

3.6 Weight-to-Power Classes

The assignment of the correct "Weight-to-Power Class" (WPC) to a hybrid vehicle is carried out in three steps:

- In the first step, the "Nominal Vehicle Power" PN is calculated with the formula given in Article 3.6.1;
- In the second step, a value for the "Weight-to-Power Ratio" (WPR) is calculated with the formula given in Article 3.6.2, and;
- In the third step, the WPR number is used to determine the correct WPC. The correspondence between a WPR number and the WPC is given in the Hybrid Classification Table presented in Article 3.6.2.

Neither the power of the internal combustion engine, nor that of the electric motor, nor the capacity of the STSY registered in the Technical Passport may be changed.

The WPC of a vehicle is kept only if the minimum weight according to Art. 1.9.1 is not exceeded.

It is both the duty and the responsibility of the competitor to specify the vehicle's correct WPC to the organizer.

The FIA-AEC reserves the right to adjust the classification of a hybrid vehicle according to the Hybrid Classification Table HCT.

3.6.1 Nominal Vehicle power

The Nominal Vehicle Power PN is given for hybrid vehicles by:

$$P_N = P_{ICE} + k_E \cdot P_E \frac{P_E}{P_{ICE} + P_E} \quad \text{and for}$$

plug-in hybrid vehicles by:

$$P_N = P_{ICE} + k_E \cdot P_E + P_{STSY}$$

P_{ICE} as the maximum "Power of the i.c. engine" in kilowatt [kW] according to the Technical Passport,

P_E as "Power of the electric engine," is either the maximum power of the electric traction motor or, if more than one electric traction motor is used, the sum of the maximum power of all electric traction motors in kilowatt [kW] according to the Technical Passport, and

P_{STSY} as the maximum "Power of the STSY" in kilowatt [kW] given by $P_{STSY} = E_{STSY} / T_D$ with

E_{STSY} as the maximum usable "Energy in the STSY" in kilowatt hours [kW] according to the Technical Passport, and

T_D as the "Discharge time" of the maximum usable energy in the STSY in hours [h].

The factor k_E is used to account for the type of hybrid vehicle and is given by:

$k_E = 0$ for series hybrid vehicles.
Explanation: The i.c. engine powers a generator and the generator powers the electric traction motor(s).

$k_E = 2$ for parallel hybrid vehicles.
Explanation: The i.c. engine and the electric traction motor(s) jointly propel the vehicle.

$0 < k_E < 2$ for power split hybrid vehicles.
Explanation: The i.c. engine powers the traction wheels, as well as a generator and the electric propulsion motor(s) receive the electric energy from the generator and from the STSY.

$k_E = 1$ for plug-in hybrid vehicles.

$T_D = 0.5$ hours

The FIA-AEC and the organizer of FIA-AEC hybrid vehicle speed events are authorised to determine, in the Supplementary Technical Regulations, specific values for the factor k_E and the discharge time T_D .

3.6.2 Hybrid Classification Table

The Weight-to-Power Ratio WPR is a value given by:

$$WPR = \frac{\text{Minimum weight in kg according to the FIA-AEC Technical Passport}}{\text{Nominal hybrid vehicle power } P_N \text{ in kW}}$$

Hybrid Classification Table HCT		
Weight-to-Power Class (WPC)	Weight-to-Power Ratio (WPR)	
1		less than 2,5
2	from 2,5	to < 3,4
3	from 3,4	to < 4,6
4	from 4,6	to < 6,1
5	from 6,1	to < 8,2
6	from 8,2	to < 11
7	from 11	to < 14,7
8	from 14,7	to < 19,7
9	from 19,7	to 26,5
10	over 26,5	

Example:

Parallel hybrid ($k_E = 2$), 1550 kg, 55 kW i.c. engine power, 15 kW electric motor:

$$P_N = P_{ICE} + k_E \cdot P_E \frac{P_E}{P_{ICE} + P_E} = 55 +$$

$$2 \cdot 15 \cdot 15 / (55 + 15) = 55 + 6.43 = 61.43$$

$WPR = 1550 / 61.43 = 25.23 \Rightarrow$ from the HCT we get a **Weight-to-Power Class 9** for this vehicle.

N.B.: the text of Article 3.6 may be updated in order to take into account new experimental data, which ensure the fairness of competition.