This device is an OEM installed magnetic (inductive coupled) charger pad for use in a motor vehicle. It employs three charging coils (only one of which may be used at any given time) to transfer energy from itself to a compatible, portable receiving device placed in contact with the EUT surface. The system uses load modulation on the power transfer frequency as part of its power management and control features. No other communication is employed by the EUT and no data is transferred to the client via the load modulation employed; no other frequencies are employed by the device.

# 2 Power Transmitter Designs

This Section contains the definition of the new Power Transmitter design A32. The provisions in this Section will be integrated into [Part 1] in a next release of this System Description Wireless Power Transfer.

## 2.1 Power Transmitter design A32

Figure 2-1 illustrates the functional block diagram of Power Transmitter design A32, which consists of two major functional units, namely a Power Conversion Unit and a Communications and Control Unit.

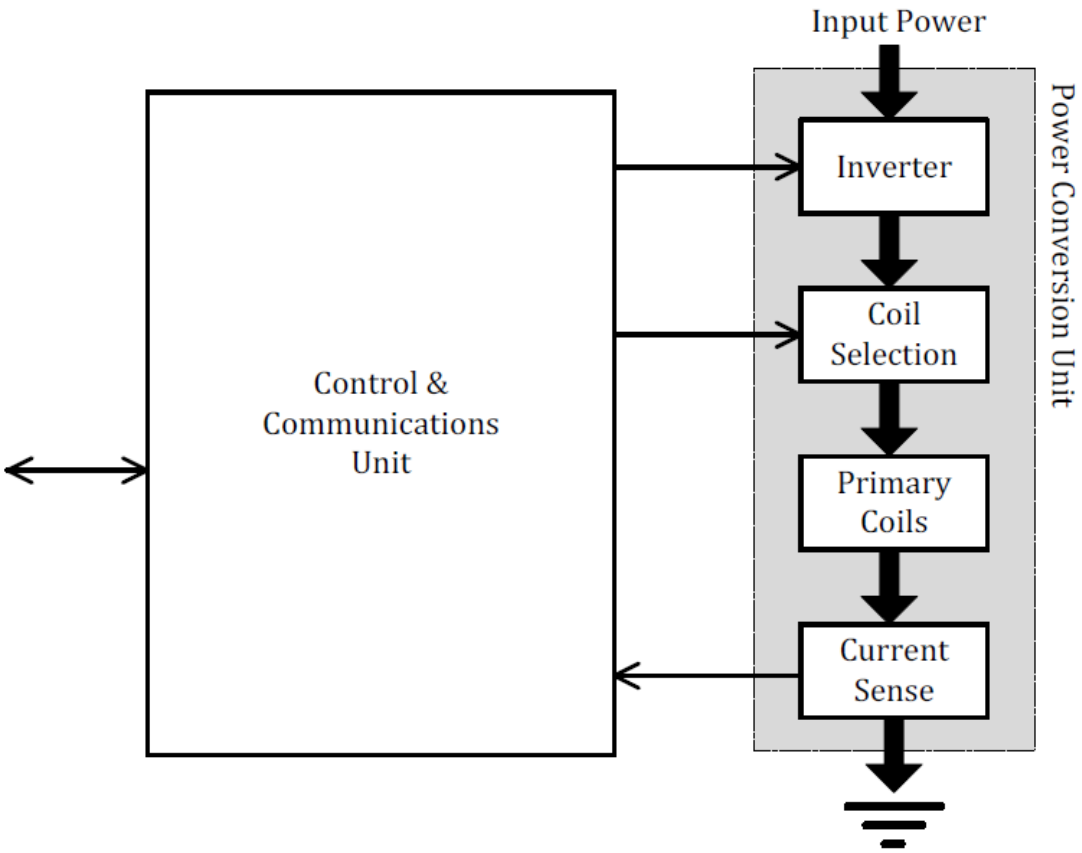


**Figure 2-1: Functional block diagram of Power Transmitter design A32**

The Power Conversion Unit on the right-hand side of Figure 2-1 comprises the analog parts of the design. The inverter converts the DC input to an AC waveform that drives a resonant circuit, which consists of the selected Primary Coil plus a series capacitor. The selected Primary Coil is one from a linear array of partially overlapping Primary Coils, as appropriate for the position of the Power Receiver relative to the Primary Coils. Selection of the Primary Coil proceeds by the Power Transmitter attempting to establish communication with a Power Receiver using any of the Primary Coils. Note that the array may consist of a single Primary Coil only, in which case the selection is trivial. Finally, the current sense monitors the Primary Coil current.

The Communications and Control Unit on the left-hand side of Figure 2-1 comprises the digital logic part of the design. This unit receives and decodes messages from the Power Receiver, configures the Coil Selection block to connect the appropriate Primary Coil, executes the relevant power control algorithms and protocols, and drives the frequency of the AC waveform to control the power transfer. The Communications and Control Unit also interfaces with other subsystems of the Base Station, e.g. for user interface purposes.

#### 2.1.1.3 Interface Surface

As shown in Figure 2-5, the distance from the Primary Coil to the Interface Surface of the Base Station is $d_z$=2.75$^{\pm 1}$ mm, across the top face of the Primary Coil. In addition, the Interface Surface of the Base Station extends at least 0.5 mm beyond the outer dimensions of the Primary Coils.

#### 2.1.1.4 Separation between multiple Power transmitters

If the Base Station contains multiple type A32 Power Transmitters, the Primary Coils of any pair of those Power Transmitters shall have a center-to-center distance of at least 49.2$_{\pm 4}$ mm.

### 2.1.2 Electrical details

As shown in Figure 2-6, Power Transmitter design A32 uses a full-bridge inverter to drive an individual Primary Coil and a series capacitance. Within the Operating Frequency range Specified below, the assembly of Primary Coil and Shielding has a self-inductance $L_P = 11.5^{\pm 10\%}$ µH for coils closest to the interface surface, and inductance $L_P = 12.5^{\pm 10\%}$ for coils furthest from the Interface Surface. The value of inductances $L_1$ and $L_2$ is $1^{\pm 20\%}$ µH. The value of the total series capacitance is $1/C_{ser1} + 1/C_{ser2} = 1/200^{\pm 10\%}$ 1/nF. The value of the parallel capacitance is $C_{par}$ = $400^{\pm 10\%}$ nF. (Informative) *Near resonance, the voltage developed across the series capacitance can reach levels exceeding 100 V pk-pk.* Power

Power Transmitter design A32 uses the input voltage of the inverter to control the amount of power that is transferred. For this purpose, the input voltage has a range of 1…12 V, with a resolution of 10 mV or better.

When a type A32 Power Transmitter first applies a Power Signal (Digital Ping; see [Part 1] Section 5.2.1), it shall use an initial voltage of 3.5±0.5 V for a bottom Primary Coil, and 3.0±0.5 V for a top Primary Coil, and a recommended Operating Frequency of 110 kHz.

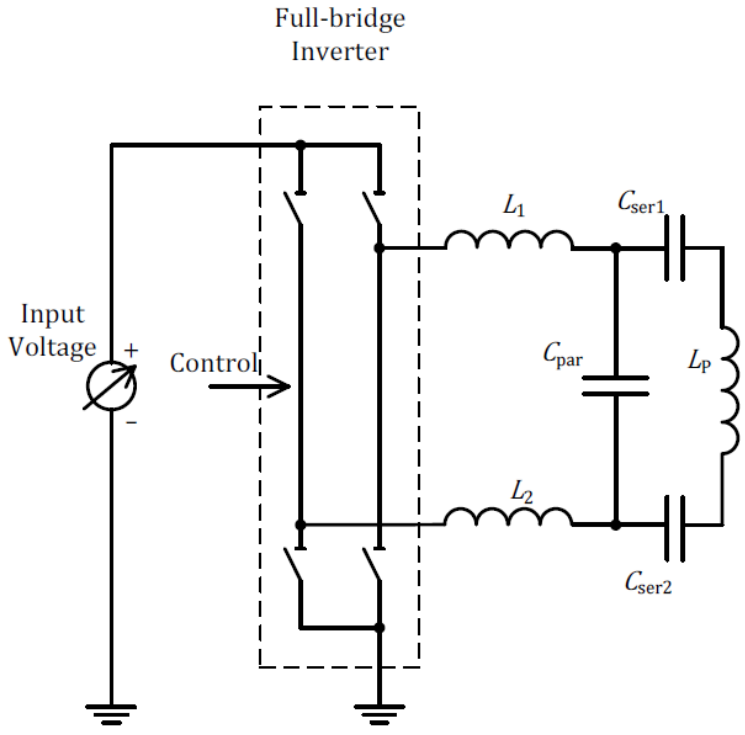


**Figure 2-6: Electrical diagram (outline) of Power Transmitter design A32**

Control of the power transfer shall proceed using the PID algorithm, which is defined in [Part 1] Section 5.2.3.1. The controlled variable $v^{(i)}$ introduced in the definition of that algorithm represents the input voltage to the inverter. In order to guarantee sufficiently accurate power control, a type A32 Power Transmitter shall determine the amplitude of the Primary Cell current—which is equal to the Primary Coil