



Thein Industry Železniční dodavatelská



Hybrid locomotives H2



Hmotnostní Hustota energie?

Elektrochemické zdroje – účinnost 95%

- Primární /sekundární.
- 0,04 kWh/kg Zn-C,
- 0,06 kWh/kg nikl-kadmiové dosahují,
- 0,1 kWh/kg nikl-metalhydridové uloží zhruba
- 0,2 kWh/kg u alkalických,
- 0,08 – 0,33 kWh/kg Li-Ion
- 0,5 kWh/kg (Lithiové – LiSOCl₂).

Vodík – účinnost 55% – 33,3 kWh/kg nutno skladovat i při vyšším tlaku

CNG Zemní plyn – účinnost 29% – 12,1 kWh/kg a v kapalně formě za nízkých teplot (-160 stupňů Celsia)

LPG – účinnost 29% – 13,5 kWh/kg.

Benzín a motorová nafta – účinnost 29% 12,5 kWh/kg téměř stejná a činí zhruba,

Líh – účinnost 29 – 7,9 kWh/kg ve variantě E85, palivo obsahuje 85% lihu a 15% benzínu

Objemová hustota energie.

Motorová nafta 10,7kWh/l

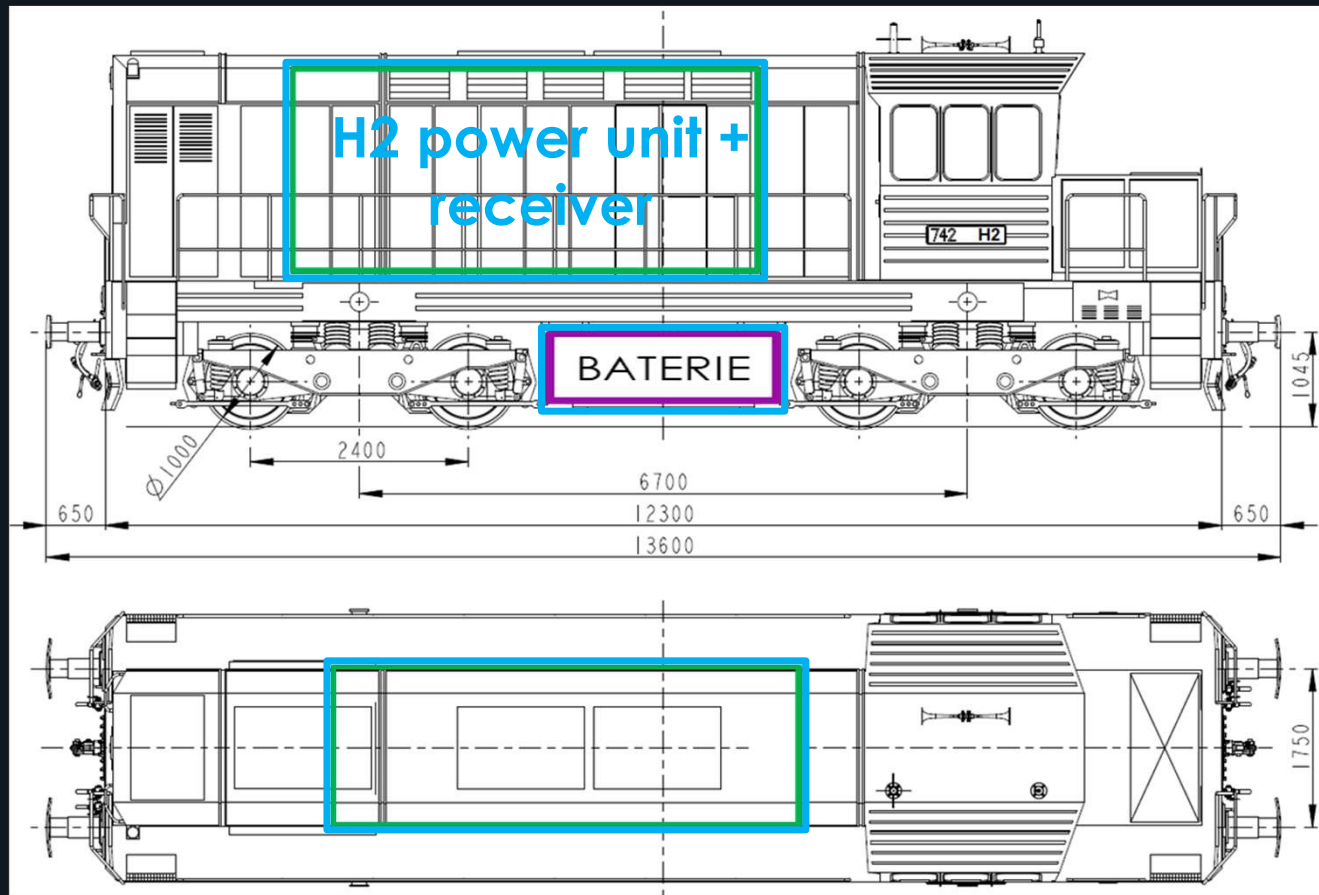
Benzín 9,7kWh/l

CNG Zemní plyn 3,1kWh/l

LPG 7,8kW/l

Li-Ion 0,65kW/l

Vodík 0,75kWh/l (tzn. velké nároky na uskladnění objemu)

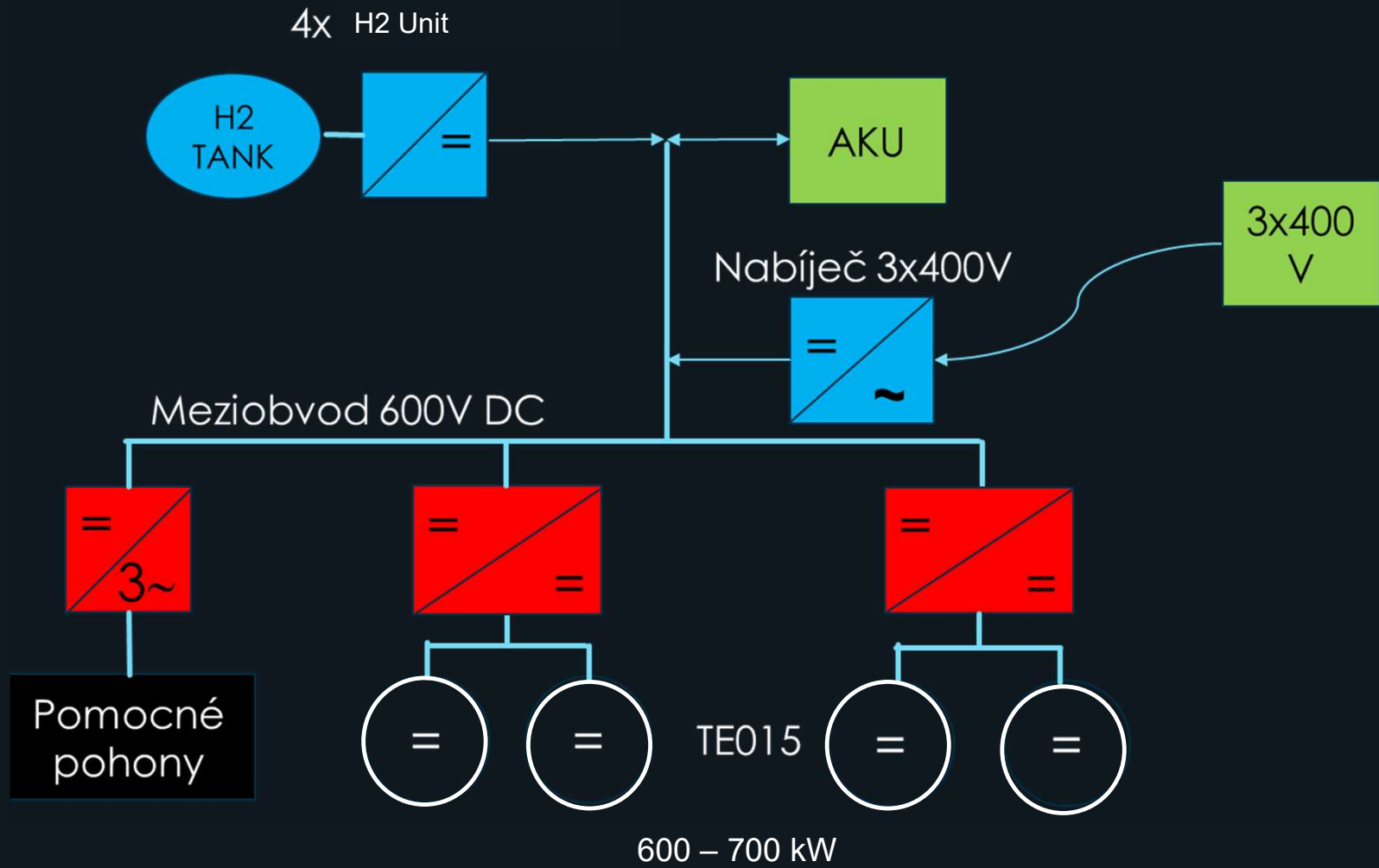


H2 power pack o rozměru 6250x1550x2300

Místo naftové nádrže – baterie 2000x3000x600mm (cca 180–200kWh)

Energie 140kg H2 = 4650kWh * 55% účinnost = 2550kWh (trakční energie)

Energie 3400kg nafty = 40800kWh*29%účinnost= 11830kWh

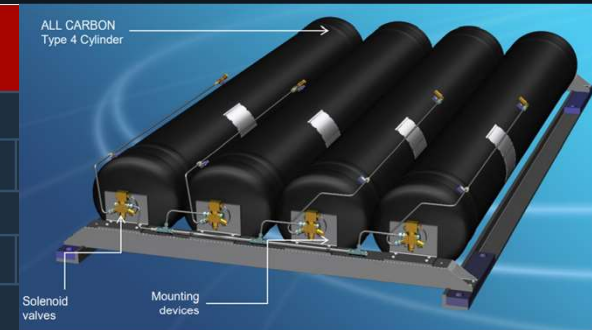


| Type PM 200 | 24 | 48 | 72 | 96 | 120 | 144 | 168 |
|-----------------------------------|---------------------------|---------|---------|---------|----------|----------|----------|
| Electrical Output | | | | | | | |
| Power Range* [kW] | 0.4-2.1 | 0.8-4.2 | 1.2-6.3 | 1.6-8.4 | 2.0-10.6 | 2.4-12.7 | 2.8-14.8 |
| Current Range [A] | 0-150 | | | | | | |
| Voltage Range [V DC] | 14-28 | 28-55 | 42-83 | 56-110 | 70-138 | 84-165 | 98-193 |
| El. System Efficiency* [%] | 47-67 | | | | | | |
| Hydrogen Interface | | | | | | | |
| Hydrogen Quality | ISO 14687 – 2 / SAE J2719 | | | | | | |
| H2 Supply Pressure [barg] | 1.5-7.5 | | | | | | |
| Hydrogen Consumption (max) [kg/h] | 0.14 | 0.29 | 0.43 | 0.57 | 0.71 | 0.85 | 1 |
| Dimensions | | | | | | | |
| Width x Height** [mm x mm] | 294 x 237 | | | | | | |
| Length**[mm] | 395 | 489 | 583 | 676 | 771 | 861 | 957 |
| Volume [l] | 27.5 | 34.1 | 40.6 | 47.1 | 53.7 | 60.0 | 66.7 |
| Tare weight [kg] | 15.9 | 19.3 | 22.7 | 26.1 | 29.5 | 32.9 | 36.3 |



* without peripherals
 ** main dimensions

| Type PM 400 | 48 | 72 | 96 | 120 | 144 | 168 | 192 | 216 | 240 |
|-----------------------------------|---------------------------|----------|------------|----------|----------|----------|----------|------------|-----------|
| Electrical Output | | | | | | | | | |
| Power Range* [kW] | 2.1-14.2 | 3.1-21.3 | 4.1 – 28.4 | 5.1-35.5 | 6.2-42.6 | 7.2-49.7 | 8.2-56.8 | 9.2-64.0 | 10.3-71.0 |
| Current Range [A] | 0-500 | | | | | | | | |
| Voltage Range [V DC] | 28-55 | 42-83 | 56-110 | 71-137 | 85-165 | 99-193 | 113-220 | 127-248 | 142-275 |
| El. System Efficiency* [%] | 47-67 | | | | | | | | |
| Hydrogen Interface | | | | | | | | | |
| Hydrogen Quality | ISO 14687 – 2 / SAE J2719 | | | | | | | | |
| H2 Supply Pressure [barg] | 3.0-7.0 | | | | | | | 7.0 +/-0,5 | |
| Hydrogen Consumption (max) [kg/h] | 0.93 | 1.39 | 1.85 | 2.32 | 2.78 | 3.25 | 3.71 | 4.18 | 4.64 |
| Dimensions | | | | | | | | | |
| Width x Height** [mm x mm] | 436 x 279 | | | | | | | | |
| Length**[mm] | 486 | 580 | 673 | 768 | 860 | 954 | 1048 | 1141 | 1235 |
| Volume [l] | 59.1 | 70.6 | 81.9 | 93.4 | 104.6 | 116.0 | 127.5 | 138.8 | 150.2 |
| Tare weight [kg] | 37 | 46 | 55 | 64 | 73 | 82 | 91 | 100 | 109 |



* without peripherals

** main dimensions

Thank you!

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