13.56 MHz conversion efficiency at 85% in the 1 kW–5 kW power output range

DAIHEN High-Power RF Wireless Power Transfer System

Auto matching function
Our high-efficiency RF sensor and matching technologies maintain power transmission under various types of transmitter/receiver misalignments (X, Y, Z axes, non-parallel planarity).

Smaller, lighter, more efficient coils (transmit/receive) with our higher frequency (13.56 MHz) power systems.
DAIHEN 13.56 MHz system reduce not only coil diameters by up to 80% but also weight by an astounding 99% with commensurate reduction in coil size (compared to kHz range system).

Individual systems available in kHz through MHz band operating frequencies
Our extensive product line can be shipped with a customer selected, default frequency from our factory. Frequencies ranging from 10 kHz to 13.56 MHz support demanding specifications, including future applications for “On the fly” charging mode.
Announcing the industry’s first low-cost, High-Efficiency Wireless Power Transfer System

Illustration of our High-Efficiency Wireless Power Transfer System

High-Efficiency Power Transmission

“System electrical efficiency” is defined as the ratio between the level of electrical power input from the supply source (including the AC mains) and the amount of power output to the receiver coil. Achieving and maintaining high system efficiency for any wireless power transfer requires an emphasis on reducing power losses in each system component.

Power loss is generally attributed to the following four areas:

1. Conversion from commercial 50/60 Hz alternating current input to direct current output
2. Conversion from direct current to high-frequency power
3. Wireless power transmission between the power transmitting coil and power receiving coil
4. Conversion from high-frequency power to direct current power in the receiving circuit

DAIHEN’s high-frequency power sources for wireless power transfer achieve high transmission efficiency, especially for item 2 above (Conversion from DC to High Frequency AC). Achieving high-efficiency conversion from direct current electric power to high-frequency power was considered difficult in the MHz band, e.g. 13.56 MHz. DAIHEN, however, has achieved a minimum conversion efficiency of 85% for high-frequency power output of 1-5 kW by utilizing optimized components from our high-frequency power sources used in semiconductor fabrication equipment.

Wireless power transmission between the power transmitting coil and power receiving coil as in item 3 above

Higher-efficiency power transmission between coils is achieved through an automatic matching function that operates high-frequency tuning components in a stable mode, thereby reducing high-frequency reflective wave power in the power transmission coil components. (In a transmission distance test with a 300-mm-diameter coil, electric power transmission at 1 kW between coils 300 mm apart achieved a minimum of 90% efficiency.) When the coils are misaligned, high-efficiency power transmission between the coils is maintained through automatic detection and tuning of the mis-matched condition.

DAIHEN’s high-frequency power source: Merging our expertise in inverter and high-frequency technologies

DAIHEN continues to focus on developing uniquely superior products and technologies. Through the organic combination of proprietary advanced technologies, DAIHEN has introduced a superior power source for a wireless power transfer system.

Plasma control technology arising from semiconductor and flat panel display fabrication

DAIHEN has a proven record of more than 20 years, acquiring a wealth of technological expertise as a manufacturer of high-frequency power sources for plasma generation used in semiconductor and flat panel display fabrication. To compensate for the misalignment that can occur between power transfer coils during wireless power transfer, DAIHEN has applied its high-frequency matching technology to stabilize the plasma state; high-precision high-frequency sensor technology to monitor plasma in real time; and high-frequency power source technology to accommodate a wide range of loads. This maintains high efficiency during power transfer.

High power conversion technology

DAIHEN’s symbiotic relationship, among our RF sensor, generator & impedance matching controls with our related inverter technology, coupled with our expertise in electromagnetic fields, is built on our decades of experience with transformers and inverter technology based on our development of welders and power conditioners for photovoltaic power generation systems. The resulting product achieves high-efficiency, high power conversion critical to wireless power transfer. DAIHEN offers superior technology, reliability, performance and the lowest cost of ownership in the industry.

Specifications of High-Frequency Power Source

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency output</td>
<td>13.56 MHz</td>
</tr>
<tr>
<td>Power output</td>
<td>50–5000 W</td>
</tr>
<tr>
<td>Matchable load range</td>
<td>0.1–50 Ω</td>
</tr>
<tr>
<td>AC input specifications</td>
<td>180–242 V</td>
</tr>
<tr>
<td></td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Dimensions</td>
<td>812 mm (W) X 944 mm (D) X 705 mm (H)</td>
</tr>
<tr>
<td>Weight</td>
<td>80 kg</td>
</tr>
<tr>
<td>Ambient operating range</td>
<td>5–45°C</td>
</tr>
<tr>
<td>External interfaces</td>
<td>RS-232 communication with PC via dedicated software</td>
</tr>
<tr>
<td>External interlock terminal</td>
<td>X 2</td>
</tr>
<tr>
<td>Indicator lamps</td>
<td>AC powered, AC power supply, RF output, Alarm</td>
</tr>
<tr>
<td>Emergency stop button</td>
<td>Provided</td>
</tr>
</tbody>
</table>

*Specifications are subject to change without notice due to continual improvements.*

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