

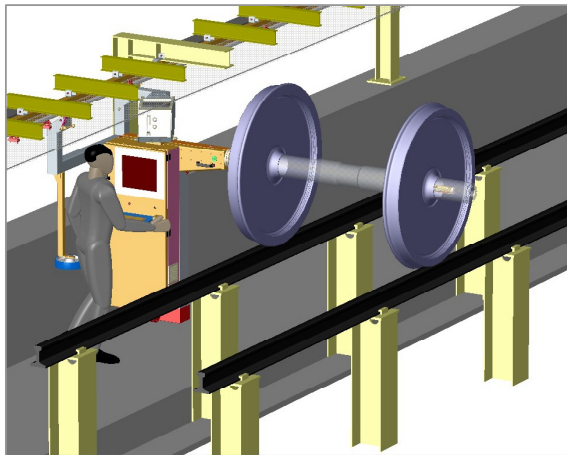
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## ULTRASONIC HOLLOW SHAFT TESTING SYSTEM

### ULTRADŹWIĘKOWY SYSTEM TESTOWANIA WAŁÓW

#### Mobile Ultrasonic Hollow Shaft Testing System

The GMH PRÜFTECHNIK product range of measuring and testing systems for railway vehicles has been extended by the subsequently introduced Ultrasonic Hollow Shaft Testing System.



The Testing System has been designed to check the wheel axles (hollow shafts) of railway vehicles with different hole diameters in an automated way. The picture on the right shows the testing system of the Oesterreichische Bundesbahn ÖBB (Austrian Railway) version. Here it is used for inspecting the axle shafts of the railway vehicles (type series) 1016/1116 and 1044. Special requirements regarding space, mobility and coupling to the wheel-axle demanded novel techniques for the feed of the probes and for coupling the testing system to the axle. Conventional coupling techniques have been unsuitable up to now due to the axle's little excess length overlapping the bearing journal. We also developed a system which meets the requirements regarding space and the technical specifications of an ultrasonic testing system at the same time.

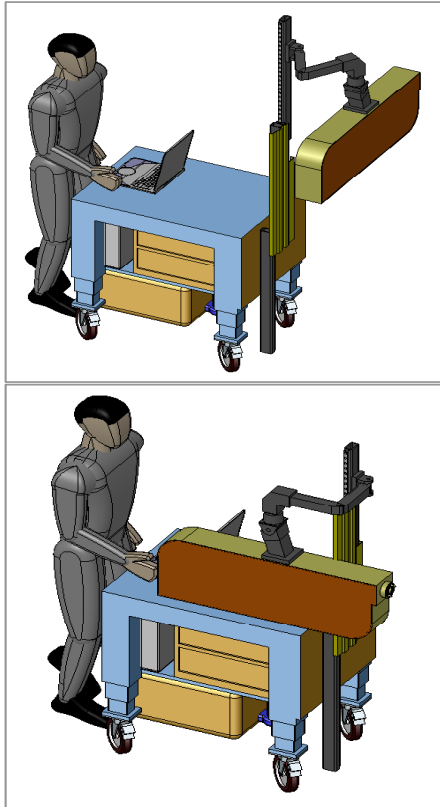
The testing system as shown in the picture on the left meets the requirements mentioned above and can also be adapted by us in broad

fields to other customer-specific environmental requirements.



The complete testing system of this version fits into a movable workstation which can be moved manually alongside the train to the axle while hanging on a guidance rail. Thanks to its compact design there is enough clearance to easily pass the mounted system during testing. The workstation contains all necessary devices and mediums, so no cables or additional equipment have to be moved separately. Power and compressed air is supplied by a cable drag chain mounted to the guidance rail. After completion of the testing the system can be pivoted by 90 degrees, thus consuming only little space next to the rails.

The following two pictures show another option model of the testing system. In this version the complete testing system including the feed unit and the attached probe holder is combined in a freely movable workstation. This allows an even more flexible usage in the workshop as the unit can be moved to the wheelset and used nearly everywhere in the railway workshop.



The application area introduced in this section is only a small part of the possible application areas. With this testing system the user has a flexible and universally applicable testing system at his disposal which can be used in nearly all fields of hollow shaft testing and in all areas of the railway workshop. Should it make sense or become necessary to adjust the testing system due to on-site conditions or special requirements on the part of the customer, this can completely be carried out by the GMH Prüftechnik company having profound knowledge of the development process.

### Technical Data

#### Mechanical

Testable axle bores	30mm...110mm (with different adapters)
Coupling to the axle	Vacuum flange (optionally magnetic)
Feed	Shear chain drive
Testing length	max. 2400mm
Action area	Solidly mounted or freely movable workstation
Dimensions (W x H x D)	1.55m x 2.35m x 0.5m (WxHxD) (fixed workstation)

	1.3m x 1.1m x 1.6m (LxWxH) (movable workstation)
Weight	approx. 200 kg (100 Kg for HHPA compact)
Protection class	IP 54
Sound level	max. 80 dB(A) (vacuum pump switched on)
Ambient air temperature	10...30°C
Coupling medium	Oil (closed oil-circulation system)

#### Electrical

Power connection	230V / 50 HZ
Power consumption	max. 400W
Safety equipment	Emergency stop with safety relays
Regulations	CE, EMI, individual international regulations

#### Testing System

	Fully digital multi-channel ultrasonic testing device, compact construction.
Ultrasonic channels	8
Probes	7 from 50mm bore (each 2x45°/70° forward, 2x45°/70° backward, 2x60° circumferential cw/ccw and 0° I/E)
Probe frequency	5 MHz
Sample rate	100 MHz
Resolution	12 bit
Testing duration	approx. 25 min.
Rotation velocity	30 rpm (revolutions per minute)
Testing grid	4mm (adjustable down to 1mm)
Flaw location	Axial and circumferential flaws
Reference notch	5 x 1 mm

#### Hollow Shaft Inspection HWP-PD 2700/30-90



## Brief Description

The GMH PRÜFTECHNIK enhanced the product family of measurement and testing machines for railway systems with this new hollow shaft testing system.

The testing system is designed to realize a fully automated test of wheel axles used for very different trains with very different bore diameters. This testing system fulfills for the first time the very high requirements of a “zero testing” (the first testing of a wheel axle) in production. Three areas of the axle can be tested simultaneously: the surface, the volume and, for the first time in this type of testing, the surface of the bore. For the surface and the volume we use ultrasonic, whereas for the surface of the bore an eddy current system will be used.

This innovative combination of two testing technologies in one wheel axle testing system combined with a high efficient software solution defines a new dimension in resolution, analysis security and flexibility for testing these products during production.

## Technical Specifications

- Fully-automated evaluation of testing results
- Short testing periods
- Efficient handling software
- Display of test results in A-, B-, and C-Scan
- Flexible adaptability to client specifications
- Adaptable to customers' demands

## Ultrasonic/Eddycurrent

- 12-channel UT testing system
- 2-channel ET testing system
- Probe frequency 1...20 MHz (bandwidth up to 30 MHz)
- Adjustable dynamic 96 dB
- Sampling rate up to 100/200Ms/s with 12 bit amplitude dynamic
- High signal-to-noise ratio
- DAC (distance amplitude correction) with graphical display of curve
- HELIX Scan for fast and precise testing
- Fully integrated PC-based user interface
- Standard operating system „Windows XP/Windows 7“
- Test results are displayed on a 22“ TFT monitor

- Different user levels are individually secured by passwords

## Automation and Dimension

- Rotating ring with frame and adjustable machine feet
  - Precise positioning system for height adjustment of the lance
  - Precise fixing positions for angle adjusting to the testing axle
  - Precise guidance of the probes in the bore
  - Motor driven height adjusting of the lance
- |                 |                |
|-----------------|----------------|
| Bore dimensions | 30...90(110)mm |
| Wheel length    | 1500...2700mm  |
- Repeat accuracy of probe position  $\pm 0,5$ mm
  - Resolution  $\pm 0,1$ mm min.
  - Testing speed (typ.) 20 min/axle
  - Dimensions  
ca. 4000 x 1500 x 1800 cm<sup>3</sup> (L\*W\*H)

## Software

- Efficient handling- and evaluation software
- Evaluation of individual probes
- Manual insertion of test and probe data
- Well arranged layout of important information
- Various graphical displays as
  - A- Scan for every channel (switchable for two channel system)
  - B- Scan (B-scope presentation of probe)
  - C- Scan (amplitude C-Scan) or (runtime C-Scan)
- 2D and 3D evaluation
  - Freely adjustable evaluation aperture (also changeable subsequently)
  - Various evaluation algorithms
  - Powerful zoom functions
  - Direct positioning of testing results in C-Scan
  - Efficient report generator with different export functions
  - Data saving with CD/DVD – drive
  - Network connection for integration into company network
  - Remote maintenance via ISDN or network
  - Offline analysis functions

## Control

- Fully-integrated PC-based control and drive system
- Automatic control of testing process
- High precision servo drive with extremely low disturbances

- High safety standard

## Contact

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"We also producing great Ultrasonic testing machines for great turbine shafts and great rings for generators. In this machines we can test shafts up to 6 meters of length and up to 50 tons of weight. For this kind of machines we only use the newest Ultrasonic technology as Phased array and conventional UT Technology System. Additional we design the complete Software and all the necessary algorithm for processing the datas completely by us. So you have always the a very competent partner and you could be sure to do the best for your investment."

