



EST150

Product Manuals

For several Applications there are Application Notes available on our website.
See PRODUCTS\EST150\DOWNLOADS.

PRODUCT MANUAL

Contents:

- 1 – Safety Instructions
- 2 – General
- 3 – Operating
- 4 – Maintenance & Trouble Shooting
- 5 – EU Declaration
- 6 – UK Declaration

1 SAFETY INSTRUCTIONS - EST150-series

1.1 Caution

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with the safety precautions or warnings in this document violates safety standards of design, manufacture and intended use of this equipment and may impair the built-in protections. Delta Elektronika shall not be liable for user's failure to comply with these requirements.

1.2 Installation Category

The Delta Elektronika power supplies have been evaluated to installation category II (Over voltage category II).

1.3 Grounding of Mains Terminals (AC Power Terminals)

This product is a safety Class 1 unit. To minimize shock hazard, the unit must be connected to the AC Power Supply mains through a three conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet.

For units designed to be hard-wired to the mains supply, the protective earth terminal must be connected to the safety electrical ground before another connection is made. Any interruption of the protective ground conductor, or disconnection of the protective earth terminal will cause a potential shock hazard that might cause personal injury.

1.4 Grounding of DC Power Terminals

If the DC power terminal of a unit is specified to sink or source to a maximum of 60VDC, and either the 'minus' or 'plus' DC power terminal is grounded, the voltage on the following connections can be considered safe:

- DC power terminals and sense connections.
- programming/monitor/status-signals
- all Delta Elektronika interfaces.

Warning! When the 'plus' DC power terminal can exceed 60VDC in respect to the 'minus' DC power terminal, additional external measures must be taken to ensure safety isolation of the DC power terminals and sense connections.

Warning! When the 'minus' DC power terminal of the unit can exceed 60VDC / 42.4Vpk in respect to ground, additional external measures must be taken to ensure safety isolation of the following:

- DC power terminals and sense connections.
- programming/monitor/status-signals.
- interfaces with operation isolation.
- non-isolated interfaces.

Caution 1: If a low voltage unit has both DC power terminals floating, or if the DC terminals are in series with an external high AC or DC voltage, the 'minus' DC power terminal can exceed the safe value in respect to ground as specified in the above warning!

Caution 2: Although a high voltage unit is set to a safe voltage below 60VDC, for safety it must always be considered as a high voltage unit! Wrong operation, a programming error or an external defect can result in an unsafe high DC output voltage.

Caution 3: when programming a high voltage unit directly via a PC or a network connection, either ground the 'minus' DC power terminal or use a safety isolated interface!

For more information regards Grounding & Safety, see the online application note "*Safe operation of a power supply*".

1.5 Fuses

Fuses to be changed by authorized Delta Elektronika service personnel only, for continued protection against risk of fire.

1.6 AC Input Ratings

Do not use an AC Supply which exceeds the AC input voltage and frequency rating of this unit. The AC input voltage and frequency rating of the Delta Elektronika power supply series are stated in the accompanying datasheet.

1.7 Live Circuits

Operating personnel should not remove the unit covers. No internal adjustment or component replacement is allowed by non Delta Elektronika qualified personnel. Never replace components with the power cable connected. To avoid injuries, always disconnect power, remove external voltage sources and discharge circuits before touching components.

1.8 Parts Substitutions & Modifications

Parts substitutions and modifications are allowed by authorized Delta Elektronika service personnel only. For repairs the unit must be returned to a Delta Elektronika service facility.

1.9 Removal of (safety) covers

Safety cover(s) are used to cover potentially hazardous voltages.

Observe the following when removing safety cover(s):

- Switch off the unit and disconnect the unit from the AC mains supply and from the DC power application.
- Wait for 5 minutes to allow internal capacitors to discharge, then unscrew and remove the cover(s).
- Always place the cover(s) back before connecting the unit to the mains supply again.

1.10 Handling and mounting

Warning! Risk of cutting: unit has sharp edges and corners!

Warning! No wall mounting or ceiling mounting allowed! Risk of crushing under unit. Only mount unit horizontally, place on a stable surface or use rack mounting.

1.11 Cooling, thermal burn

Proper air flow is required for cooling of the unit. This enables operation at full power and a longer life time. If the unit gets over heated, the power will shut down until unit has cooled down again.

Warning! Top cover and can get hot. Avoid touching this while operating the unit at high power!

Warning! Do not block cooling openings. Do not try to enter openings by any object.

Warning! Do not (dis)connect cables to the DC power terminals while the unit is on. Sudden making or breaking of high DC currents can cause large sparks, even at low voltages. Risk of thermal burn and fire!

1.12 Electro medical devices

Warning! High currents can run through the DC power terminals. These currents cause strong magnetic fields. Do not come near if you have an electro medical device such as a pacemaker.

1.13 Environmental Conditions

- The Delta Elektronika power supplies safety approval applies to the following operating conditions:
- Usage : Indoor use only.
Warning! Not intended to be used in the presence of children or animals!
- Ambient temperature : -20 to 50 °C.
- Maximum relative humidity : 95%, non condensing, up to 40 °C, 75%, non condensing, up to 50 °C.
- Altitude : Do not use above 2000 m sea level.
Warning! Electrical Creepage & Clearance not valid for higher altitudes!
- Pollution degree : 2

1.14 Symbols & markings



Caution risk of electrical Shock.



Instruction manual symbol. The instrument will be marked with this symbol when it is necessary for the user to refer to the instruction manual.



Protective ground conductor terminal.



Off (supply).



On (supply).

WEEE (Waste Electrical & Electronic Equipment)

1.15 Correct Disposal of this Product

Applicable in the European Union.



This marking shown on the product, its packing or its literature indicates that it should not be disposed with other wastes at the end of its working life, but should be collected separately to recycle it responsibly to promote the sustainable reuse of material resources.

2 GENERAL

2.1 OUTPUT

- The outputs of the EST150 can either be used as a constant voltage source with current limiting or as a constant current source with voltage limiting.
- The change of mode occurs sharply at the crossing of the voltage and current settings. Fig. 2 - 1 shows the output ranges.

2.2 OVERLOAD PROTECTION

- The power supply is fully protected against all overload conditions, including short circuit.

2.3 INPUT VOLTAGE

- The power supplies have a wide input voltage range.

2.4 INPUT CURRENT

- The units have active power factor correction (PFC). The input current will therefore be almost a sine wave. This means the rms-value and the harmonic distortion of the input current will be relatively low.

2.5 EFFICIENCY

- The efficiency is very high and constant over a wide output current range. High efficiency also means low power loss and low heat generation.

2.6 CV REGULATION

- The CV-load regulation should be measured directly on the output terminals (see fig. 2 - 2). A few cm of cable can have a voltage drop of several mV (at high current!).

2.7 RIPPLE & NOISE

- The output ripple is very low with almost no spikes. The ripple voltage has to be measured directly on the output terminals using a probe with very short connections (to avoid pick up of magnetic fields) (see fig. 2 - 3).
- Note: to get reliable results, the background noise level should be lower than the output ripple.

2.8 TRACKING MODE

- When the unit operates in Tracking Mode, the CV potentiometer for the output 1 sets the voltage for both output 1 and 2.
- In this mode a Dual Voltage Supply with an equal negative and positive voltage can be created (see fig 2 - 4).
- Both outputs can also be connected in series or parallel to create a unit with twice the output voltage or current.
- Both CC potentiometers have to be set separately.

2.9 PULSATING LOAD

- To avoid overheating of the output capacitors, the AC component of the load current should be limited (see fig. 2 - 5).
- One method of decreasing the AC current through the output capacitor is by using a large external electrolytic capacitor in parallel with the load.
- Care must be taken the capacitor in combination with the lead inductance will not form a series resonant circuit!

2.10 INSULATION

- For safety reasons the insulation of the separating components (transformers) between input and output is tested at 3750 Vrms for 1 minute. This is tested before assembly.
- Warning! Afterwards the 3750 Vrms cannot be tested on the assembled unit because the insulation between the components on the input side and the case (like the bridge rectifier) is specified at 2500 Vrms. Since the insulation between output and case is low (only 600 V DC), the

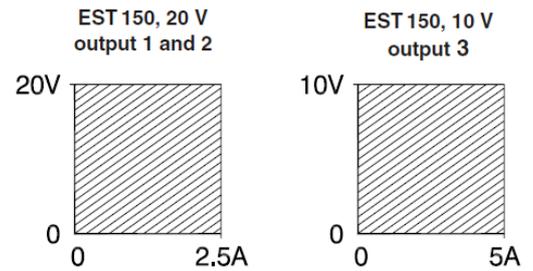


fig. 2 - 1

The two output ranges, every point in the hatched areas can be used.

The left and middle outputs operate in the 20 V / 2.5 A range. The right output operates in the 10 V / 5 A range.

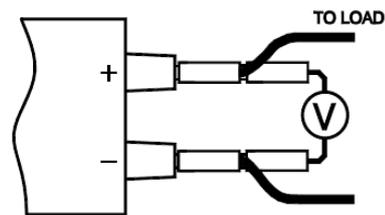


fig. 2 - 2

Measuring CV-regulation

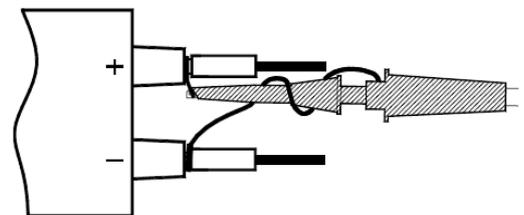


fig. 2 - 3

Measuring ripple voltage

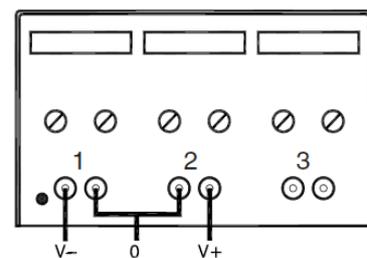


fig. 2 - 4

Dual Voltage Supply in Tracking mode

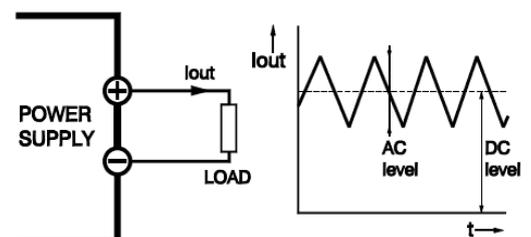


fig. 2 - 5

Pulsating load current

insulation between the primary components and case will break down when 3750 Vrms is applied between input and output (2500 Vrms + 600 V DC < 3750 Vrms). See also fig. 2 - 6).

- Note: when testing the insulation, take care to slowly (e.g. in one second) charge and discharge the capacitors between input - case and output - case. This to prevent high peak currents, which could destroy the power supply. Make sure to discharge the capacitors completely before using the unit again.

2.11 RFI SUPPRESSION

- Both the input and output have RFI filters, resulting in very low conducted RFI to the line and load. Due to the output filter the output voltage is very clean, having almost no spikes.
- The combination of RFI filters and the closed metal case results in a low radiated RFI.

2.12 OPERATING TEMP

- At full power the operating temperature range is -20 to +50 °C.
- From 50 to 60 °C the output current has to be derated linearly to 75 % at 60 °C (see fig. 2 - 7). These temperatures hold for normal use.

2.13 THERMAL PROTECTION

- A thermal switch shuts down the output in case of insufficient cooling. After cooling down, the unit will start working again.

2.14 HOLD - UP TIME

- The hold - up time depends on the load, output voltage and line input voltage. A smaller load or a lower output voltage results in a longer hold - up time (see fig. 2 - 8). The influence of the line input voltage is limited because of the active PFC.

2.15 TURN ON DELAY

- The output voltage is available 0.25 sec after mains switch on.

2.16 INRUSH CURRENT

- The inrush current is limited with a 30 Ohm NTC to about 10 A when the NTC is cold.

2.17 COOLING

- The cooling is by natural convection, no noisy blowers are present. The unit should have sufficient free space. A distance of minimum 5 cm around the unit is recommended.
- For long life the temperature of the air surrounding the unit, should be below 35 °C under normal conditions.
- Under extreme conditions it should be below 50 °C.

2.18 SERIES OPERATION

- Series operation is allowed up to 600 V total voltage. The power supplies can be connected in series without special precautions.
- Note: when two or more outputs are connected in series, the maximum current is limited by the highest CC potmeter setting.

2.19 PARALLEL OPERATION

- Parallel operation of the units has no limitations. The power supplies can be connected in parallel without special precautions.

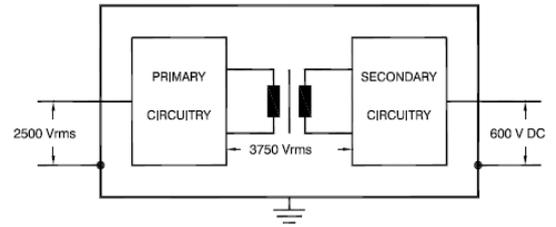


fig. 2 - 6
Insulation test voltages

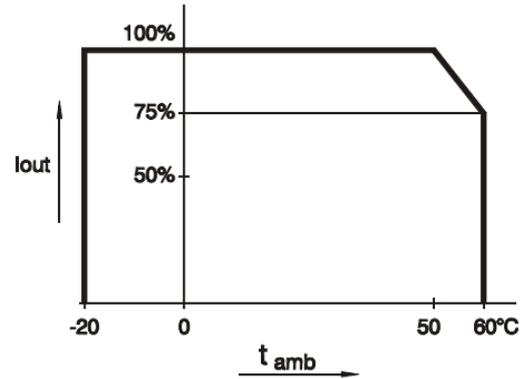


fig. 2 - 7
Operating temperature ranges

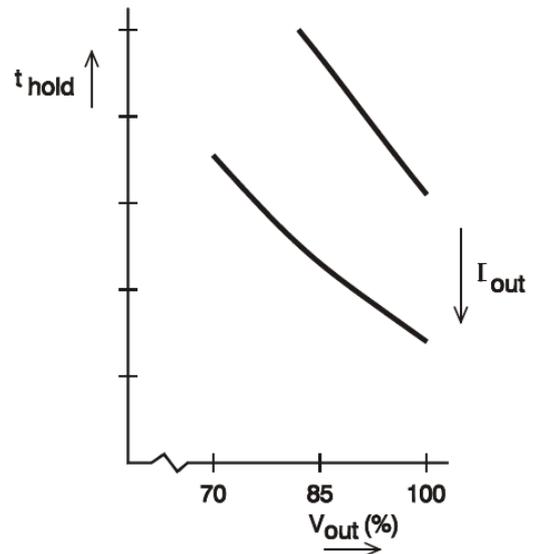


fig. 2 - 8
Hold-up time vs V_{out} with I_{out} as a parameter

3 OPERATING

3.1 OPERATING THE UNIT FOR THE FIRST TIME

- Check there is no condensation on the unit. If there is, allow some time to dry.
- For all three outputs set the CV and CC potentiometers to minimum (fully anticlockwise).
- Switch on the unit.
- For the output 1 push the "OUTPUT ON/OFF" button to turn it on.
- Turn both the CV and CC potentiometer a few turns clock wise.
- A voltage should be present on this output.
- By pressing the "DISPLAY SETTINGS" button, the meters will show the setting of the CV and CC potentiometer for this output.
- Repeat above step for the other two outputs.
- Check the cooling on the backside of the unit is not obstructed.
- Now the unit is ready for operation. All three outputs are independent and floating (see fig. 3 - 1)
- Each output can be used as a Voltage Source (unit in CV-mode) or as a Current Source (unit in CC-mode).

3.2 TRACKING MODE

- Push the "TRACKING ON/OFF" button. Both output 1 and 2 will turn off and the LED for Tracking Mode will light.
- Turn CV potentiometer for output 1 to minimum (fully anticlockwise).
- This potentiometer controls both output 1 and 2 in the Tracking Mode.
- The CV potentiometer for output 2 is disabled in this mode.
- Turn both CC potentiometers to minimum. Both the CC potentiometers have to be set separately.
- Push the "OUTPUT ON/OFF" button for output 1 to turn both output 1 and output 2 on.
- Turn the CV potentiometer for output 1 and both CC potentiometers a few turns clock wise. An equal voltage should be present on output 1 and output 2.
- By pressing the "DISPLAY SETTINGS" button 1, the meters will show the setting of CV potentiometer 1 and CC potentiometer 1.
- By pressing the "DISPLAY SETTINGS" button 2, the meters will show the setting of CV potentiometer 1 and CC potentiometer 2.
- Both outputs can be used as a Dual Voltage Supply by connecting the plus of output 1 to the minus of output 2 (see fig. 3 - 2).
- In this configuration the outputs operate as a unit with an equal negative and positive output of -20 V / 2.5 A and +20 V / 2.5 A.
- Both outputs can also be connected in series to operate as one unit with a range of 40 V / 2.5 A (see fig. 3 - 3).
- Note that in this configuration the current is limited by the highest CC potmeter setting.
- In parallel operation the outputs operate as one unit with a range of 20 V / 5.0 A (see fig. 3 - 4).
- The settings of output 3 are not influenced by the Tracking Mode.
- To return to the normal mode, push the "TRACKING ON/OFF" button again. Both output 1 and output 2 will turn off. After pushing both the "OUTPUT ON/OFF" buttons again, output 1 and output 2 can be set independent again.

3.3 OPERATING AND STORAGE CONDITIONS

3.3.1 TEMPERATURE

- The operating temperature range at full load is -20 to +50 °C.
- Note: a lower temperature extends the life of the power supply.
- The storage temperature range is -40 to +85 °C.



fig. 3 - 1
Triple Mode

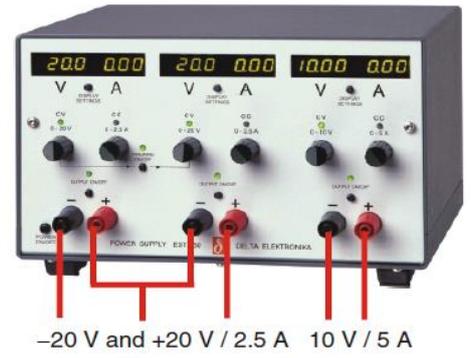


fig. 3 - 2
Dual Voltage Tracking Mode



fig. 3 - 3
Series Tracking Mode



fig. 3 - 4
Parallel Tracking Mode

3.3.2 HUMIDITY

- During normal operation humidity will not harm the power supply, provided the air is not aggressive. The heat normally produced in the power supply will keep it dry.
- Condensation. Avoid condensation inside the power supply, break-down could be the result. Condensation can occur during a period the power supply is switched off (or operating at no load) and the ambient temperature is increasing .
- Always allow the power supply to dry before switching it on again.

3.3.3 GALVANIC INDUSTRY

- For using the power supplies in the galvanic industry it is strongly recommended to take precautions against an aggressive environment.
- An aggressive environment with acid, salt, etc. can harm the electronic components. Sometimes even the copper traces of the pc-boards dissolve.
- To avoid problems the power supplies should be mounted in a relative clean room, or mounted in a cabinet receiving clean air with over pressure. Or a cabinet with a heat exchanger.

4 MAINTENANCE & TROUBLE SHOOTING

4.1 GENERAL

- The ES-series power supplies normally need no maintenance or calibration. Only care must be taken that the cooling of the unit is not obstructed.

4.2 NO OUTPUT (normal operation)

- Remove load from output.
- Check position of prog. switches at the rear panel, they should be on MANUAL.
- Switch on unit.
- Turn all the CV and CC potentiometers a few turns clockwise. A voltage should be present on the output.

4.3 NO LEDS on.

- Overheating can be the cause, cooling down will reset the thermal protection.
- Check input power.
- Check fuses inside unit.

4.4 NO equal voltages in Tracking Mode

- One or both of the tracking outputs are in CC mode (CC LED on).
- Turn the CC potentiometers fully clockwise.
- Reduce the load.



5 EU Declaration of Conformity - EST150-series



We

Delta Elektronika
Vissersdijk 4
4301 ND ZIERIKZEE
The Netherlands

Declare under sole responsibility that the following Power Supply:

EST 150

Meet the intent of Directives

2014/30/EU Electromagnetic Compatibility (EMC)
2014/35/EU Low Voltage Directive (LVD)
2011/65/EU Reduction of Hazardous Substances (RoHS2)

Compliance was demonstrated to the following specification as listed in the official Journal of the European Communities:

EN 61000-6-3:2007 Generic Emissions (residential, light industrial)

+A1:2011

EN 61000-3-2:2014 Power Harmonics
EN 61000-3-3:2013 Voltage fluctuation and flicker

EN 61000-6-1:2007 Generic Immunity (residential, light industrial)

EN 61000-6-2:2005 Generic Immunity (industrial environment)

EN 61010-1:2010 Safety of electrical equipment for measurement, control and laboratory use

EN 63000:2018 Assessment of electrical and electronic products with respect to RoHS

J. Koopman
Managing director,
Zierikzee, January 2021



DELTA ELEKTRONIKA B.V.
DC POWER SUPPLIES

Vissersdijk 4, 4301 ND
Zierikzee, the Netherlands

www.DeltaPowerSupplies.com
Tel. +31 111 413656

6 EU Declaration of Conformity - EST150-series



Product: EST150 Power Supply Series
Model Numbers: EST150.

Manufacturer:
Name: Delta Elektronika B.V.
Address: Vissersdijk 4, 4301 ND Zierikzee, The Netherlands

This declaration is issued under sole responsibility of the manufacturer

Product Description: Regulated DC Power supply
Specification: 150W DC power supply 10 to 20 Volts

The object of the declaration described is in conformity with the relevant UK Statutory Instruments (and their amendments):

2016 No. 1091	Electromagnetic Compatibility Regulations 2016
2016 No. 1101	Electrical Equipment (Safety) Regulations 2016
2012 No. 3032	Restriction of the Use of Certain hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Standard	Title
BS EN 61000-6-3:2007 +A1:2011	Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments.
BS EN 61000-6-2:2005	Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments.
BS EN 61000-6-1:2007	Electromagnetic compatibility (EMC). Generic standards. Immunity standard for residential, commercial and light-industrial environments.
BS EN 61000-3-2:2014	Electromagnetic compatibility (EMC). Limits. Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current ≤ 16 A per phase.
BS EN 61000-3-3:2013	Electromagnetic compatibility (EMC). Limits. Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems. Equipment with rated current ≤ 16 A per phase.
BS EN 61000-4-2:2009	Electromagnetic compatibility (EMC). Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.
BS EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements.
BS EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Signed for and on behalf of:	Delta Elektronika B.V.
Place of issue:	Zierikzee, Netherlands
Date of issue:	8th of January 2021
Name:	J. Koopman
Position:	Managing director
Signature:	