

Highly-precise, repeatable measurement  
with TwinCAT automation software

## Wheel gauging systems are the measure of success

The flawless rotation of a wheel is the most fundamental requirement for safe and comfortable travel. Wheel gauging systems serve to guarantee this requirement. They measure the geometrical features of the wheel, such as radial and axial runout, circumference, width, center hole diameter and its centricity. Some dimensions can be measured directly, while others can only be derived from a combination of measured dimensions. Wheel gauging systems have to operate with utmost precision and be accurately reproducible and highly productive.

IEF Werner has met this challenge with fully automatic wheel and rim gauging machines of various types. They have been successfully implemented in full-scale production in the automotive industry for over 20 years. The modular construction of the mechanics, electronics and control software in particular permit a system that can be configured easily according to precise customer needs. Important functions such as recording dimensions and calculation as well as the display of measurement results are likewise provided on an individual basis.

### Wheel gauging machine R2010

The modular construction of the R2010 wheel gauging machine for car and truck wheels integrates the latest advances from the fields of information technology, optics, laser technology and micro technology. The basic frame of the wheel gauging machine, a torsion-resistant machine body made from thermally and vibration-resistant polymer concrete, creates the basis for high-precision measuring. The rotating and clamping unit, being the support for the wheels or rims, is the reference point for all measurements. The wheel gauging machine can be equipped with up to three measuring stations each with two measuring heads. Each measuring head contains up to three freely programmable axes. Linear drives combined with innovative drive technology operate the measuring heads with precision and accurate repeatability.

### Precise and highly accurate measuring sequences

IEF Werner chose PC-based control technology from Beckhoff to control the complex measuring sequences. Harald Lorenz, IEF product manager for wheel gauging systems, stresses: "We selected the Beckhoff system because it offered us the best option for integrating the sequential control for a machine with the complex functions of technically/scientifically applied software in one computer, without loss of performance. This was confirmed on a prototype on which we were even able to increase the performance in relation to cycle times, visual representation of complex sequences and network connections." The core of the control system is the control cabinet Industrial PC C6350 with the operating system Windows XP

→ Thanks to leading edge control technology from Beckhoff, wheel gauging systems made by IEF Werner GmbH are able to record the geometrical features of wheels of every kind (cars, trucks, tractors) with high precision in an exactly reproducible way. Even dimensions with minimal tolerances can be measured precisely and reliably. As a result, IEF Werner wheel gauging systems can fulfill the demanding requirements of the automotive industry.

PC-based control system for wheel gauging machine R2010 made by IEF Werner GmbH



multi-lingual and the software platform, TwinCAT NC PTP. Here the current measuring head positions are analyzed and target specifications for controlling the linear drives calculated. The basis for this is the integrated Setting Master. It has known geometrical dimensions and is stored as an actual value file in the C6350. The target specifications are relayed to the linear drives via PROFIBUS. The connection to PROFIBUS takes place via the FC3102 PCI Fieldbus Card. Incremental encoders record the actual position of the measuring heads. Measurement data are transferred quickly and securely to the PC via Lightbus with the FC2001 Fieldbus Card.

Beckhoff Bus Terminals are used as the I/O system. The KL3132 2-channel analog input terminal is used here because it is optimized for high-precision control processes as required for measuring wheels with a measuring error of  $\pm 0.05\%$  (in relation to the full scale value).

**PC-based control technology – a production series recipe for success**

According to Harald Lorenz, the highlights of the control technology are "high performance integration potential, simple operation and modularity. The hardware components and the TwinCAT NC PTP control platform are optimally adapted to one another and to the application for axis control." This allows

- | full achievement of the high grade measuring required by the wheel gauging machine and
- | evaluation speeds of less than 1 ms, enabling the wheel gauging machine to achieve optimized productivity.

A particular advantage for Harald Lorenz is the fact that the PC-based control solution eliminates multiple hardware PLC units and provides interfaces to all common fieldbuses. "The components, based on different bus systems, can be integrated into the system easily," explains Harald Lorenz. Moreover, the use of Windows XP as the operating system enables the integration of additional Windows-based applications, such as the measuring program used by IEF Werner – on one user interface. Operation and maintenance of the system is simplified by standardized and user-specific, graphic Windows user interfaces. "The operator and maintenance engineer benefit from this in particular," according to Lorenz, "because the functions which are of relevance to them are available in a user-friendly form. The option of accessing the machine via the Internet also assists remote system diagnostics and maintenance."

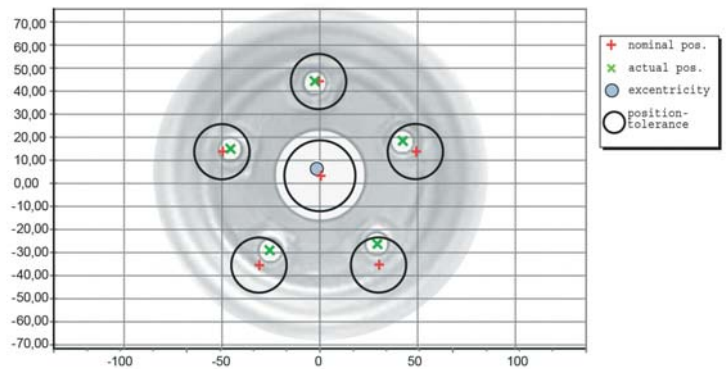
The TwinCAT NC PTP control software with its modular structure is especially successful for use with configurable systems. "This allows different drives to be integrated in a modular way using identical driver interfaces, for example," explains Harald Lorenz. "The driver is developed once, instantiated several times and specifically adapted depending on the application. This leads to a reduction in development and commissioning times."

→ IEF Werner [www.ief-werner.de](http://www.ief-werner.de)



The wheel gauging machine R2010 for car wheels operates quickly, precisely and with accurate reproducibility thanks to leading edge PC-based control technology.

The PC-based control system enables the integration of additional Windows-based applications e.g. special measuring software. The measuring software visualizes the comparison between the measured and target dimensions, in a bolt hole positioning diagram, for example.



bolthole positions

Technical data	
Layout (minimum):	1 m x 2 m
Wheel dimensions (standard machine)	
Diameter	13" to 22"
Rim width	3.5" to 12"
IPC:	Industrial PC C6350, Windows XP, TwinCAT NC PTP control platform

