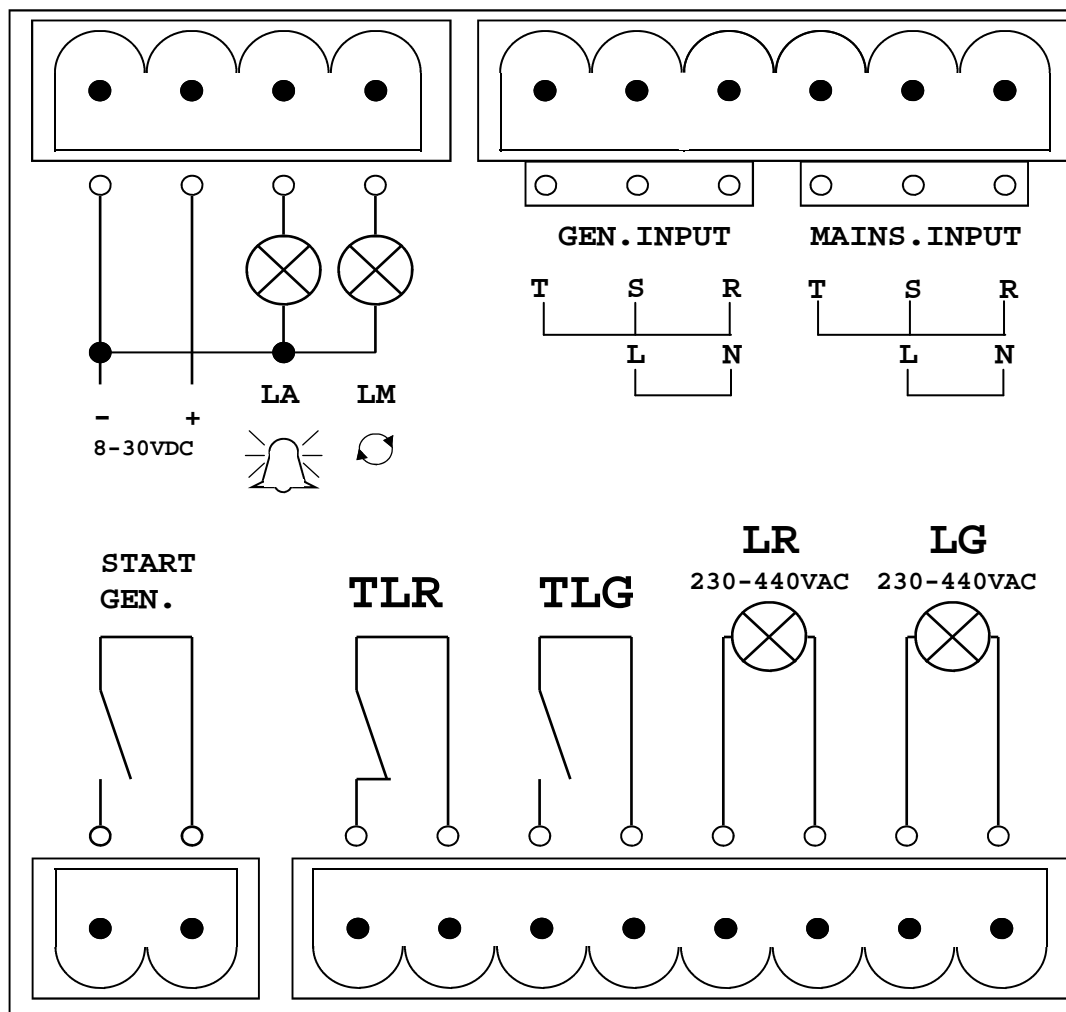


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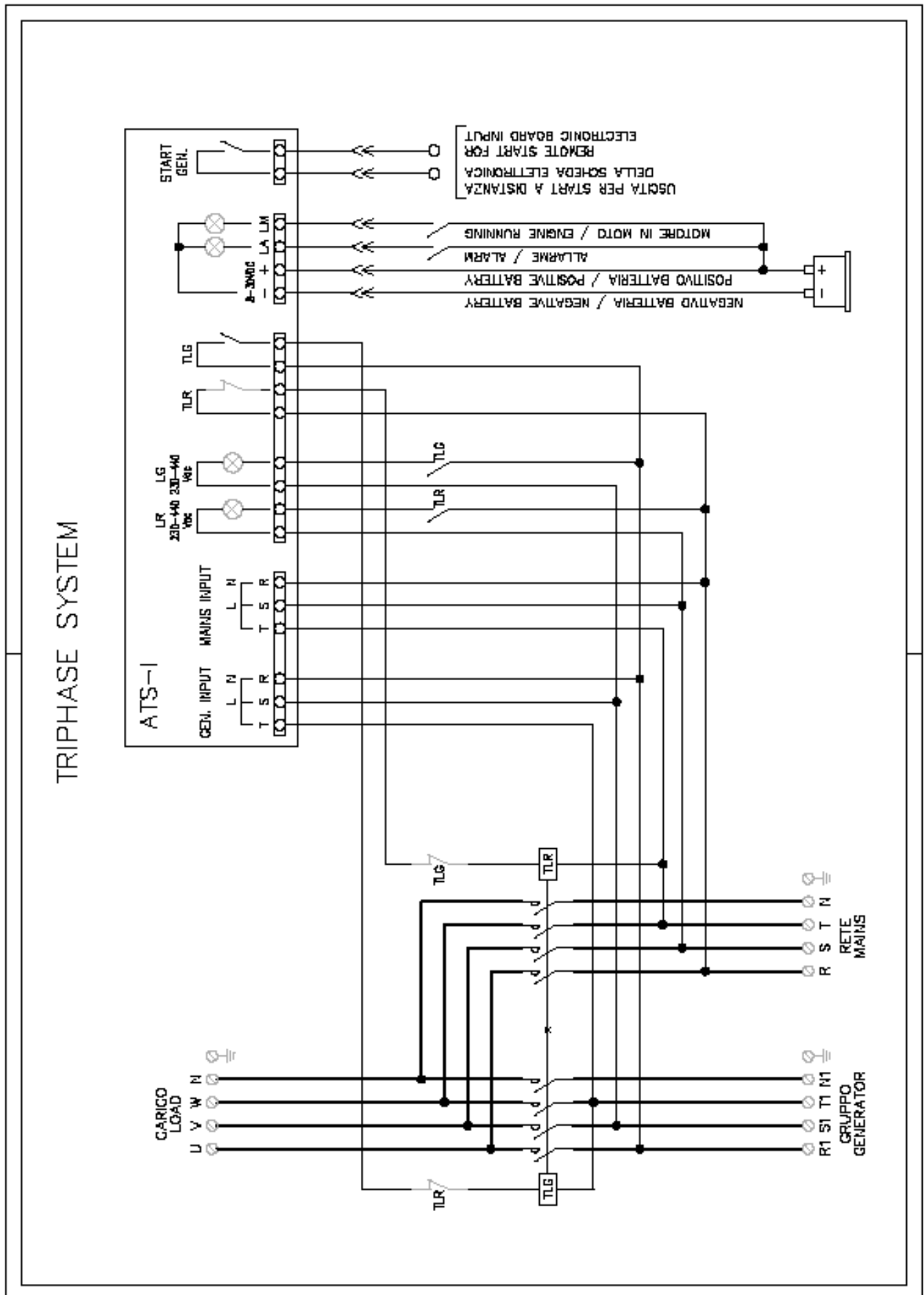
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Rear View



Three-phase wiring diagram (230Vac, 400Vac, 440Vac)



Single phase wiring diagram (230Vac)

