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## **Real time networking for distributed controls of multi-coordinate direct drives**

In the South of Thuringia many companies are developing and producing direct drives since several years. This drives are used in a wide variety of applications. In order to bundle the development activities and to strengthen the market position of the companies in this region of Thuringia the growth core 'VERDIAN' was established in 2006. VERDIAN stands for '**VER**netzte Integrierte Magnetische **DI**rekt**AN**triebe' – 'Networked integrated magnetic direct drives'.

The direct drives have characteristically a high dynamic range and can also achieve high positioning accuracy. However, the drives have to be controlled by very complex hard- and software components, especially for multi-coordinate magnetic direct drives. If a two(2)-coordinate magnetic direct drive is used, a third coordinate have to be controlled too, e. g.  $x$ ,  $y$  and  $\varphi_z$ . The 3<sup>rd</sup> coordinate is necessary because the actuator is only guided with air bearings against an x-y plate and the other degrees of freedom are controlled by magnetic fields.

This direct drives are a good example for for the current needs to realise distributed control mechanism. This control model helps to increase the dynamic and positioning characteristics. It also simplifies the production and service processes. Thereby the cost of ownership can reduce too. But it becomes necessary to have a real time network, which can handle the pieces of control information in a fast, strict deterministic and equidistant mode. The development of the Industrial Ethernet seems to be a solution for these networks. Therefore the presentation will give a general view on Industrial Ethernet and more detail on one representative called EtherCAT (Ethernet for Control Automation Technology). It will be explained why EtherCAT was chosen by the VERDIAN consortium based on the needs for controlling the direct drives.

In a further chapter there will be a more detailed explanation about the upcoming distributed control of the multi-coordinate direct drive PPS200 by the TETRA GmbH. It will be shown how EtherCAT can support the development of the distributed control

model based on the current existing control solution. First results by realising the new control solution will be presented too. Furthermore a forecast about future development steps of the direct drives based on EtherCAT in the VERDIAN consortium will be drawn. This includes conclusions on implementing the distributed control model of direct drives.

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