SPECIFICATIONS - 2408R CHARGER

Totally Automatic Switch-Mode Battery Chargers

"Suitable for Gel, Sealed & Wet Lead Acid Batteries"

Summary: **24 V, 3 A Constant Current**
(equivalent to 6 A tapered in charging time)

- Automatic Cut-off and then true Float. Can be left connected indefinitely without harming the battery.
- **European Standard EN60335-1, EN60335-29-2 and CE (European EMC Directive) Listed**.
- **Input 230 VAC** - Suitable for Europe & U.K.
- Suitable for On-board (internal) & Off-board (external) Applications. **Onboard interlock is provided.**
- Increases battery life by de-sulfating the battery.
- Many advance features described in this spec.
- **Very small size and very light weight**

Model 2408S is also available with 115 VAC input (U.S.A., Canada & Japan) with UL and CSA approvals.

Explanation of the Features:

The advance technology of the OEM Battery Chargers supplied by Soneil is fundamentally different from other battery chargers. The conventional linear battery charger is an electrical device whereas the 2408R is a light weight sophisticated electronic device.

1. **Switch-Mode Technology:**

   Most of the battery chargers use linear technology which convert the 230 VAC to 24 VDC at 50 Hz. This requires a large transformer which has the disadvantage of lower efficiency resulting in higher heat generation, larger size and weight.

Soneil's Battery Charger transforms the 230 VAC into 24 VDC at 100,000 Hz (2000 times faster than conventional charger) which requires a much smaller transformer and this results in a unit of smaller size, low weight and improved efficiency.

The 2408R uses sophisticated electronic circuitry with micro-chips. All present day computers use switch-mode technology.

2. **Approvals:**

European Standard EN60335 Part 2.29 and CE (European EMC Directive) Approved.

3. **Input Requirements:**

a) 230 VAC (range 180-260 VAC)

b) 47 - 63 Hz

Input AC tolerance +/- 20%. This means 2408R will operate satisfactorily in areas where the input voltage is low.

This charger is also **suitable for every part of the world** where 230 VAC is used.

4. **Output:**

3 Amps Constant Current @ 24 Volts DC
(Equivalent to 6 Amps tapered in charging time)

a) Line Regulation @ Full Load 2%

b) Load Regulation @ 230 VAC3%

c) **Ripple Voltage**: Very low
The peak-to-peak ripple voltage into a resistive load is less than 200mV for the output voltage above 24 VDC.

5. **Charging Cycle:**

The charging curve is attached. The explanation of the charging cycle is as following.

a) **AC connected and battery not connected:**

When the charger is connected to the AC power, the red light will be ON, showing that AC power is connected. If the output is not connected to the battery, the green light will flash informing the user that battery side is not connected. Some of the scooter users may be old and if they forget to connect the battery side, the green flashing light reminds them.

b) **Charging:**

When the charger is connected to the battery and AC is plugged in, the red (power) and yellow (charging) light will be ON.

i) **Deep discharge battery:**

The charger can start charging at the battery voltage as low as 0.5 volts. Soneil charger can charge a very deeply discharged battery. Not many chargers can do this. When charging starts, up to 5 volts, the current is $1/3^{rd}$ of full current. We want to protect a very deeply discharged battery and do not want to give full current. This charging from 0.5V to 5V only takes few seconds (sometime a fraction of a second) and sometimes it is difficult to measure without sensitive equipment. The red and yellow lights will be on.

Then charger will charge at about full constant current rate and the red & yellow light will be on. Due to the constant current, the charging time will be same as a tapered charger of twice the current rating (e.g. In charging time the Soneil 3A constant current charger is equivalent to 6A tapered charger).

ii) **Full Charge:**

When the battery voltage reaches about 28.8 volts (called upper cut-off voltage), the yellow light changes to green light.

iii) **Maintaining full charge:**

Soneil charger maintains the battery at full charge and does not overcharge. This is done by pulse charging. The light remains green.

At upper cut-off voltage, the charger shuts-off complete (zero current). When the battery voltage falls (due to internal losses) to 27.6 volts (lower cut-off, which is standby voltage), the charger turns ON and gives a current until the voltage reaches upper cut-off of 28.8V(gives a pulse of current). Then the charger shuts-off again.

By using the pulse method for final charging, the Soneil charger maintains the battery at full charge at all time without overcharging. For a new battery with lower internal losses, the pulses are less often. With an older battery with higher internal losses, the pulses are more often. The charger adjusts itself to the requirement of the battery.

Soneil charger can charge gel or sealed lead acid batteries without use of any switch.

6. **Two colors in one LED:**

LEDs are used to show the charging status. The Red LED shows AC on. The second bicolour LED shows Yellow when charging and changes to Green when the battery is fully charged. The charger will continue to provide very small current to cover internal losses and will maintain the battery at full charge.

7. **Very low voltage start:** 0.5 Volts

Will charge very deeply discharged batteries. Many 24 volts chargers in the market will not charge batteries discharge below 18 volts.

8. **Protection**:

User accessible output fuse is provided.

a) **Reverse polarity protection** - provided

b) **Short circuit protection** - provided

c) Over-Voltage Protection - provided

d) Over current protection - provided

e) **AC Surge Protection** - provided

f) **Soft start and stop:** Starts and stops gradually.

No sudden in-rush of current. This protects both the batteries and any other circuits connected to the charger.

9. **De-sulfation of battery:** The charger will remove loose sulfation and increase the battery life. (Hard sulfation cannot be reversed).

10. **No current drain:**

No (zero) current is taken from the battery when connected to battery but AC not plugged in. (Many other chargers in the market draw 30-40 mAmp which drains the battery.)

11. **Reliability**:

a) **Mean Time between failures (MTBF)**:

30,000 power-on-hours (POH) or greater. This translates into 10 years of everyday operation of 8 hours.

b) **Burn-in**: All chargers are burned in at an average DC load of 3 Amps.

12. **Electromagnetic Interference (EMI)**:

The charger will not generate excessive radiated or conducted emissions. No interference with TV, radio, computer or other equipment. Meets EN55022, EN50081-1& -2, EN60555 –2 & -3, EN 50082 –1, IEC 801 –2, -3 & -4.

The charger is in compliance with CE (European EMC Directive).

13. **Ground leakage current**:

The ground leakage current is 87 microAmp, which complies with the requirements.

14. **On-board (internal) Feature:** Standard (not an option)

The model has a third output wire, which provides an interlock signal that will prohibit the operation of the vehicle's motor controller whenever the charger is plugged to an AC source.

Interlock signal: The interlock signal is an open circuit output, leakage less than 5 microAmp or less, when the charger is not connected to an AC source. This signal will be less than 50 mV DC while sinking 10 mA when the charger is connected to an AC source.

15. **Size:** **Very Small** Length - 6.9" (175 mm)
Width - 3.7" (94 mm)
Height - 1.9" (48 mm)

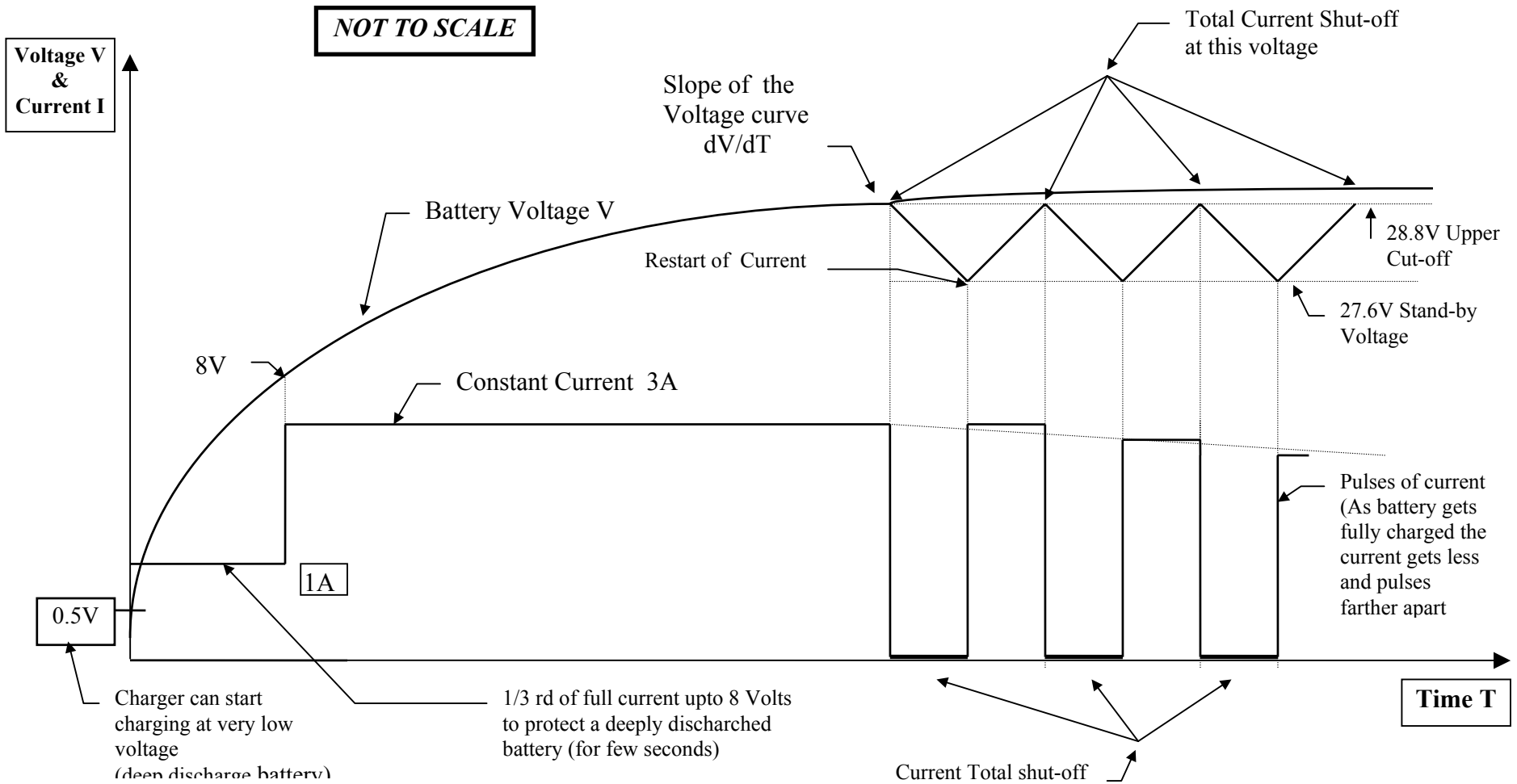
Very Light Weight 1.5 lbs (700 grams)

Very nice looking **metal case with black matte finish**.

Ref: SPEC2408R(Rev A5). 14-Jul-03

CHARGING CURVE

MODEL 2408S AND 2408R
SONEIL 24V/3A CONSTANT CURRENT CHARGER



Ref.Curve2408S&R.02089

506-2408-S01~6

OUTPUT CONNECTOR:(TYPE SEE REMARK1)

TYPE: STD

WHITE BATTERY+
BLACK BATTERY−
GREEN INHIBIT

A +20 −10

40

SVT 18AWGX3C 105°C
UL/CSA APP'D COLOR BLACK

N5D5

TYPE: A

BATTERY+ PIN 1
JUMPER FROM PIN2 PIN 3
BATTERY− PIN 2

NEW TIDE 89M-101\3P COLOR BLACK
OR LEAD YEAR APP'D

B +20 −10

SVT 18AWGX3C 105°C
UL/CSA APP'D COLOR BLACK

TYPE: B

BATTERY+ PIN 1
INHIBIT PIN 3
BATTERY− PIN 2

NEW TIDE 89M-101\3P COLOR BLACK
OR LEAD YEAR APP'D

C +20 −13

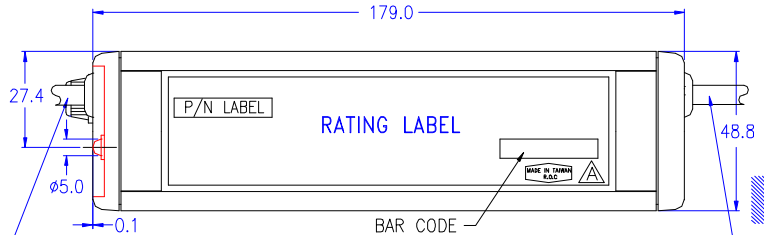
SVT 18AWGX3C 105°C
UL/CSA APP'D COLOR BLACK

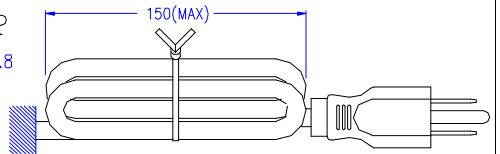
REMARK1:

Touch Fastening strips

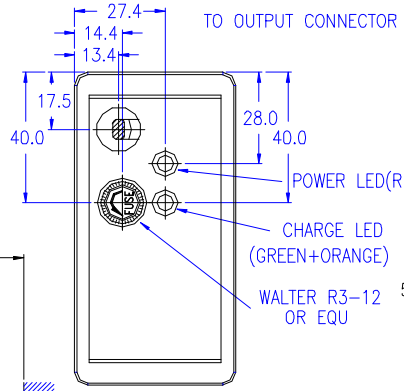
P/N	MODEL	OUTPUT CONNECTOR	CABLE LENGHT	HOOK	WARNING LABEL	P/N LABEL	RATING	REVISION
506-2408-S01	2408S-C	STD TYPE	A=840mm	NONE	NONE	NONE		R10
506-2408-S02	2408S-B	A TYPE	B=790mm	NONE	YES	YES		R10
506-2408-S03	2408S-B	B TYPE	C=368mm	YES	YES	NONE		R10
506-2408-S04	2408S-C	STD TYPE	A=840mm	NONE	NONE	NONE	3.5A	R04
506-2408-S05	2408S-C	STD TYPE	A=1220mm	NONE	NONE	YES		R01
506-2408-S06	2408S-B	B TYPE	C=790mm	NONE	NONE	YES		R01

ALL POWER SUPPLY C21,C22 IS CER. CAP. 1000pF/1KV

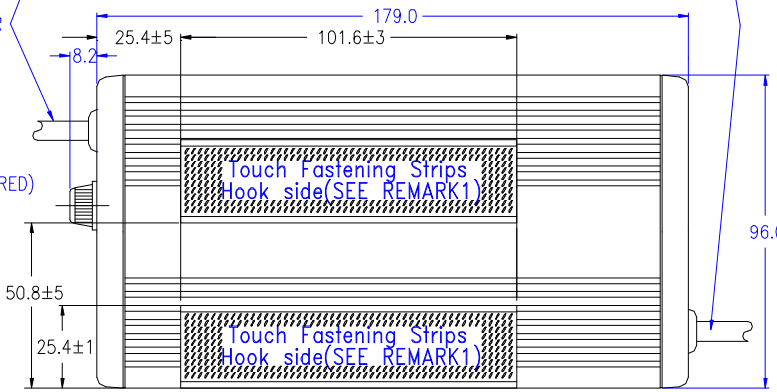


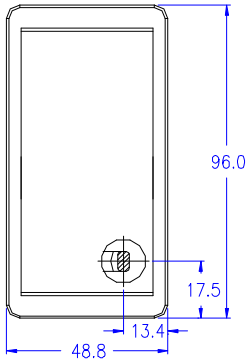


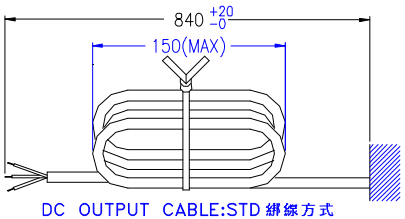
AC INPUT CABLE:ST綁線方式



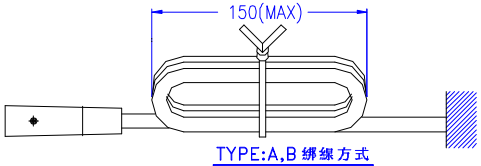
TO OUTPUT CONNECTOR



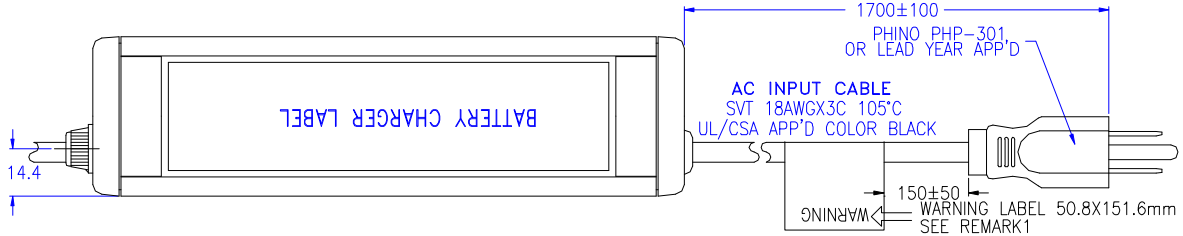




DC OUTPUT CABLE:STD綁線方式



TYPE:A,B 綁線方式



FILE: 2408S\S01-3

ISSUE

SONEIL— MISSISSAUGA ONTARIO CANADA

UNIT mm	SCALE	SHEET 1 OF 1	R	0	J

TOLERENCE: UNLESS OTHERWISE SPECIFIED
X ±0.3 ±0.1 ±0.05
X ±1.0 ±0.5 ±0.3

DRAWN	DESIGNED	CHECKED	APPV'D	DATE
				MAY.17.2002

506-2408-S01~6

TITLE SWITCHING BATTERY CHARGER