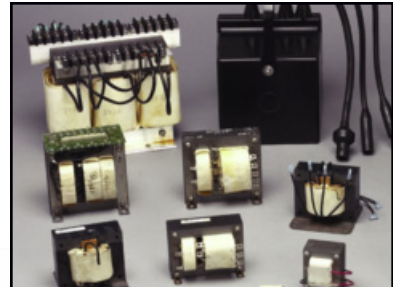


Charles®



**SOLID
POWER**

INDUSTRIAL SOLUTIONS



www.charlesindustries.com



TABLE OF CONTENTS

BATTERY CHARGERS

C-Charger Basic EB Series	i3
C-Charger Premium EP Series	i4
AA Series Automatic Equalize	i5
AE Series Manual Float / Equalize	i6
CI Series Automatic Float	i7

TRANSFORMERS

Custom Transformers	i8
Isolation Transformers	i9

MORE BATTERY CHARGER OPTIONS ARE AVAILABLE IN THE "MARINE SOLUTIONS" FLIPSIDE OF THIS CATALOG.

Charles Industries offers many additional battery charger and power supply options in our Marine Battery Charger lines that can also be used in Industrial applications. From our award-winning IMC Series to our Electronic and Ferroresonant options, Charles has a full line of battery chargers to offer the right size, features, performance and safety for any job.

Please see these additional models on the flipside of this catalog:



**HQ Series
Battery Chargers & Power
Supplies**

Page m3



**5000 and 2000 SP Series
Electronic
Battery Chargers**

Page m4



**9000 SP Series
Ferroresonant
Battery Chargers**

Page m5

C-CHARGER® BASIC SERIES

C-Charger Electronic Basic Series Chargers offer an economical battery charging solution without sacrificing performance and reliability. EB Series chargers meet UL 1236 requirements for safety and reliability, and are designed for low emissions. A front panel DC ammeter and power-on LED display operating status. Units are field adjustable for output voltage, provide AC and DC fuse protection, and are equipped with cooling fans for efficient heat dissipation. 1-year limited manufacturer's warranty, made in the USA.



ELECTRONIC BASIC (EB) SERIES

Model Number	Input Voltage (VAC)*	Equalize Rate Output Voltage (VDC)	Float Rate Output Voltage (VDC)	Dimensions (in.)			Approx. Weight (lbs.)
				H	W	D	
3 AMP MODELS							
93-CI1203-EB	120	14.1	13.65	7.5	8.9	4	2.1
93-CI2403-EB	120	28.2	27.3	7.5	8.9	4	2.1
5 AMP MODELS							
93-CI1205-EB	120	14.1	13.65	7.5	8.9	4	2.1
93-CI2405-EB	120	28.2	27.3	7.5	8.9	4	2.1
10 AMP MODELS							
93-CI1210-EB	120	14.1	13.65	7.5	8.9	4	2.1
93-CI2410-EB	120	28.2	27.3	10.5	9.6	5	5.5
20 AMP MODELS							
93-CI1220-EB	120	14.1	13.65	7.5	8.9	4	2.1
93-CI2420-EB	120	28.2	27.3	10.5	9.6	5	5.5

NOTES

1. Ambient temperature range: -20°C to +55°C
2. All chargers equipped with ammeter only
3. Model CI2420 is equipped with a cooling fan

* 120 VAC models will accept variance in input voltage from 90-135 VAC and variances in frequency from 45-60 Hz with no degradation of output.

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 Fax: (217) 932-2473
 Email: marine.industrial@charlesindustries.com
 Web: www.charlesindustries.com
 (includes Owner's Manual archive)

C-CHARGER PREMIUM SERIES BATTERY CHARGERS

C-Charger Electronic Premium Series Chargers are the superior choice for applications that require high-performance charging with UL Listed products. They are approved to UL's stringent 1236 specifications, testing and evaluation to ensure safety and reliability.

EP Series chargers feature a front panel DC ammeter and voltmeter for easy visual reference of the chargers current status. Units can be adjusted in the field for output voltage and alarm limits. Each unit has AC and DC fuse protection, and is designed for low emissions. All EP Series chargers are backed by a 2-year limited manufacturer's warranty and are made in the USA.



ELECTRONIC PREMIUM (EP) SERIES

Model Number	Option Board	Input Voltage (VAC)*	Equalize Rate Output Voltage (VDC)	Float Rate Output Voltage (VDC)	Dimensions (in.)			Approx. Weight (lbs.)
					H	W	D	
6 AMP MODELS								
93-CI1206-EP	Yes	120	14.1	13.65	11	9.5	5	5.5
93-CI1206-EPI	Yes	220	14.1	13.65	11	9.5	5	5.5
10 AMP MODELS								
93-CI1210-EP	Yes	120	14.1	13.65	11	9.5	5	5.5
93-CI1210-EPI	Yes	220	14.1	13.65	11	9.5	5	5.5
93-CI2410-EP	Yes	120	28.2	27.3	11	9.5	5	5.5
93-CI2410-EPI	Yes	220	28.2	27.3	11	9.5	5	5.5
20 AMP MODELS								
93-CI1220-EP	Yes	120	14.1	13.65	11	9.5	5	5.5
93-CI1220-EPI	Yes	220	14.1	13.65	11	9.5	5	5.5
93-CI2420-EP	Yes	120	28.2	27.3	11	9.5	5	5.5
93-CI2420-EPI	Yes	220	28.2	27.3	11	9.5	5	5.5

An advanced set of LEDs display operating conditions and alarm warnings that can alert users to potential power problems before the charger's operation is put at risk. Five illuminated LEDs display a variety of conditions:

Alarm	LED Color
Power On	Green
High Rate	Yellow
Low Current	Red
Over Voltage	Red
Under Voltage	Red

EP Series chargers are available with or without an accessory option board. The accessory option board includes:

- Overvoltage and under voltage relay and LED outputs
- Summary relay output that activates with under voltage, over voltage, current failure or loss of power
- Loss of power output relay (no LED)
- External temperature compensation -3.25 mv/°C/cell (requires optional external temperature compensation probe)

NOTES

1. Ambient temperature range: -20°C to +55°C
2. All models are equipped with voltmeter and ammeter
3. Model CI2420 is equipped with a cooling fan
5. All models are UL/cUL listed

*120 VAC models will accept variance in input voltage from 90-135 VAC and variances in frequency from 45-60 Hz with no degradation of output. 220 VAC models will accept variances in input voltage from 180-220 VAC and variances in frequency from 45-60 Hz with no degradation of output.

AA AUTOMATIC EQUALIZE CHARGERS

Electrically, the C-Charger is a paragon of efficiency and simplicity. It uses a ferroresonant transformer with integral self-regulation. It has been intelligently designed to be completely devoid of any complicated switching circuits that could possibly burn out. There are no tubes nor delicate electronics to fail or to cause radio frequency interference (RFI).

Voltage output to the batteries remains at a safe and constant DC level from full load to no load, even if AC power runs as high as 132 VAC or as low as 108 VAC. This automatic voltage regulation relieves strain on internal electrical components and lengthens the lifespan of the unit. All components are designed to operate safely and continuously in an ambient temperature as high as 122° F.



The Auto Equalizer Battery Charger is the first C-Charger to offer fully automatic equalizing. The advantages of automatic equalizing are clear: no manual switching or settings, no waiting for power failure, no 9 to 24 hour overcharges, and no failure to return to float due to high load currents. The addition of an Auto Equalizer Charger expands the equalizing options of the C-Charger line, which also includes Float/ Equalize Switch, 0-24 Hour Timer, and 0-24 Hour Automatic Equalizer Timer.

If battery voltage drops below a set value (i.e. 25.5 VDC), the charger switches to the equalize mode and the yellow equalize indicator illuminates. The charger remains in equalize mode until the battery voltage reaches another set value (i.e. 28 VDC). This ensures that the battery is completely recharged and not cycled. At this voltage the charger is switched to the float mode and the yellow equalize indicator turns off.

If battery voltage remains low, a red low voltage alarm indicator illuminates. If battery voltage remains high, a red high voltage alarm indicator illuminates. An optional summary alarm relay is available for remote locations. Adjustable low and high voltages permit users to tailor the charging system to specific batteries. Precise setting of these voltages is provided by potentiometers. 2-year limited manufacturer's warranty, made in the USA.

Features

- Fully automatic equalizing
- Constant voltage output/continuous duty
- Equalize indicator and test button
- AC Power On indicator
- Low Voltage / High Voltage indicators
- DC ammeter and voltmeter
- AC circuit breaker
- Terminal board
- Vacuum impregnated, ferroresonant transformer for reliability
- Stainless steel for corrosion resistance
- Flush meters
- Isolated positive and negative: can be used as a negative voltage charger (single bank charger only)

Specifications

- AC Input: 108-132 volts/60 Hz (220 volts/50 Hz optional)
- Operating Temp: 0° to 50° C (32° to 122° F)
- Storage Temperature: -20° to 60° C (-4° to 140° F)
- Cooling: Convection
- DC Output:
 - Float: 2.16 VPC for lead acid, 1.45 VPC for nickel cadmium
 - Equalize: 2.33 VPC for lead acid, 1.55 VPC for nickel cadmium
- Current Limit: Approximately 135%
- Enclosure: 304 stainless steel hinged cover to facilitate installation

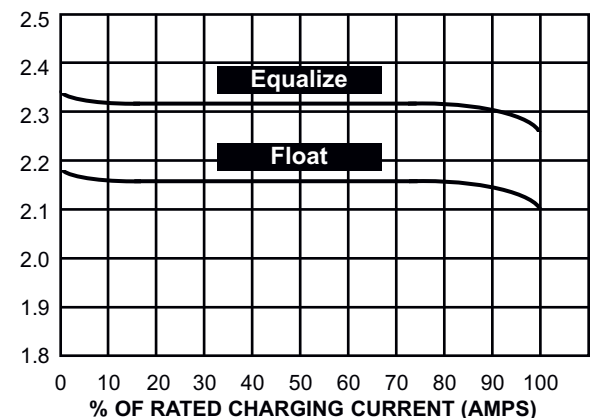


UL/cUL listing applies to 12V and 24V units only

Model Number	DC Output		Height Inches	Width Inches	Depth Inches	Approx. Weight
	Amps	System Voltage				
12 Volt						
AA1206*	6	12	11	9	8.5	12
AA1210*	10	12	11	9	8.5	14
AA1220*	20	12	11	9	8.5	22
24 Volt						
AA2406*	6	24	11	9	8.5	14
AA2410*	10	24	11	9	8.5	22
AA2420*	20	24	13	16.5	8.5	38
32 Volt						
AA3206	6	32	11	9	8.5	22
AA3210	10	32	11	9	8.5	26

*UL/cUL Listed

VPC **Typical Output Curve**



See note on page i6 for available Diagnostic Alarm Relay options.

AE MANUAL FLOAT / EQUALIZE CHARGERS

Safe to say, there's no other manual float / equalize charger built like a C-Charger from Charles Industries. Rugged #304 grade stainless steel forms the sturdy housing that withstands virtually all environmental challenges; including heat, humidity, vibration, and other stress factors. The steel cover is hinged to ease installation.

A two-position switch on the center front panel allows users to manual toggle between float and equalize operation. Float position allows batteries to charge in a steady trickle and is the normal mode of operation, while equalize provides a boost in voltage to break apart lead sulfate deposits and equalize individual battery cells for optimal battery performance.



Voltage output to the batteries remains at a safe and constant DC level from full load to no load, even if AC power runs as high as 132 VAC or as low as 108 VAC. This automatic voltage regulation relieves strain on internal electrical components and lengthens the lifespan of the unit. All components are designed to operate safely and continuously in an ambient temperature as high as 122° F.

AE Series Battery Chargers are available in 12, 24 and 32 Volt models and may be used with both lead acid and nickel cadmium battery banks. 2-year limited manufacturer's warranty, made in the USA.

Features

- DC ammeter and voltmeter
- Float/equalize switch
- Equalize light
- AC circuit breaker
- Terminal board
- Cannot discharge battery during AC failure
- Stainless steel for corrosion resistance
- Ferroresonant transformer for reliability
- Sealed silicon diodes
- Isolated output: no direct AC to DC connection
- Isolated positive and negative: can be used as a negative voltage charger (single bank charger only)

Specifications

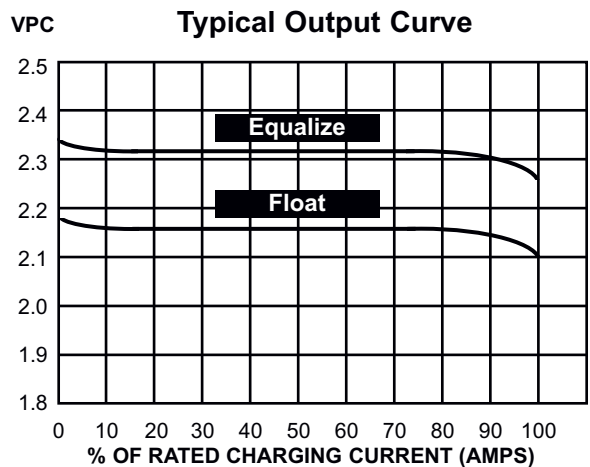
- AC Input: 108-132 volts/60 Hz (220 volts/50 Hz optional)
- Operating Temp: 0° to 50° C (32° to 122° F)
- Storage Temperature: -20° to 60° C (-4° to 140° F)
- Cooling: Convection
- DC Output:
 - Float: 2.16 VPC for lead acid, 1.45 VPC for nickel cadmium
 - Equalize: 2.33 VPC for lead acid, 1.55 VPC for nickel cadmium
- Current Limit: Approximately 135%
- Enclosure: 304 stainless steel hinged cover to facilitate installation



UL/cUL listing applies to 12V and 24V units of 20 Amps output or lower only

Model Number	DC Output		Height Inches	Width Inches	Depth Inches	Approx. Weight
	Amps	System Voltage				
12 Volt						
AE1206*	6	12	11	9	8.5	12
AE1210*	10	12	11	9	8.5	14
AE1220*	20	12	11	9	8.5	22
AE1230	30	12	11	9	8.5	26
24 Volt						
AE2406*	6	24	11	9	8.5	14
AE2410*	10	24	11	9	8.5	22
AE2420*	20	24	16.5	15	8.5	38
AE2430	30	24	16.5	15	8.5	55
32 Volt						
AE3210	10	32	11	9	8.5	26

*UL/cUL Listed



Diagnostic Alarm Relays available for Charles AA and AE Ferroresonant Battery Chargers (call for ordering information):

Low Voltage (L)

Battery has been discharged.
No AC supply voltage.
Input breaker has tripped.
Charger has failed.

High Voltage (H)

Battery or load problem.

DC Ground Fault (G)

Detects DC ground fault.

AC Power Failure (P)

No AC supply voltage.
Tripped AC breaker.

Current Failure (F)

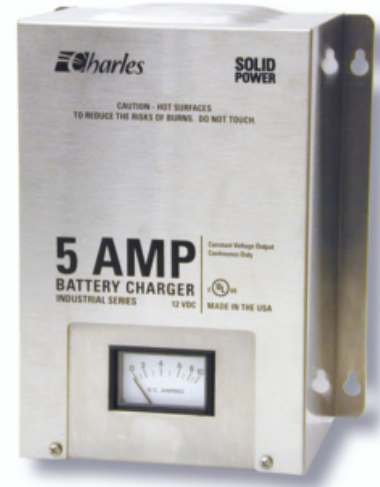
No AC supply voltage.
Input AC breaker has tripped.
Charger has failed.
False alarm: low current due to fully charged battery.

CI AUTOMATIC FLOAT CHARGERS

For basic trickle charging of batteries, CI Automatic Float Chargers offer superior performance and great value. Rugged #304 grade stainless steel forms the sturdy housing that withstands virtually all environmental challenges; including heat, humidity, vibration, and other stress factors.

Voltage output to the batteries remains at a safe and constant DC level from full load to no load, even if AC power runs as high as 132 VAC or as low as 108 VAC. This automatic voltage regulation relieves strain on internal electrical components and lengthens the lifespan of the unit. All components are designed to operate safely and continuously in an ambient temperature as high as 122° F.

CI Series Battery Chargers are available in 12, 24 and 32 Volt models and may be used with both lead acid and nickel cadmium battery banks. 2-year limited manufacturer's warranty, made in the USA.



Features

- DC ammeter
- Terminal board
- Sealed silicon diodes
- Cannot discharge battery during AC failure
- Stainless steel for corrosion resistance
- Ferroresonant transformer for reliability
- Isolated output: no direct AC to DC connection
- Isolated positive and negative: can be used as a negative voltage charger (single bank charger only)
- UL/cUL listed

Specifications

- AC Input: 108-132 volts/60 Hz (220 volts/50 Hz optional)
- Operating Temp: 0° to 50° C (32° to 122° F)
- Storage Temperature: -20° to 60° C (-4° to 140° F)
- Cooling: Convection
- DC Output:
 - Float: 2.16 VPC for lead acid, 1.45 VPC for nickel cadmium
 - Equalize: 2.33 VPC for lead acid, 1.55 VPC for nickel cadmium
- Current Limit: Approximately 135%
- Enclosure: 304 stainless steel hinged cover to facilitate installation

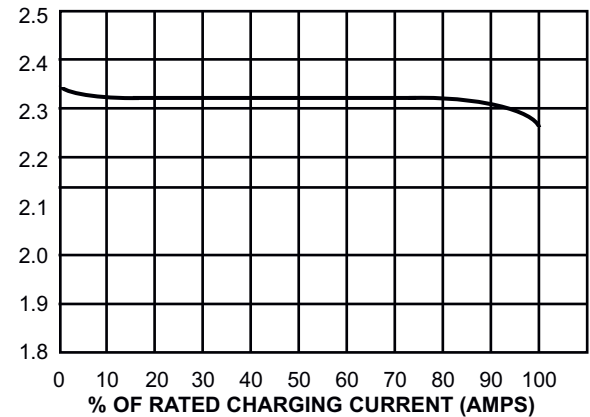
Model Number	D.C. Output		Height Inches	Width Inches	Depth Inches	Approx. Weight
	Amps	System Voltage				
12 Volt						
CI1205C*	5	12	9.5	7.5	5	9
CI1210C	10	12	9.5	7.5	6.25	13
CI1220C	20	12	9.5	7.5	6.25	17
CI1230C	30	12	11.5	9	8.75	20
CI1240C	40	12	11.5	9	8.75	30
CI1260C**	60	12	13	11.5	10.25	38
24 Volt						
CI2405C*	5	24	9.5	7.5	5	12
CI2410C	10	24	9.5	7.5	6.25	17
CI2420C	20	24	11.5	9	8.75	30
32 Volt						
CI3205C*	5	32	9.5	7.5	5	15
CI3220C**	20	32	13	11.5	10.25	38

Consult Charles Industries for additional models

*DC Ammeter Only

**Switch Optional

Typical Output Curve



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CUSTOM TRANSFORMERS

For more than 40 years, Charles has designed and manufactured a wide range of transformers for all types of electrical systems. Charles Engineering Department utilizes the latest state-of-the-art computer and manufacturing technology to produce fast, accurate and detailed custom designs for your special applications. Our commitment to utilizing the best materials and manufacturing techniques ensures our transformers can be depended upon for years of worry-free service.

Toroidal Transformers and Inductors

Sizes: .25" thru 2.5" outside diameter.

- Power Transformers: 120VAC thru 600 VAC, 50HZ thru 400HZ
- Current Transformers: Primary up to 1,000 RMS AMPS $\pm 1\%$ tolerance, 50 HZ thru 50KHZ
- Inductors: 1mH thru 100 Hys up to 50 RMS AMP 50HZ thru 50KHZ
- Audio Transformers: Broadcast Quality up to 300 Watts RMS
- Switching Transformers: Up to 1500 watts RMS, 20KHZ thru 300KHZ

Printed Circuit Mounting

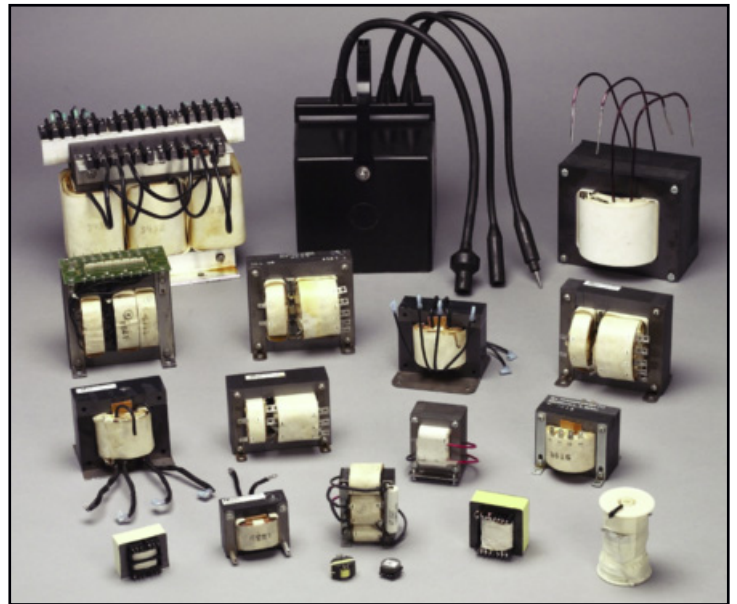
Sizes: .25" thru 2.5" Cubes with Primary 120VAC thru 480VAC, 50HZ thru 400HZ using E + UI Cores for Power, Inductor, Audio, and Switching applications (design and prototype only).

Surface Mounting Transformers

Offering Custom Designs in sizes from .1" thru 1" cube. Up to 500KHZ used in Audio, Telecom, Switching, and Inductor Applications (Design and Prototype only).

Current Transformers

Power Ratings: 1VA thru 100VA Burdan 1,000RMS AMPS Primary $\pm 1\%$ accuracy. 50HZ thru 50KHZ, E core configuration for power line and High Frequency applications.



Steel Core Inductors

Inductance Range from 1 Micro Henry thru 1 Henry Current, .010 AMPS thru 1,000 AMP, size 1" Cube thru 14" Cube for Power, Inductor, Audio and Switching applications.

Ferroresonant Transformers

Power Ratings: 10VA thru 15KVA, Sine Wave or Square Wave with 120VAC thru 600VAC Primaries @ 50HZ, 60HZ and 400HZ. Used in Battery Chargers, High Voltage Strobe Lights, Medical Equipment, and UPS Systems.

Power Transformers

Power Ratings: 1VA thru 25KVA with 120VAC thru 600VAC primaries @ 50HZ, 60HZ and 400HZ using a UL recognized insulation system. These Transformers are used in Medical Instruments, Motor Drives, and Welding Equipment.

Three Phase Transformers

Power Ratings: 1VA thru 30KVA with 120VAC thru 600VAC primaries @ 50HZ, 60HZ, and 400HZ. Used in Medical Instruments, Motor Drives, Power Supply and High Current Welding.



**MADE IN THE
USA**

Did You Know?

Charles Transformers help power the aircraft safety tower lighting atop the Willis Tower (formerly Sears Tower) in downtown Chicago!

ISOLATION TRANSFORMERS

Charles Industries' 1500 Watt Isolation Transformers are used by airports worldwide to isolate high operating voltage for constant operation of approach lighting used on airport runways. Made in the USA, Charles Isolation Transformers are built to the highest quality testing which includes visual inspection, ratio testing and HIPO T testing. Fully ETL accepted and FAA approved.

Encapsulated in an aluminum case and designed to operate efficiently while submerged in water, Charles transformers are approved to operate between -55° C and +70° C and can be installed above ground or direct buried.

Features

- Passes NBP ALSF-2 lamp out power line carrier monitoring system signal
- Meets FAA-E-2690A up to 1800 watts to allow for power lost in wiring
- Quick connections consist of molded L-823 plugs and receptacles.
 - Primary Side: Style 2 plug and Style 9 receptacle with 10 AWG, 5000 volt lead wire.
 - Secondary Side: Two pin Style 8 receptacle with 12 AWG, 600 volt lead wire. All leads are 24.0"
- Attached lifting handle
- Meets 15KVDC insulation resistance requirements of FAA-E-269A

Electrical Specifications

Capacity	1800 Watts
Primary Current	20 AMPS
Power Factor	0.90 Minimum
Efficiency	95% Minimum
Frequency	60 Hertz
Secondary	20.0 AMPS +/- 0.2 AMPS Full Load
Secondary	22 AMPS Maximum Short Circuited Current
Primary Voltage	845.5 Volts to Peak with Secondary Open Circuited
Primary HIPOT	5000 Volts RMS
Secondary HIPOT	600 Volts RMS
Operating Temperature	-67° F (-55°C) to 185° F (+70°C)

Mechanical Specifications

Width	8.00 inches (20.32 cm)
Depth	7.50 inches (19.1 cm)
Height	9.00 inches (22.9 cm)
Diagonal	10.50 inches (26.7 cm)
Weight	62 lbs (28 kg)

Note: Dimensions are for transformer body (excluding leads and handle).



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