

GERMANY | WAIBLINGEN

A WEIGHTY MATTER



Every gram counts. After all, the lighter the product, the more comfortable it is for the customer. That is why STIHL products are continuously pushing the boundaries of what is possible in lightweight design. The latest example is the STIHL MS 400 C-M, the world's first chain-saw with a magnesium piston.





Lighter is better. The less a product weighs, the easier it is to work with. It may be a simple formula, but it takes work, time and knowledge to get there. The STIHL MS 400 C-M, the world's first professional chainsaw with a magnesium piston, was no exception. This one part has shed 20 grams compared to an aluminum piston, a 25 percent weight reduction in this key component. The change has brought gains too, though: Performance is up by 10 percent and the power-to-weight ratio now stands at 1.45 kg/kW. For operators, this tool is lighter yet delivers even more power.

"The aim was to close the gap between the MS 362 C-M and the MS 462 C-M," says project manager Jonas Lank. The new concept includes lower emission levels despite higher torque and more power. "An increase in comfort is usually associated with more weight. We here at ANDREAS STIHL do it exactly the other way around." Over a quarter of the parts in a professional chainsaw are made of steel. Twenty-five percent are plastic or rubber, and 40 percent are made of aluminum or magnesium. In particular, the use of magnesium calls for special expertise. Thanks to its own magnesium die-casting plant in Weinsheim, Germany, ANDREAS STIHL boasts such expertise. In Waiblingen, research is conducted regularly to determine which product components can be made from this material. This expertise is no longer reserved for internal customers - the Weinsheim plant has a steady flow of orders from external customers in the automotive and other industries.



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JONAS LANK,
PROJECT MANAGER MS 400 C-M



In the case of the MS 400 C-M, it was the piston - previously made of aluminum - that got the magnesium treatment. However, the decision to use magnesium requires a range of other developmental measures. "It's not a question of simply exchanging one material for another," Lank says. Assembly, maintenance and repair are almost identical. But when the saw is running at full power, the pistons are exposed to temperatures of over 300 degrees Celsius. To ensure they can withstand this strain, without excessive wear, a special coating co-developed by ANDREAS STIHL must be applied.

But there was more for the developers in Waiblingen and Weinsheim to consider. Under extreme temperatures, magnesium expands more than aluminum. That, in turn, increases stress on other components. Consequently, other elements of the machine design had to be optimized. The experts enhanced both the inner mechanics and the software. The STIHL MS 400 C-M features the M-Tronic 3.0 engine management system. Fully electronic engine management was first installed in the STIHL MS 441 C-M in 2010. Using sensor technology and intelligent algorithms, the saw detects its immediate operating environment and automatically adjusts settings such as ignition timing and fuel consumption to achieve optimum engine performance. Version 3.0 offers users the additional option of calibrating the machine manually. "All in all, this chainsaw is truly state-of-the-art," says Lank.



LIGHTWEIGHT CONSTRUCTION AND VERTICAL MANUFACTURING

MS 400 C-M COMPONENTS PRODUCED IN-HOUSE



HOUSING, HANDLE AND TANK HOUSING

-  Fiberglass-reinforced, injection-molded plastic
-  Plant 2 + Plant 6, GER



AIR GUIDE SHROUD

-  Two-component injection molding
-  Plant 2, GER



CRANKSHAFT

-  Forged steel parts
-  Plant 1, GER



CYLINDER

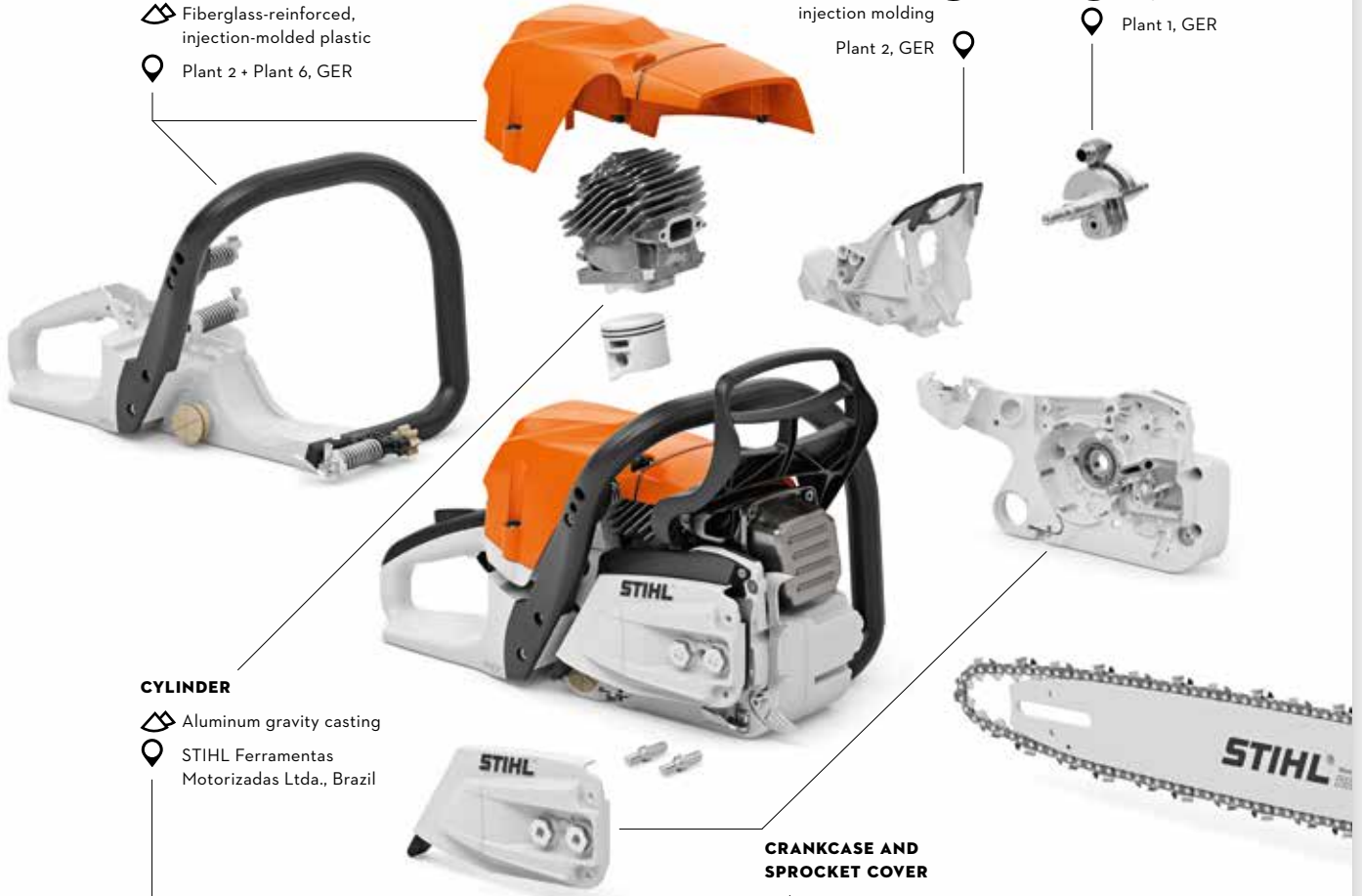
-  Aluminum gravity casting
-  STIHL Ferramentas Motorizadas Ltda., Brazil

PISTON

-  Magnesium die casting
-  Plant 4, GER / STIHL Incorporated, USA

CRANKCASE AND SPROCKET COVER

-  Magnesium die casting
-  Plant 4, GER



The shift from aluminum to magnesium **CUTS WEIGHT BY 25%** in this key component alone.

1.45
KG/KW

is the **POWER-TO-WEIGHT RATIO** of the **MS 400 C-M**. That's a gain of more than 10% in terms of power compared to the STIHL MS 362 C-M.



ANDREAS STIHL won **FIRST PLACE** in the Euroguss magnesium component competition for developing and manufacturing the magnesium piston.