UNECE GRPE 75
Reg 85: Measurement of Net Power

Effects of Thermal Loading on the Determination of Net Power for Electric Motors
Electric Motor Power

 Definitions from Regulation 85

2.3. "Net power" means the power obtained on a test bench at the end of the crankshaft or its equivalent at the corresponding engine or motor speed with the auxiliaries listed in table 1 of annex 5 or in annex 6 to this Regulation, and determined under reference atmospheric condition.

2.4. "Maximum net power" means the maximum value of the net power measured at full engine load.

2.5. "Maximum 30 minutes power" means the maximum net power of an electric drive train at DC voltage as defined in paragraph 5.3.1. of this Regulation, which a drive train can deliver over a period of 30 minutes as an average.
Electric Motor Power (2)

“5.3.1. DETERMINATION OF THE NET POWER

5.3.1.1. The motor and its entire equipment assembly must be conditioned at a temperature of 25°C ± 5°C for a minimum of two hours.

5.3.1.2. The net power test shall consist of a run at full setting of the power controller.

5.3.1.3. Just before beginning the test, the motor shall be run on the bench for three minutes delivering a power equal to 80 per cent of the maximum power at the speed recommended by the manufacturer.

5.3.1.4. Measurements shall be taken at a sufficient number of motor speeds to define correctly the power curve between zero and the highest motor speed recommended by the manufacturer. The whole test shall be completed within 5 minutes.”
Electric Motor Power (3)

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Maximum **net** power, or
Maximum **30 minute** power?
Electric Motor Power (4)

- Operating at 80% of maximum net power would require ~80% of the maximum current that the motor can sustain. High current results in significant resistive heating in the motor.

- Air cooled motors are limited by motor temperature. A 3 minute warm-up at 80% maximum net power results in a high thermal load. The motor reverts to a restrictive thermal protection mode which limits the power.

- The parameters for 30 minute power are chosen so that the temperature does not exceed the thermal limits during a 30 minute test sequence.

- Therefore, running at maximum 30 minute power might only require ~40% of the maximum current = significantly less heating.
Electric Motor Power (5)

- A 3 minute warm-up at 80% maximum power results in the declared net power figures being much lower than the actual power of the motor.

- In real world use, operating above 80% maximum net power is only expected for a very short time. Most driving is expected to be in the 30 minute power range.

- This could be misleading and potentially unsafe for the consumer.
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5.3.1.3. Just before beginning the test, the motor shall be run on the bench for three minutes delivering a power equal to 80 per cent of the maximum 30 minute power at the speed recommended by the manufacturer.

5.3.1.4. Measurements shall be taken at a sufficient number of motor speeds to define correctly the power curve between zero and the highest motor speed recommended by the manufacturer. The whole test shall be completed within 5 minutes.”
Thank you for your attention.

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