



Instructions for use

and technical data for brushless, sensorless electric motors of the series 10/15/19/22

1. **ATTENTION:** Because of the high packing density of the motors the thread depth for the mounting screws is **max. 3 mm (max. 2.5 mm for series 10)**.
2. The rpm values of the motors are proportional to the DC voltage at the controller. The mechanical limit is approx. 85,000 rpm for the series 10/15/19, 50,000 rpm for the series 22.
3. The maximal power throughput depends strongly on the rpm and on cooling.

Operating voltage x 2 = rpm x 2 = double power.

Tip: Please use our online calculator at:

www.lehner-motoren.de

4. All efficiency values η contain the losses of both **motor and controller**, e.g. an overall efficiency of 94% contains controller losses of approx. 1-2%, which corresponds to a motor efficiency of approx. **95-96%**.
5. All motors are equipped with **rotors optimized for partial power** (sliced structure). This yields an efficiency loss of **no more than 7%, typically 4-5%**, at half power (**massive magnetic rotors** can have losses of **30%!!**). If, however, the operating parameters are outside the approved max. efficiency range (**full power current too high!**), then there is still the risk of **thermal destruction** of the magnetic rotor through excessive eddy currents!

Tip: Electric helicopters are particularly in need of optimal adaptation!

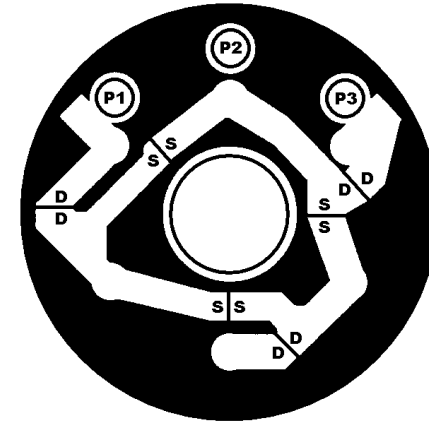
Important tips:

6. Since the sensorless/brushless motor control, which we first brought to market in 1996, meanwhile seems to have prevailed, there are now many similar motor controllers made by various manufacturers. Depending on design and software version they can behave quite differently (for example, start, timing, start protection, etc.)
7. Our rpm/power data have been determined using BK controllers. Please check the compatibility with the respective controller manufacturer.

Two motors in one case. Why?

Two different numbers of windings through star-triangle-switching

1. Default is the **triangle configuration**. The three **D-D connections** are bridged (marked red on the motor). All data in the rpm table applies to the triangle configuration.



View on rear motor plate series 10/15/19/22

P1, P2 und P3 are the 3.5 mm connection sockets of the three phases (pluggable in any order).

2. For the **star configuration** the **three D-D soldering bridges** have to be **severed** with a soldering iron and some soldering imbibing braid werden, and the **three S-S connections** bridged with solder.
3. In **star configuration** the motor behaves as if it had **1.73** times the number of windings and an accordingly lower, by the same factor, rpm per Volt (see rpm table).

Examples:

Type **1920/10** in star configuration is approximately equivalent to a type **1920/17** in triangle configuration.

1920/10 (**D**) has 3,135 rpm per Volt. In (**S**) it would have 1,844 rpm per Volt.



— We wish you ongoing fun and success with our motors.