Whitepaper

Pears and Apples: The performance comparison for motors

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The first glance when choosing suitable drives for an application is usually directed at the nominal output of the alternative products. This approach provides a first indication, but is often misleading on closer inspection. There are several reasons for this:

(1) When comparing different motor concepts, the high overload capacity of DC motors should be considered. In many applications with cyclic operating modes, the continuous output power is not relevant, but the short-term maximum output. Both the brushed and the brushless DC motors of Dunkermotoren are able to withstand the multiple nominal torque. This is a property that does not exist in many other motor designs. The illustrated characteristic curve of the BG 95 dPro (24 V) with integrated power and control electronics serves as an example. In the continuous operating point, the motor reaches a torque of 2.65 Nm at a speed of 3711 rpm, corresponding to a power of 1030 W. In cyclic operation, on the other hand, up to 8 Nm at 3000 rpm is possible, this corresponds to an output power of 2515 W.

(2) In the case of DC motors, the winding design, i.e. the number of windings and the wire diameter, is decisive for the motor speed at a given voltage. Thus, it is possible to design the motors for a high speed, with only slightly lower permanent torque. This results in an optimized power density, i.e., a very high output power can be generated from the given installation space. However, high speeds have the disadvantage that these are not suitable for many industrial applications. High gear reduction ratios are necessary, which in turn are noise-intensive and result in a high wear on the part of the mechanical components. Therefore, the motors of Dunkermotoren are always designed for an industrial nominal speed in the range of 3000 to 4000 rpm. If an application allows and requires it, the rotational speed can be easily increased by selecting another winding, for example the use of a GR motor of nominal 12 V at a supply voltage of 24 V. This doubles the idle speed and the entire motor characteristic is shifted accordingly in parallel. This results in a significantly increased continuous output power of the motor.

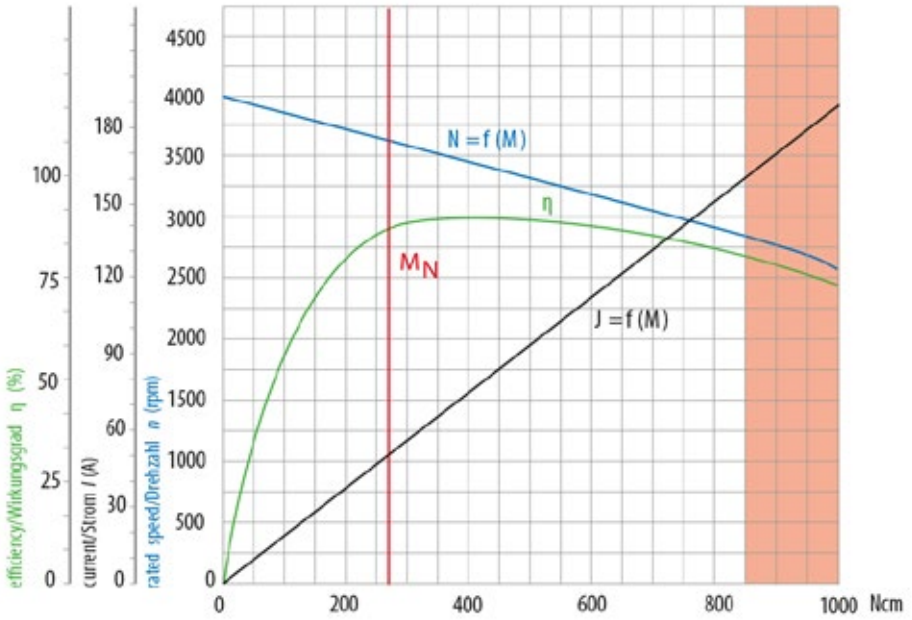

Figure 1: Load characteristics BG 95x80 dPro 24V

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(3) The measurement methods for the specification of motors are not uniform and may differ widely from one supplier to another. This makes the comparison of values difficult even for comparable motor concepts and speeds. For example, motors are always measured in thermally insulated state according to EN60034 at Dunkermotoren, whereas in the case of competitors, 105x105 mm heat sink plates are mounted on the motor. This results in a better
cooling of the motor, which means that significantly higher continuous output rates can be specified. Many manufacturers do not give any information on their method of measurement.
For a better comparison, motors from competitors were measured at Dunkermotoren and the values were compared with the respective catalogue specifications.

All comparative products show that the measurement methodology of Dunkermotoren is significantly more conservative. The deviations from the catalogue specifications to the measured powers were 35% to 50%. A result of this magnitude that even the engineers of Dunkermotoren did not expect.

PRODUCT		Specific continous output power	Measured continuous output power (thermally insulated)
Dunkermotoren BG 65X25 PI		123 W (0,405 Nm @ 2.900 rpm, 24 V)	123 W (0,405 Nm @ 2.900 rpm, 24 V)
Competitive product		178 W (0,425 Nm @ 4.000 rpm, 24 V)	113 W (0,22 Nm @ 4.900 rpm, 24 V)
Dunkermotoren BG 95x40 *dCore*		700 W (1,69 Nm @ 3.945 rpm, 48 V)	700 W (1,69 Nm @ 3.945 rpm, 48 V)
Competitive product		1160 W (3 Nm @ 3.716 rpm, 35.5 V)	580 W (1,49 Nm @ 3.716 rpm, 35.5 V)

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