

## **PRESS RELEASE**

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### **Strong material for demanding tasks**

**The automotive supplier FTE Automotive uses Grivory HT1VL-50X for a new gear shift module. This long glass fiber reinforced material from EMS-GRIVORY with its strong property profile, is the perfect product for this challenging metal replacement application.**

Dual clutch transmissions and automated gear boxes are taking an increasing market share in modern vehicles. Reasons for this trend are, among others, the higher driving comfort of these kinds of system and their high efficiency which allows significantly lower fuel consumption and emissions to be achieved. In addition, these concepts facilitate use of start-stop systems and create the best conditions for further development into hybrid drive systems.

While in automated gear boxes changing of gears is carried out by actuators driven by electrical motors or electro-hydraulic systems, in a dual clutch system, the gear selector shafts are controlled directly by hydraulic gear shifting cylinders. Integrated position sensors ensure maximum gear-changing precision.

### **Continued successful cooperation**

FTE Automotive, based in Ebern, Germany, recognised the trend to automated gear shift systems at an early point and offers a series of highly sophisticated solutions in the field of gearbox actuators and gear shift cylinders. Housings and pistons made of high-performance polymer materials guarantee high cost efficiency, freedom of design, and resistance to wear over the lifetime of the component and in high temperature ranges.

Based on the good existing cooperation work with EMS-GRIVORY, FTE Automotive again chose heat-resistant and successful Grivory HT1 for the newly designed gear shift module for a 7-gear dual clutch transmission for Audi. This material is characterised by very high stiffness and strength as well as excellent resistance to oils and chemicals. Grivory HT1 maintains its excellent mechanical properties even at high temperatures and outclasses other high-performance materials such as PPS or PEEK. In addition, Grivory HT1 provides very good dimensional stability and a low tendency to warp.

## **Markedly improved properties**

In practical use, the gear shift module is exposed to a complex loadcase. In order to achieve reliable performance and the required tightness, the material used must fulfil high requirements regarding stiffness and creep resistance at high temperatures as well as low shrinkage and warpage. For this reason Grivory HT1VL-50X, a surface-optimised Grivory HT1 with 50 weight percent special, long glass fibre reinforcement, was chosen for the gear shift module. The long glass fibre reinforcement makes it possible to further significantly improve the already excellent property portfolio of the short glass fibre reinforced Grivory HT1 grades.

Grivory HT1VL-50X has higher stiffness and strength values (Fig. 1), increased energy absorption and notched impact strength, a higher heat deflection temperature and strikingly increased creep resistance (fig. 2). In addition, the long glass fibres are more evenly oriented in an injection-moulded component which greatly reduces directional dependency of the material properties. This has an extremely positive influence in particular on the shrinkage behaviour of the material and therefore on warpage of mouldings (fig. 3).

This improved property portfolio is achieved through the characteristic reinforcing effect of long glass fibres. During the injection moulding process these form a tightly-meshed, physical fibre felt network and provide the component with a structural "skeleton" (fig. 4).

## **Comprehensive support**

Along with the principle performance increase through Grivory HT1VL-50X, the EMS-GRIVORY application development department provided comprehensive support during the development of the gear shift module. In the course of extensive simulations taking into account the predominant load case, among other things the gating design was optimised (fig. 5) to achieve optimal filling of the mould and orientation of the fibres as well as reduced shrinkage and warpage of the part. In this way, the basis for optimum functional reliability of the gear shift was already created during the development phase.

Thanks to the perfect combination of high-quality material and comprehensive support, it was possible to successfully realise this application using a high-performance polymer material. The new gear shift module replaces the previously used heavier and more cost-intensive metal solution and in doing so, also helps to reduce weight and CO2 emissions of the vehicle.

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The FTE Automotive gear shift module made of Grivory HT1VL-50X.

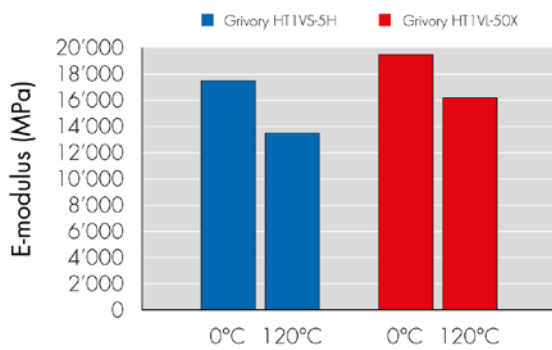


Fig. 1:  
 Grivory HT1VL-50X further increased stiffness and strength values at high temperatures.

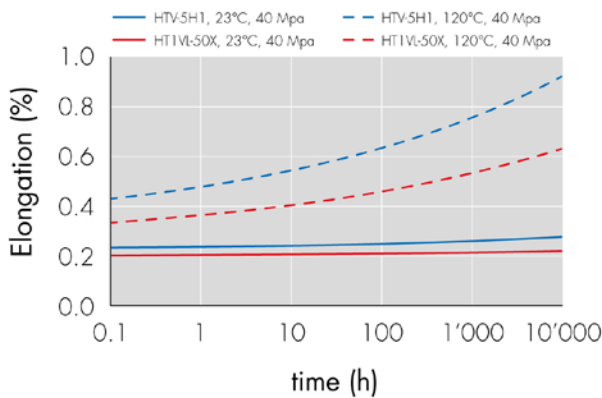
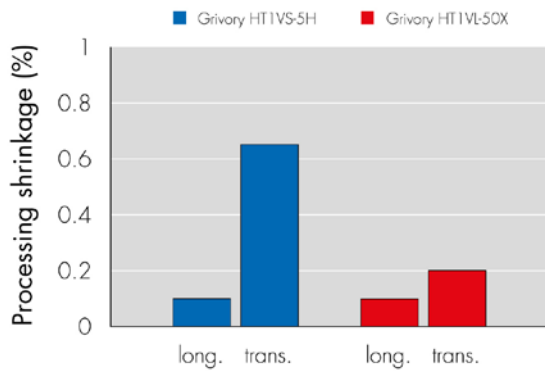


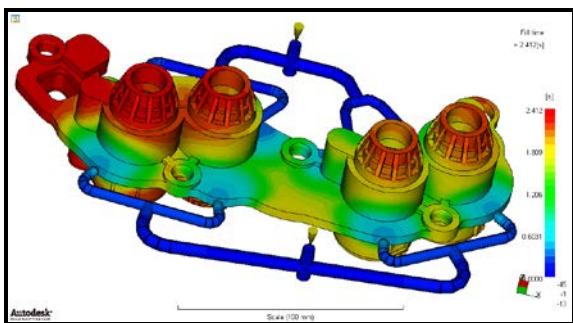
Fig. 2:  
 Creep behaviour of Grivory HT1VL-50X compared to Grivory HTV-5H1 with short glass fibre reinforcement.



**Fig. 3:**  
The significantly reduced shrinkage and warpage of Grivory HT1VL-50X.



**Fig. 4:**  
Pictured left, the ten millimetres long glass fibre granules and the black test part reinforced with long glass fibres. To the right, the fibre felt structure remaining after ashing of the test part at high temperatures.



**Fig. 5:**  
A filling study of the gear shift module.



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