



**CONTROL
TECHNIQUES**

**SYNERGY:
ADVANCED TECHNOLOGY
MEETS CUTTING EDGE
INNOVATION**

HEINRICH GEORG | TEST RIGS

DRIVE OBSESSED

CONTROL TECHNIQUES VARIABLE SPEED AC DRIVES SUPPORT INNOVATION FROM DYNAMOMETER MANUFACTURERS

In a world where technology is advancing rapidly, companies such as Heinrich Georg (UK) Limited, ensure that newly designed products and applications are not only tested to meet their design criteria, but also pass the durability and failure mode tests, to ensure they operate as the designers intended.

Georg UK is a subsidiary of Heinrich Georg GmbH. The origins of the German parent company were in the entrepreneurial and inventive post-war era. 75 years later, the company continues the tradition of being at the peak of global technological advancement in the coil processing and special machine market, whilst the UK arm is at the forefront of dynamometer innovation and manufacturing. The Wolverhampton based engineering company is one of the UK's leading manufacturers of special purpose machines and test rigs.

Georg UK service research and development facilities in academia, aerospace, rail, and the automotive sectors. They primarily work with universities, research facilities and industrial manufacturing companies. Many of the dynamometer projects they are involved in are so cutting-edge that the applications themselves are highly confidential. Georg UK has chosen Control Techniques drives to provide the foundation for ease of operation and reliability of these highly complex and customised solutions.

Georg UK and Control Techniques have worked together for over 20 years in the coil processing industry. In 2020, Georg UK decided that Control Techniques drives were the perfect mix of specialist expertise, innovative design, and had all the characteristics, features, and reliability to meet the needs of their programmable dynamometers.

Andrew Cheadle, Project Manager at Georg UK explains:



We've always known that Control Techniques drives were a reliable product; then they were recommended to us as the preferred drive by the manufacturers of the high-speed motors that we were using. Control Techniques drives allow us to achieve sufficiently higher switching frequencies for the smooth control of high-performance motors at their elevated operational speeds, whilst also reacting quickly to changes in load, without the need for a gearbox. This gives us an advantage as direct drive solutions are something our competitors can't always achieve.



What is a dynamometer?

A dynamometer is a device used for performance testing motors, engines, or other rotating equipment within a drive train. Typical characteristics measured during testing are torque, rotational speed, and power. Georg UK programmable dynamometers are typically used for characterisation testing of individual electrical machines and/or total system performance testing of electrical machines and their associated drives. As the served markets are moving from combustion engines towards electrically powered solutions, testing regimes are changing, driving a new market for Georg UK programmable dynamometers. Test data such as torque, speed, power, temperature, and vibration is then transmitted to a data acquisition system.

Georg UK programmable dynamometers are classified as 'universal' dynamometers in that they are capable of both driving and being driven (generator/absorber) by the equipment under test. All dynamometers are stringently in-house tested, and by simulating real world conditions and attributes, Georg UK are confident that the machines they deliver will achieve the robust level of testing required by the customer, whilst ensuring strict industry safety standards are adhered to.

AC drives elevate performance of dynamometers

Motors are becoming smaller and faster; Control Techniques are the singular innovator able to supply Georg UK with the drives capable of effectively controlling their advanced applications without the need for a gearbox.

Dynamometers are supplied for the proof, production, and qualification testing of prototype motors. When Georg UK are approached to design a new dynamometer solution, Control Techniques will specify the most effective drive solution for the individual project, determined by the components chosen by the skilled engineers at Georg UK.

Georg UK's Technical Manager, Simon Jones emphasises how the motors that their dynamometers are used on are often expected to run to 30,000 rpm to achieve a full spectrum test of the client developments. The exceptional performance of the Unidrive M700 not only achieves and exceeds this potential, but it is also consolidated with the ability to output 690V AC from a 400V supply, possibly eliminating the need for a step-up transformer and the associated losses of space and energy; plus the ability to use the same power and control modules to deliver a DC source, otherwise known as a battery emulator.





The Unidrive M700 is equally at home acting as an Active Front End (sometimes known as 'regen' or 'grid tie') with voltage boost facility, it has a DC source which can be buck or boost, plus it can act as bi-polar and bi-directional or a motoring/absorbing drive. Current and speed loops are all synchronised with current loop execution in as little as 62.5us, and the switching frequency on the 320 amp modules is up to 16kHz.

Georg UK have engineered advanced solutions with the use of multibank Control Techniques drives of up to 1 Megawatt. The dynamic switching frequency of the M700 reduces the drive size to the extent that smaller panels can be provided to the end user, reducing space wastage and lowering floor space costs for the customer.

The Active Front End capability of M700 provides a bi-directional connection to the grid that is virtually harmonic free and doesn't need any form of dynamic braking resistor or energy dump. The dynamic response of the Active Front End is further enhanced by a feed forward term that is generated by the motoring/absorbing drive to ensure a comprehensive response to a change in load. Gone are the days of DC motor commutator flashover when the mains droop when the drive is trying to regenerate, although care is needed to ensure the uncontrolled open circuit voltage of a PM machine running significantly above base speed can't damage the drive DC link.

Importantly, Control Techniques' variable speed drives integrate seamlessly with Georg UK's PLC based control systems. This is achieved via the inbuilt 2-port Ethernet interface supporting both PROFINET RT and EtherNet/IP protocols. Furthermore, additional ports can be added in any or all 3 undedicated option slots. Other networks such as POWERLINK and EtherCAT are supported along with the usual RS485 based legacy protocols. The Unidrive M700 supports a universal encoder port that can handle up to 2 position feedback devices simultaneously such as EnDat, BiSS, HIPERFACE, Sine-Cosine, SSI, resolvers and incremental encoders. Additional ports can also be added along with I/O and co-processors. Onboard and optional co-processing capability to IEC61131-3 is available along with a Safety Module that interfaces with the drive STO (Safe Torque Off), providing important functions for Safe Speed, Safe Stop, and Safe Direction.

Furthermore, the importance of usability of such a highly advanced product must not be under-played. Daniel Boggild, Control Systems Engineer at Georg UK, explains:

“The drives almost set themselves up, even for the high-performance special motors used by Georg”

Specifying components that are simple to set-up, easy to use, and require minimal maintenance during their lifetime are key in strengthening relationships between Georg UK and their customers. These projects rely upon the results delivered by their dynamometers, and it is therefore imperative that they are easy to operate and ready to perform.

The reliability and proximity of the Control Techniques team of 'drive obsessives', means that Control Techniques are head and shoulders above their competitors. Their network spans the globe, but in the case of Georg UK, the local team are positioned just a 25-minute car journey away. In short, the whole package provided by Control Techniques allows Georg UK to enhance their business reputation and focus on what they specialise in: creating dynamometers. Simon explains:



Control Techniques enhance our business reputation; they give us the confidence to find a solution to any dynamometer enquiry. Every one of our dynamometers has been individual – we haven't made two the same. Our dynamometers stand out from the competition due to their high level of control, speed, and accuracy and this, in part, can be attributed to our use of Control Techniques drives.



Daniel Boggild explains how Georg UK's customers have noted significant energy reduction and thus reduced costs when their machine solutions have been retrofitted with Control Techniques drives:



Using Control Techniques drives means we can achieve higher power without the need for extra space requirements, extra losses in the system, and extra cost. Especially with the price of electricity rising, if we can save 3% running a 110 kW motor, this soon adds up over a short period of time and cost saving benefits can be returned to the customer in less than 12 months.



AC variable speed drives company and dynamometer design partnership is set for the long term

Both Georg UK and Control Techniques have a long entrepreneurial history. Neil Wyke, Managing Director of Georg UK explained how the benefits from the relationship between the two companies continues through initial specification meetings, through to commissioning with customers, and beyond.

“Control Techniques are always our first port of call when we get a new project. We work hand in hand to produce the best solutions for our customers”

Neil mentions that Control Techniques drives have allowed Georg UK to enter new markets and secure new customers. This is due to a business strategy shared by both organisations, fuelled by a fundamental need to innovate and pioneer. Neil points out that the relationship between Control Techniques and Georg UK is more than supplier and customer; it is a partnership.

“We’ve got no doubts when we use Control Techniques drives that we are delivering a first-class solution”

Dynamometers of the future

Looking to the future, the demand for the complex solutions that Georg UK produce is growing rapidly. Dynamometers play a crucial role in the development of more environmentally friendly and renewable energy technologies, and Control Techniques will continue to support Georg UK in their future endeavours.

With synergistic successes in mind, Control Techniques will persist in providing drives that exceed expectations, not only in technology, but in customer service, reliability, and precision.

