

CHARGE

September 2024

A Technical News Journal from Deki Electronics Ltd

Editor's Desk

Dear Reader,

At Deki, we are honoured to be recognized as India's largest manufacturer of plastic film capacitors and a trusted supplier across various applications, including lighting, fan regulators, energy and smart energy meters, and the automotive industry.

Over the past ten years, we have had the privilege of gaining invaluable insights while designing, manufacturing, and supplying film capacitors specifically for metering applications.

Capacitors used in energy and smart energy meters face some of the most demanding conditions, such as high temperatures, high humidity—often due to outdoor installations—and voltage surges from the mains supply. These meters must operate reliably, 24/7, for up to twelve years, placing immense pressure on all components, especially the film capacitors. We recognize the challenge this presents and have worked diligently to turn it into an opportunity for innovation, developing a special series of capacitors tailored for this exact need.

In this edition of Charge, we are delighted to present an in-depth discussion on film capacitors used in energy and smart energy meters. We sincerely hope you will find this information useful.

As always, we are eager to hear your thoughts and suggestions on how we can continue to improve Charge to better serve you.

Shanker Raj



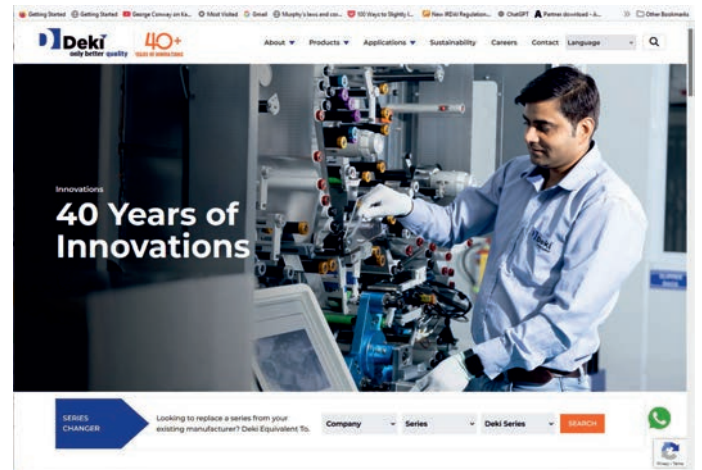
Our New Website is Live!

We're excited to announce the launch of our new website at dekielelectronics.com, designed to be your go-to source for high-performance plastic film capacitors! The new site offers a smooth and intuitive experience where you can easily explore our range of capacitors, view detailed product specs, and download brochures.

One of our standout features is the innovative Series Changer tool. This game-changing functionality allows you to easily find Deki

equivalents for capacitors from other manufacturers. Simply input the series you're currently using, and our smart system will suggest the most suitable Deki alternatives, complete with comparative specifications. It's like having a capacitor translation service at your fingertips! Stay updated on industry trends and innovations through our blog and news sections.

Visit dekielelectronics.com today and discover how we're powering tomorrow's technology!



Executive Health Check-Up Camp: A Resounding Success

At Deki, we believe that the health of our members is the most important resource for our organization. For this reason, we were thrilled to see our executives rolling up their sleeves at our recent health camp on July 22, 2024. Thanks to our friends at Welleazy Lab and ICICI Lombard, it was no longer a workday but a wellness day!

From blood pressure checks to those tricky-to-pronounce blood tests, our team got a full picture of their health. But it wasn't all serious business – we made sure to sprinkle in some fun with refreshments and plenty of chatter.

Best of all? Watching our executives exchange health tips and discussing their BMI scores. It was not only about scales and figures but about being together and showing we care.

We're already looking forward to the next one. After all, a healthy Deki is a happy Deki!



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Film Capacitors for Metering Applications

In energy meters, the AC to DC power supply comprises an X2 and a voltage dropper capacitor. The development of the latter capacitor was particularly challenging since it required high temperature and high humidity resistance. The Deki technical team continuously researched and successfully developed these capacitors. We appreciate the support and input from our customers, which has been instrumental in this journey. As a result, Deki capacitors are now well-app roved by major manufacturers of energy meters.

Furthermore, we continue to play a crucial role in keeping our customers informed about our ongoing research and the development of high-stability, long-life film capacitors for smart meters as well. These high reliability capacitors are often referred to as “double 85” or THB (Thermal humidity bias) or “long life “capacitors too.

CAPACITORS FOR SMART METERS

A smart energy meter is an advanced electronic device that accurately measures the electricity consumption of a residence, business, or any electrically powered device. It reduces the chance of error in the existing billing system to a minimum while also measuring voltage levels, current, and power factor. For instance, if one uses one kilowatt of power over one hour, one unit of energy is consumed. A smart meter records this energy consumption in real time, offering advantages such as enhanced accuracy, remote data collection, and e nergy management.

The communication between the user and the power supply grid is one of the most important aspects of smart meters. For example, electric vehicles (EVs) are a key research area due to their potential to reduce gasoline usage and greenhouse gas emissions. Large-capacity battery packs are used to charge the vehicles from the grid. When demand is high, these batteries can supply power back to the grid. This communication is achieved using the smart meter, whi ch has bidirectional communication capabilities compared to a conventional meter.

Smart meters also communicate information to consumers, providing greater clarity about consumption behaviour, which can help reduce operating expenses. Simultaneously, they provide data to electricity suppliers for monitoring and managing energy utilization, enabling the execution of effective pricing strategies.

The overall purpose is to enhance the efficiency of energy di stribution, monitor power quality, enable better demand-response

mechanisms, reduce energy wastage, and empower consumers with detailed insights into their energy usage.

BASIC FUNCTIONS & ADVANTAGES OF DEKI FILM CAPACITORS

The block diagram of a smart meter (*Fig.1*) highlights three major sections and their functions:

1. Input Mains or Power Section:

- **EMI Filtering:** Filters interference noise.
- **AC/DC Conversion:** Rectifier circuit to convert AC to DC supply.
- **Power Line Communication:** Transmits usage information to utilities.

2. Main Control:

- **Voltage and Current Sensing:** Provides readings to the microcontroller.
- **Microcontroller:** Processes readings, controls, displays, and communicates.
- **RF and Cellular Communication:** System communications.

3. Other Basic Controls:

- **Relay:** Electrical switch to control circuits.
- **Display:** Shows meter readings and billing information.

CRITICAL CAPACITORS USED IN SMART METERS

1. EMI Suppression Capacitors: THB grade and non-THB grade X-2 & Y-2 capacitors.

2. DC Filter Capacitors: THB grade and non-THB grade.

3. DC Link Capacitors: Low-loss and high-stability THB grade and non-THB grade capacitors.

EMI suppression capacitors are critical for across-the-line applications as they play an important role in suppressing interference generated in the mains. We have successfully tested and developed a new design for the THB grade X2 and Y2 filter capacitor that runs till the end-of-life of the smart meter .

After the bridge rectifier, it is necessary to use a capacitor for filtering. The filter capacitor should be highly stable and reliable over a long period. We have developed a special metallized film capacitor for high reliability, successfully tested under stringent conditions and THB grade. It features a very low ESR and ESL.

After DC filtering and smoothing, it is necessary to convert the high-

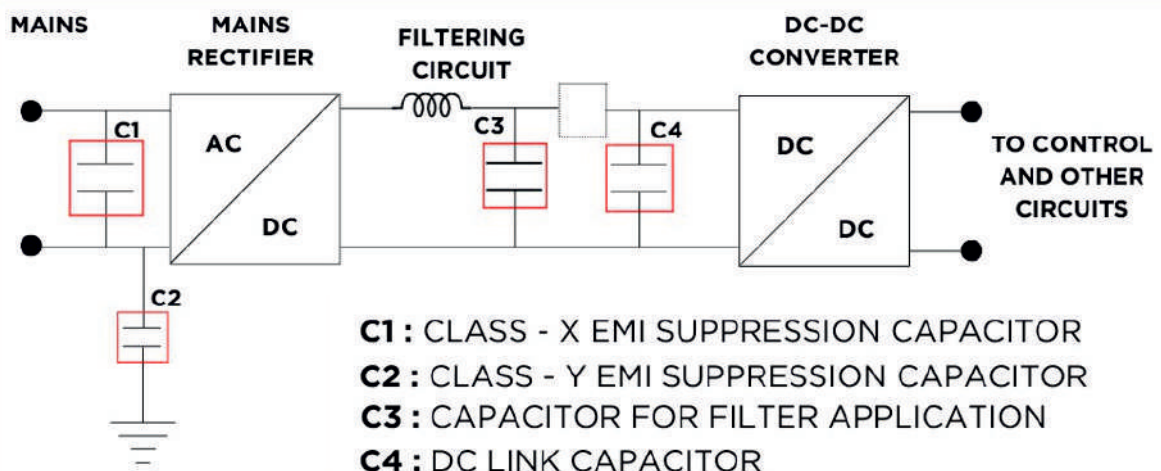


Fig. 1

voltage DC to a lower voltage DC. A more stable DC voltage is required for the DC conversion stage. We have developed a highly stable and low-loss DC link capacitor. It helps smooth out voltage ripples and fluctuations in the DC output voltage. It features extremely low ESR and ESL. This DC- Link film capacitor is a better replacement for the existing electrolytic capacitors bank in the circuit. It is cost-effective with stable electrical parameters, and with THB grade, it operates for the entire lifespan of the smart meter..

ADVANTAGES OF FILM CAPACITORS OVER ELECTROLYTIC CAPACITORS

- Unique self-healing property, which removes a fault or short circuit in the dielectric film by vaporizing the metallisation near the defect.
- Very long life, lasting till the end-of-life of the smart meter the capacitor is part of.
- Very low ESR and ESL.
- Superior ripple current handling capability.
- Higher voltage ratings.
- High reliability.

THB TEST CONDITIONS

Condition 1:

Loaded at rated voltage at +85°C temperature with 85% relative humidity (RH) for 500 hours.

| Capacitor | Function | Type | Voltage Range | Capacitance Range | Deki Capacitor Series | Deki Advantage |
|-----------|-------------------------------|------------------------------------|--|-------------------|-----------------------|---|
| C1 | EMI filter across the line | MPP-X2 | 310VAC | 0.01µF to 10µF | 151 & 207 | Long life – THB & Non-THB Grade UL & ENEC APPROVED |
| C2 | EMI filter line to ground | MPP-Y2 | 300VAC | 0.001µF to 1µF | 33 | Long life – THB & Non-THB Grade |
| C3 | Filtering after rectification | MPP-DC/ MPET-DC (Radial Box) | 63VDC-630VDC for MPP-DC/ 100VDC-1000VDC for MPET-DC | 0.001µF to 10µF | 06, 27, 30 | Long life – THB & Non-THB Grade |
| C4 | DC LINK | MPP-DC | 450VDC-1500VDC | 1µF to 210µF | 91 | Long life – THB & Non-THB Electrolytic Replacement |

Condition 2:

Loaded at rated voltage at +40°C temperature with 93% relative humidity (RH) for 1,000 hours.

After either test:

- Capacitance Change ($\Delta C/C$): 10% of initial value.
- Increase in Tan δ : 0.008 at 1 kHz.
- Insulation Resistance: 50% of the value mentioned in the specific data.

WHAT MAKES DEKI SUPERIOR?

The Deki Technical Centre has been recognized as an 'In-house R&D Unit' by the *Department of Science & Industrial Research*, Government of India, since June 2011. The centre is primarily responsible for consistently introducing new types of film capacitors to the market, in line with updated technologies.

Our engineers have achieved this thanks to the design and testing facilities available at Deki, which enable continual improvements in our designs, increasing the quality and longevity of our products.

THE DEKI RANGE OF CAPACITORS FOR METERING APPLICATIONS



X-2 Capacitor (THB Grade)



Y-2 Capacitor



DC- Link Capacitor



DC Filter Capacitor



Deki's First Aid Training: Ready for Anything!

A comprehensive first aid training session for its emergency response team members was organised at Deki on June 27, 2024. The training, led by Mr. Vivek Kumar from Magiceye Management Consultants Private Limited, was a thorough and practical exploration of essential first aid skills.

Mr. Kumar covered vital topics such as burn injuries, CPR, bone fractures, bleeding, and general first aid techniques. His hands-on approach and clear demonstrations made the session both interactive and informative.

Our team appreciated Mr. Kumar's deep knowledge and practical teaching style. The live demonstrations were particularly helpful, allowing participants to practice and solidify their understanding of first aid procedures.

This training marks an important step in enhancing our team's readiness for emergencies. We are committed to continuing this momentum with more sessions that promote safety and preparedness for everyone at Deki.



External Customer Satisfaction Survey

Most of those who know Deki must be aware of the Customer Satisfaction Survey that we conduct every six months. Since we began measuring in 2004, we've consistently seen growth, starting with an initial satisfaction rating of 75%.

In the most recent survey for July–December 2023 the Deki satisfaction score has come in at 91.96%. This is in keeping with the growth trend of the score.

In every survey, we ask respondents about two areas where we could do better, and then we work on improving those aspects over the next six months. Our customers value the efforts we make to meet their high standards.

A bit about our Net Promoter Score (NPS) now. This score indicates how likely customers are to recommend our products to others. According to Bain & Co, a score above 50 is considered excellent. Well, in the recent survey, Deki's Net Promoter Score stands at a robust 94! Additionally, our price score is at 87%, which is truly uplifting for us.



Employee Survey: Tracking Progress Together

Deki conducts an employee satisfaction survey every six months, where all direct employees respond to fifteen key questions covering:

- Work environment
- Salary
- Overall satisfaction
- Growth opportunities
- Awareness of targets, standard specifications, and operating procedures.

Each question is scored, and the results are compiled into a report that compares the latest findings with the previous survey. This consolidated report, along with action steps for improvement, is shared and discussed with all employees during an 'Open House' session led by our Managing Director, Mr. Vinod Sharma. The February 2024 survey results indicated a steady satisfaction score of 87%.



Deki Electronics Celebrates Har Ghar Tiranga

Deki Electronics proudly participated in the Har Ghar Tiranga celebration on 14th and 15th August 2024, with the entire team joining to promote patriotism and raise awareness about the Indian National Flag.

The manufacturing unit was transformed into a vibrant display of the Indian tricolour, filling the space with saffron, white, and green, symbolizing unity and pride.

A special selfie point allowed Team Deki members to capture memorable moments with the national flag, making the event interactive and engaging for everyone.

In his message, Managing Director Mr. Vinod Sharma highlighted the company's mission to make India proud, urging employees to infuse their work with patriotism. "Our commitment to excellence and innovation extends beyond business success," he said, "it's about contributing to our nation's growth." The celebration reinforced Deki's dedication to India's progress and reminded everyone of the vital role they play in the country's development.