Some words about Technix HV-generators and capacitor chargers

Watts and Joules/sec

TECHNIX generators are referenced like this:

SR(or PR)"U"-X- "P"

Maximum Power in Watts
Polarity
Adjustable from 0 Volt to U in kV
Source Regulated (PR=Power regulatet)

Example : SR10-P-5000 model is a generator capable of delivering from 0 to 10 kV, positive polarity and capable to produce up to 5000 W.

For charger models we use following references:

CCR"U"-X- "E"

Maximum Energy rate in Joules/seconds
Polarity
Adjustable from 0 Volt to U in kV
Capacitor charger Regulated

Example : CCR1.5-N-1500 model is a charger capable of delivering from 0 to 1500 V, negative polarity and capable to produce up to 1500 J/s

This means the maximum current this model can deliver is 2 A.

Let's see following diagram representing a standard timing of a capacitor charge.

If a capacitor is charged at a constant current of 2A, the charger will deliver at :

- To (beginning of the load) a power of 0 W (0V, 2A).
- Th (half of the load) a power of 1500 W (750V, 2A).
- Te (end of the load) a power of 3000W (1500 V, 2A)

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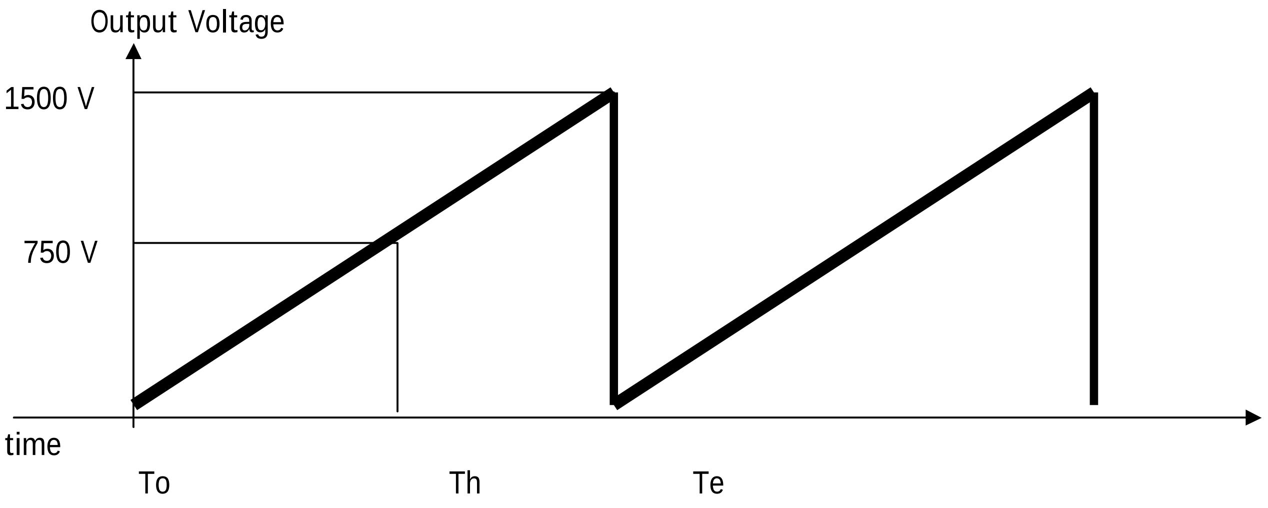

We can see through this example, the charger has to produce 3000 Watts at the end of load and 0 Watts at the beginning.
The average power is 1500 Watts.
Manufacturers give generally the average power in J/s because this value determinates the energy you feed into a capacitor in a certain time.
In our case, the CCR1.5-N-1500 can provide a maximum energy of 1500 Joules in one second.
However, the charger has to deliver at the end of the load 3000 Watts (1500V, 2A).
In other words, the max. power machine is 3000 W, but it delivers <u>in average</u> half of its max. power.

It is the reason why a charger delivering an Energy rate E (in J/s) has to deliver a power P (in Watts): P= 2*E

This can also be understood through the classic formulas
Energy stored by a capacitor: $Ec=1/2*C*V^2$ (1)
Energy rate to load Ec in a certain time: E=Ec/t (2)
Constant current during charging I= CV/t (3)
Delivered Power P=V*I (4)

From these 4 equations, you can establish: E= ½ P.

Differences between SR and CCR

The SR-Series is optimized for high voltage stability whereas CCR is optimized for stable load current.
This differences become important in the case of total discharge of the load capacitor. Empty caps are like a short circuit. The CCR delivers the constant current from beginning on whereas the SR-unit beginns in voltage mode. Therefore the SR unit would start with a high current till the output voltage increases and the unit switches into the constant current mode.
At a partial discharge application the load voltage does not become 0 V; CCR and SR-series are suitable

Signals at CCR Remote connector	Signals at SR Remote connector
1 Local/Remote Mode	1 Local/Remote Mode
2 Inhibit	2 Inhibit
3 Image of the current	3 Image of the current
4 Image of the HV voltage	4 Image of the HV voltage
5 HV on	5 HV on
6 Interlock	6 Interlock
7 Fault	7 Fault
8 HV off	8 HV off
9 Ground Reference	9 Ground Reference for analog
10 HV status	10 HV status
11 End of charge status	*11 Regulation Mode*
12 Voltage setting	12 Voltage setting
13 Ground Reference	13 Ground Reference for logic
14 +10V Reference	14 +10V Reference
15 Current setting	15 Current setting

CCR series notes

-The signal “end of charge” is generated by comparing the output voltage setting to the output voltage measurement. It appears at 95% of the load. Generally, this is appropriated for most applications. However, if the customer wants to generate it at another level, it's possible to modify it at the factory. Another solution for slow charging applications could be to set the voltage to 105%

-There is always a very small current provided from the charger which is normal and not significant compared to "normal" charging currents

-We recommend to put an output diode in series with the capacitor to avoid the capacitor discharge into CCR