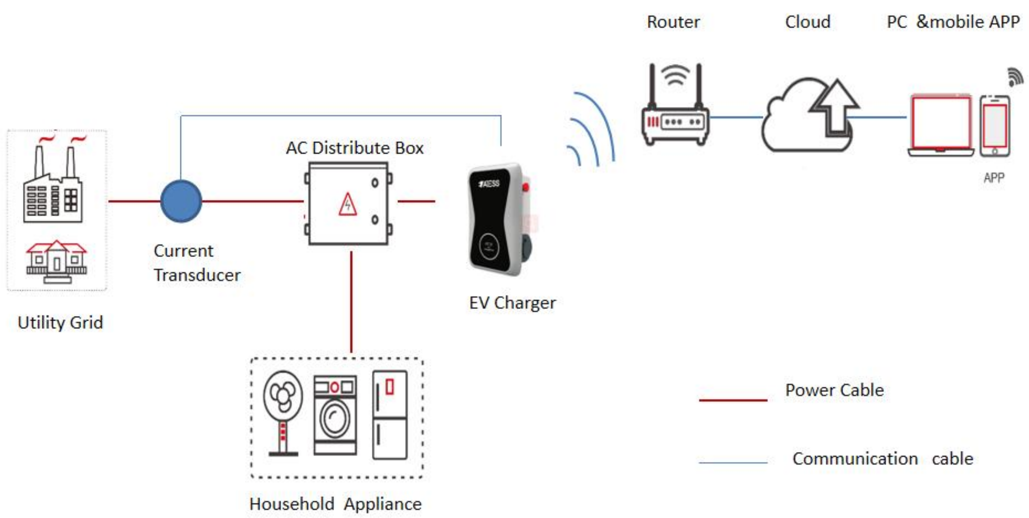
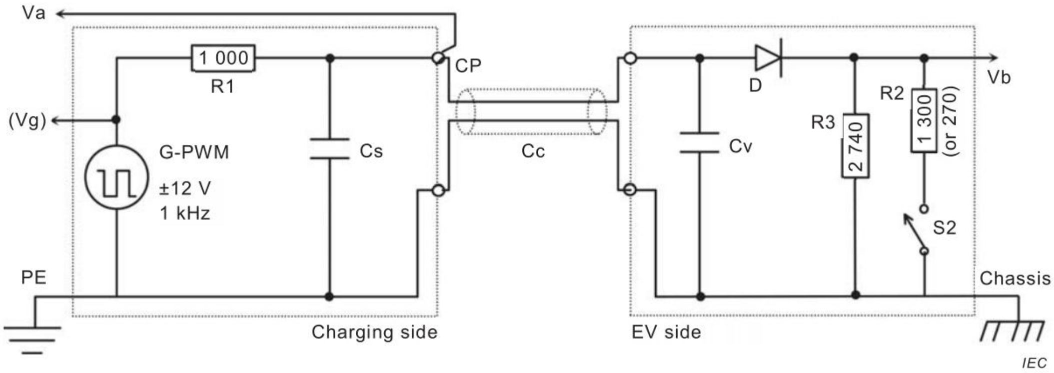
ATESS EVA Intelligent Power Distribution Solution

In the previous ATESS white paper, we have introduced the automatic power distribution function of the ATESS EV charger. There are usually household or office appliance in the installation site, and the installation is limited by the total power distribution capacity. Then what can we do to ensure normal use of the load and with the premise of not exceeding the total power? The key is that the EV charger needs to have dynamical adjusting function, to automatically tune the charging power according to the load capacity. The ATESS solution is as follow:



So how does the software of the EV charger do the adjustment?

Generally speaking, each electric vehicle has a on-board charger. In order to charge the battery on the car, the AC charger needs to output AC current and then charge the battery through OBC rectification. Therefore, we provide AC charger with corresponding power model referring to the power of OBC (specified by the vehicle brand, usually there are 3.5kw and 7KW of single-phase OBC, and 22KW and 44kw of three-phase one). The output power of EV charger is controlled by duty cycle PWM. The power control signal circuit of AC charger is shown as below:



G-PWM PWM signal generator for pilot function
Vb EV measurement of voltage，duty cycle and frequency
Vg Internal voltage measured at EV supply equipment output
CP control pilot contact
D Duty ratio

Table A.7 – PWM duty cycle provided by EV supply equipment

Maximum current I_{av}	Nominal control pilot duty cycle D_N	Description
I_{av} = 0 A	D_N = 0 %	Continuous -12 V, EV supply equipment not available; state F
	D_N = 100 %	No current available – state x1 (see Table A.5)
Maximum current is indicated via digital communication	D_N = 5 %	A duty cycle of 5 % indicates that digital communication is required and shall be established between the EV supply equipment and EV before enabling energy supply. If digital communication cannot be established, the EV supply equipment shall: • stay in 5 % duty cycle or • change to x1 (100 % duty cycle) for at least 3 s or • change to x1 (100 % duty cycle) for at least 3 s and then change to a duty cycle between 10 % and 96 %.
6 A ≤ I_{av} ≤ 51 A	D_N = I_{av} / 0,6 A	10 % ≤ D_N ≤ 85 %
51 A < I_{av} ≤ 80 A	D_N = (I_{av} / 2,5 A + 64)	85 % < D_N ≤ 96 %

According to the formula IMAX = D * 100 * 0.6 (10% ≤ D ≤ 85%):
The rated current of eva-7 series is 32a, and the corresponding duty cycle is 53.3% (10% ≤ D ≤ 54%)
The rated current of eva-3 series is 16a, and the corresponding duty cycle is 26.7% (10% ≤ D ≤ 27%)

In the scheme, the EV charger will decide the power taken from the power grid in real time according to the CT signal, and compares it with the limited value then tune the charging power through automatically trimming the duty cycle, to realizes the intelligent dynamic adjustment of the whole charging process. Thereby it ensures that the power consumption of important loads does not exceed the total load quota, at the meantime charge the vehicle with the maximum power.