

# CHARGE

September 2015

A Technical News Journal from Deki Electronics Ltd

## Editor's Desk

Dear Reader,

In this issue of Charge we talk about the CSR initiatives that Deki has put in place. Our vision, as a corporate entity, is to conduct our business activity with diligence, integrity and honesty while ensuring we engender a positive impact on the community that supports us and the society at large.

We are glad to inform you that the Deki website has been revamped. The Series Changer tool on the website now makes it very easy to find out the Deki capacitor equivalent of Epcos, Vishay, Faratronics, Wima, Arcotronics, Pilkor or Panasonic in just a couple of mouse clicks. Do visit the website at [www.dekielectronics.com](http://www.dekielectronics.com).

Many years ago the government decided to replace all mechanical energy meters with electronic energy meters for improved accuracy. Electronic energy meters contain a film capacitor which is used as a voltage dropper. Deki is one of the leading suppliers of this capacitor to the Indian market with two variants. One is the AC Metallised PP capacitor and the other, meant especially for coastal and high humid areas, is the High Capacitance Stability capacitor for AC applications. The technical section in this issue gives you the required details about both the options.

And, as always, we look forward to your comments and suggestions.

*Anil Bali*

## CSR & Social Development Activities

### Empowerment of Women

**D**eki believes that education is the tool for creating an empowered, enlightened society capable of rising to its full potential.

Therefore, the thrust of our CSR pursuits is promoting gender equality and empowering women from marginalised backgrounds. We intend to meet this objective by providing educational, vocational and skill development training to enable them to be gainfully employed.

To this goal, we have established ties with the Akhil Bharatiya Mahila Ashram in Dehradun, a home for girls from marginalized backgrounds from all over India.

The ashram strives to provide food, shelter, and mentoring to teenage girls while they obtain secondary education at local institutions. The ashram does not have the resources to offer further assistance once the girls have passed their high school. Normally, the girls end up returning home to uncertain futures with no opportunities for self-reliance or economic independence.

Our efforts are directed to help these graduating girls to enroll in programs which will help them develop useful skills that will enable them to get jobs to become economically independent and support themselves and possibly their families.



## Chairman's Message

Deki Electronics, a leader in the field of manufacturing electronic components, strives to be a model corporate citizen who is aware of the fact that it exists and operates in a social environment.

In keeping with our vision, enunciated by the Editor alongside, we, at Deki believe that each person ought to be given an opportunity to reach her/his potential.

Unfortunately, social and economic realities are such that there is a vast section of our society that remains disadvantaged and marginalised largely on the basis of gender, disability, location, economic opportunities and social standing. This prevents those in these strata from attaining self-worth and economic independence.

To meet its Corporate Social Responsibility, Deki aims to contribute towards providing knowledge, opportunities, and resources to empower the disenfranchised to gain better control of their lives. This warrants a long-term commitment and a dedication to the goal.

*Jai Kumar*

**3<sup>rd</sup>** The latest issue, **Electronics Bazar** magazine reports that Deki is **India's 3rd largest components manufacturer** after Epcos and Vishay. Quite an achievement for a single product Indian company.



Ashram residents attending a prayer meeting



High-school students from the ashram

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## Capacitors for Energy Meters

### Reliability under hot and humid conditions

Power utilities around the world are rolling out smart meters in order to enable automated meter reading and optimized energy management. These meters are generally mounted outside the houses thereby being subjected to extreme environmental conditions like extreme temperatures and high humidity. Some of our customers manufacturing industrial energy meters informed us that they were facing problems of drop in capacitance value in capacitors being used in energy meters in high humid areas.

Constantly being operated with AC voltage and extreme climatic conditions viz Temperature and humidity, the degradation of the metallised film causes drop in capacitance value.



The challenge was to develop a capacitor which would offer extremely stable capacitance value over a long period of time regardless of the climatic conditions.

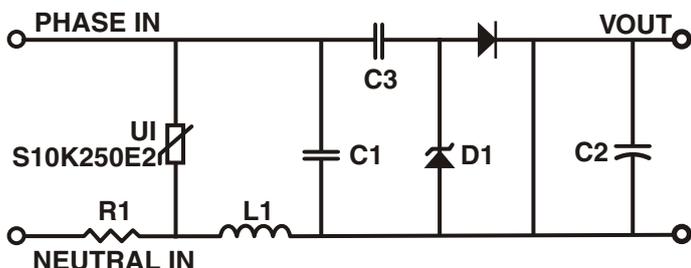
A capacitive power supply is the best solution for a low-cost energy meter. It works on the principle of reducing the line voltage (Voltage dropper) by having a series capacitor. Current flowing through this capacitor is inversely proportional to the impedance of the capacitor as given by the formula:

$$\text{Impedance (Z)} = 1/(2 \pi f C)$$

f is the line frequency and

C is the capacitance of the series impedance capacitor.

The output of the capacitor needs to be rectified to generate the DC output signal.



The output current of the rectifier circuit has ripples of positive half-cycles, so a bulk capacitor C2 is used to provide a ripple-free DC signal to the system. This capacitor provides smooth output voltage until the amount of load current is less than the charging current.

To obtain a higher output current, increase the capacitor value C3 on the AC line. There is no specific safety

requirement for this Voltage Dropper capacitor C3. However some customers do use X2 capacitor at this location. But X2 capacitor are designed to be used in parallel to the power line. In case of capacitive power supplies, this capacitor is connected in series with load.

Cap	Function	Type	Voltage Requirement	Cap Range
C1	Noise filter	MPP-X2	275VAC/305VAC	0.01 to 1μF
C2	Ripple filter	Electrolytic	-	-
C3	Voltage Dropper (Series impedance capacitor)	MPP-AC, MPP-X2, MPET-AC Hi-cap stability	275VAC/305VAC, 300VAC, 440VAC	0.1 to 1μF

### Stress on capacitor during service life of energy meter

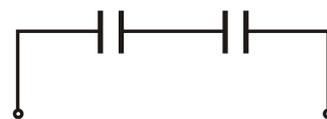
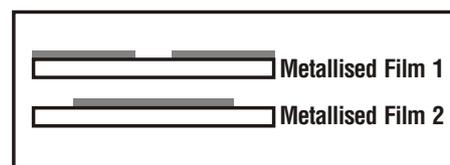
The capacitor during its entire service will always be used under the following major stressful conditions:-

1. High Temperature
2. High Humidity
3. AC Voltage

Thus the challenge posed was to provide such a capacitor which would remain fairly stable even after being used in the above mentioned stress conditions.

### Designed to withstand capacitor in hot and humid condition

In order to minimize the self healing effect of the capacitor due to high voltage Deki designed capacitor in the following manner.



The solution to the above mentioned challenge was obtained by using series construction. By making use of different metallised film, the resistance to humidity was improved. Since the resistance to humidity was changed therefore the self healing property of the capacitor was also altered and the effect of drop in capacitance value was also reduced. Both effects combine to give very good results in hot and humid condition.

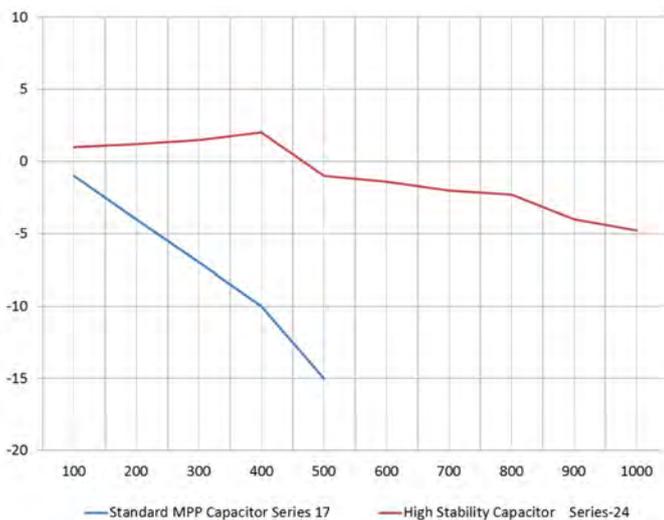
### Designed to withstand capacitor in hot and humid condition

The graph on the following page shows the difference between our normal capacitor and High Stability Capacitor when we applied 240 v ac at 85°C and 85% RH. You will observe that there is a drop in capacitance of 15% in Normal MPP AC capacitor in 500 Hrs whilst there is less than 5% change in High Stability capacitor in 1000 hrs.

## Capacitors for Energy Meters

### Comparison between high stability capacitor and normal capacitor

	High Stability Capacitor Series-24	Standard MPP Capacitor Series 17
AC Voltage Performance	Better	Good
Surge Current Capability	Good	Good
Self-healing Capability	Good	Better
Tan $\delta$ (being low frequency application Tan $\delta$ does not effect so much)	Good	Better
Low Flammability / Safe Failure Mode	Good	Good
International Approvals	Yes	Yes
Capacitance Stability under High Temperature and high humidity	Better	Poor
Thermal Stability	Good	Good
Dimensions	Little Big	Small
Price	More	Less

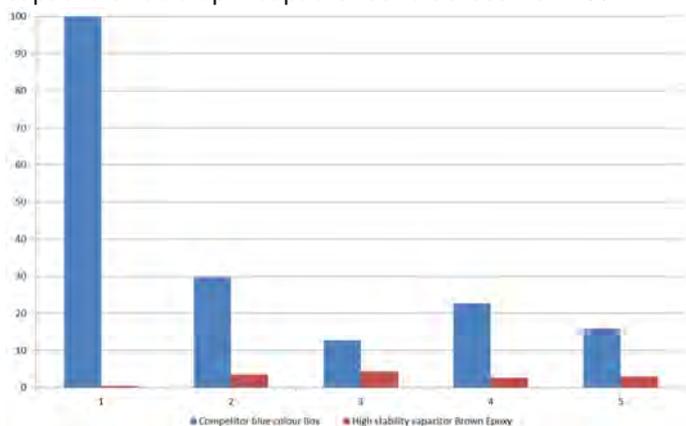


### Deki's High Stability Capacitor Comparison with BLUE Colour Box Competitor Capacitor

We also loaded our capacitor with our Competitor capacitor with following conditions:

- Applied Voltage: 240V AC
- Temperature: 85°C
- Humidity: 85%
- Duration: 1000 hours

Drop in capacitance value is as below. As you will observe all 5 competition samples failed. Whereas all 5 Deki High stability capacitors had drop in capacitance value less than 10%.



### Technical Datasheet for high stability capacitor

**MAIN APPLICATION:** This series is specially designed for energy meter applications, voltage dropper, capacitive power supply, etc for long stability of capacitance value

**CONSTRUCTION:** Series constructed metallized polyester film and normal metallized polyester film as internal electrodes which are protected with solvent resistant & flame retardant epoxy resin or encased in a flame retardant grade PBT box class UL 94 V0 with flame retardant grade resin

**CLIMATIC CATEGORY:** 55/100/56 as per IEC 60068-1

**OPERATING TEMPERATURE RANGE:** -55°C to 100°C

**RELATED STANDARD:** IEC 384-2

**ELECT. CHARACTERISTICS:** Rated Voltage – 275V AC, 310V AC, 440V AC

**TEMPERATURE DERATING:** For temperatures between +85°C and +100°C a decreasing factor of 1.25% per degree Celsius on the rated voltage is applied

**CAPACITANCE TOLERANCE:** ±5%, ±10%, ±20%

**VOLTAGE PROOF BETWEEN TERMINALS (DC):** 1250 VDC for 2 sec

**INSULATION RESISTANCE:**

Test conditions

Temperature: +25°C ±2°C

Voltage applied: 100V DC for 1min.

Criteria after the test:

For  $C \leq 0.33\mu\text{f}$ ,  $I \geq 30000\text{M R}$

For  $C > 0.33\mu\text{f}$ ,  $\geq 10000\text{S} (=I \times C)\text{R}$

**DAMP HEAT TEST :**

Test 1:

Temperature +40°C ± 2°C

Relative humidity 93 ± 2% RH

Duration 1000 hours

Test 2:

Temperature +85°C ± 2°C

Voltage 240 V AC

Relative humidity 85 ± 2% RH

Duration 1000 hours

Criteria after the test:

Capacitance change ( $\Delta C/C$ ) ≤ 10%

$\Delta \text{Tan} \delta$ : ≤ 0.005 at 1kHz

Insulation resistance ≥ 50% of initial limit

**LIFE TEST:**

Test conditions

Temperature +85°C ± 2°C

Voltage applied 1.25 \* U ~ r

Duration 1000 hours

Criteria after the test:

Capacitance change ( $\Delta C/C$ ): ≤ 8%

$\Delta \text{Tan} \delta$  ≤ 0.003 at 1kHz

Insulation resistance ≥ 50% of initial limit

## CSR & Social Development Activities *Employee Volunteering Program*

An integral part of our CSR activity is to create an employee-based volunteering programme. Such an effort is intended to foster a socially sensitive workforce that recognizes its responsibility toward society at large.

We hope that this will create CSR awareness within the company, generate goodwill, forge a mutually beneficial community spirit, and enhance Deki's corporate reputation.

We are developing plans for a company-wide **Good Deed Day** that involves Deki's management and employees develop community spirit by engaging in meaningful volunteering activities directed at the local community.

Other ideas we are exploring are drives to collect unwanted garments for distribution among poor residents in the vicinity of the factory, distribution of Diwali fire-crackers among children of migrant workers, and possibly, a mobile medical facility to provide first-aid general medical counseling, and information regarding healthy habits to migrant construction workers and people living in temporary dwellings.

## CSR Activities in Progress

Deki has also laid the groundwork for installing Solar Photovoltaic panels on the premises of the Akhil Bharatiya Mahila Ashram in Dehradun. This promises to reduce the ashram's electricity bills while contributing to environmentally sound energy practices.

We are also progressing on piloting a skill-development programme for impoverished women from surrounding villages in NOIDA.

Deki's CSR staff surveyed the area and placed banners publicizing a 6-month certificate programme that trains women in sewing and tailoring skills. We have received a positive expression of interest from residents from the Khora area of NOIDA. Deki partnered another Noida firm who has agreed to host the training on its premises. We hope to launch the project later this year.



Photo voltaic panels at the Akhil Bharatiya Mahila Ashram in Dehradun

## Pilot Project & Success Story

Our pilot effort focused on fostering self-reliance and economic independence for girls from impoverished and marginalized backgrounds residing at the Akhil Bharatiya Mahila Ashram in Dehradun is off to a promising start. We were successful in getting instructors in English and computer skills. Furthermore, Deki arranged with NIIT's Nuv Yuva Jyoti programme in Dehradun to enroll 10 girls from the ashram in a three-month vocational retail management training course starting in May 2014. While all girls successfully completed the skill-development programme, the six who were graduating high-school were placed in jobs in the retail sector.

NIIT has agreed to let the remaining four repeat the course this summer to strengthen their skills to prepare them for job-placement. In addition, with the cooperation of the ashram management, we managed to secure safe housing for the girls as they stay on in Dehradun to grow as confident self-reliant women with marketable skills. Their jobs now enable them to earn a decent wage to not only become self-reliant but to also assist their families financially. As role models, they inspire others at the ashram to follow in their footsteps. Not only do we plan to continue supporting this vocational training program, but we also hope to encourage girls to further their education by offering a scholarship to a nursing programme.



Five of the girls who completed their training at NIIT

## Electronics Bazaar Flags Off a New Section with the Deki Electronics Story

In an attempt to showcase the strengths of the Make in India campaign and how the electronics industry is responding to it, Electronics Bazaar, an electronics B2B sourcing magazine, is introducing a new section dedicated to the initiative from the August 2015 issue. In the first such story the magazine features Deki Electronics, showcasing our journey in the Indian electronics manufacturing sector.

<http://goo.gl/1YND6I>

