

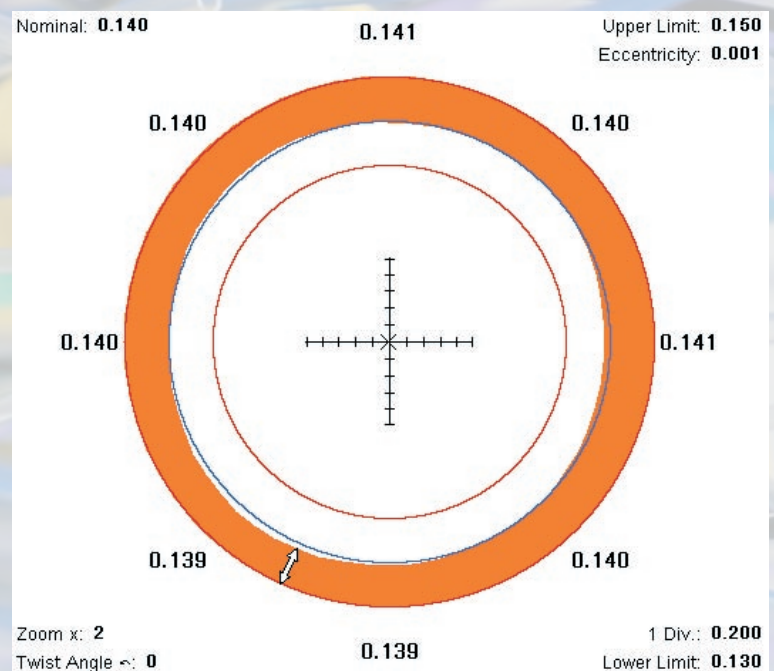
WALLMASTER

ID / OD / WALL

Measuring and Control Systems for Plastic Tubing

Product Line

- Medical
- Automotive
- Sanitary/Heating
- All Plastics and Rubber



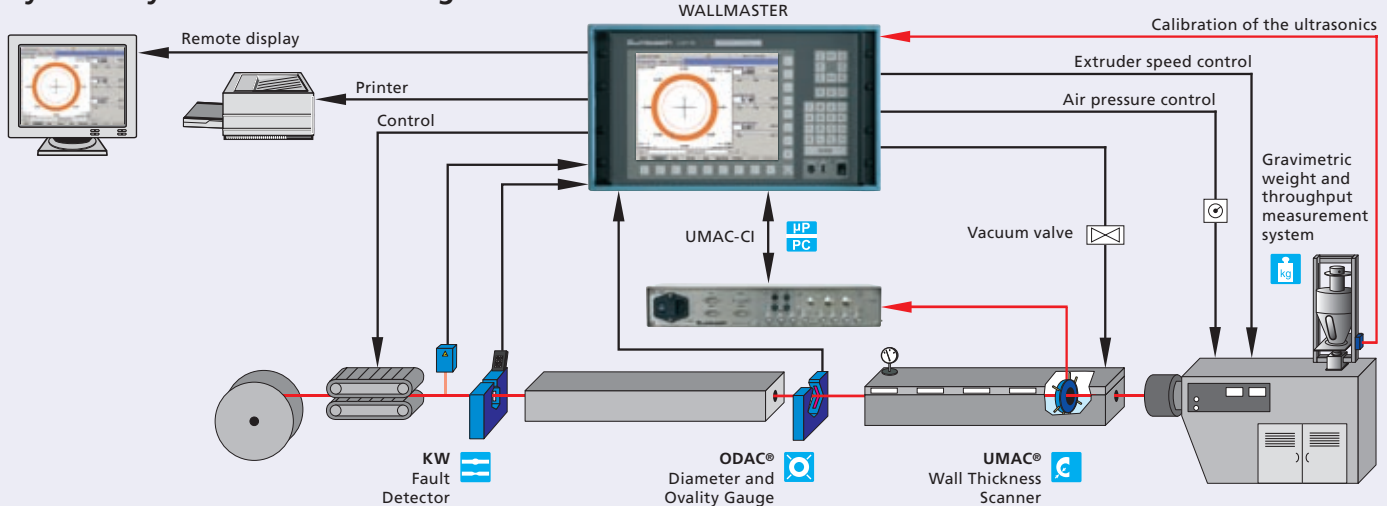
For You:

- On-Line Measuring and Control Solutions
- Benefits:
 - Improved Product Quality and Process Stability
 - Support Pressure Control
 - Improved Quality Assurance & Product or Process Validation
 - Application Specifications and Capabilities
- Data Acquisition, Processing and Display
- The Measuring Instruments
 - UMAC® – Ultrasonic Wall Thickness Scanners
 - ODAC® – Diameter and Ovality Measuring Gauges
- Worldwide Pre and Post Sales and Service Support

On-Line Measuring and Control Solutions

The demands for improved product quality and reporting on today's plastic tubing manufacturers continues to escalate so that measuring and control systems are becoming increasingly necessary. Fortunately, the **UMAC® WALLMASTER** systems from Zumbach deliver the performance and capability to enable tubing manufacturers to exceed their industry quality requirements, while offering a process tool to improve their production control.

System Layout for Plastic Tubing



- Hot end mounting for ultrasonic head for both vacuum and free-extrusion
- Broad line of **ODAC®** scanners for reliable outer diameter measurement of clear and opaque products
- Two selectable control parameters (choose from extruder, line speed, vacuum or support pressure)
- On-board data reporting for both local printouts and plant networking (optional **USYS Data Log** function)
- Internet direct access (optional **Web** enabled function)

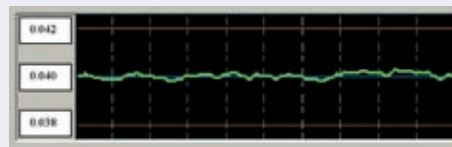
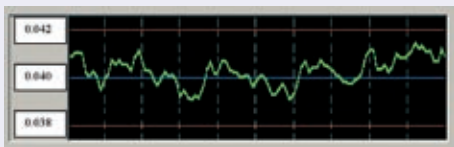
Common Benefits from using WALLMASTER:

- Rapid die centering and production set-up
- Improved product quality and process stability
- Complete product and quality traceability
- Reduced set-up time and scrap
- Improved product and process validation capability

Improved Product Quality and Process Stability

The **WALLMASTER** offers reliable and effective control to reduce process instability and to improve process capability (CP and CPK). The proven **Sigma Expert** self-tuning controller adapts the response and sensitivity of the control to the behavior of the process, thus optimizing the control for each extrusion line.

Typical cyclical variation



Reduced variation with rapid response and **Sigma Expert** self-tuning control

Support Pressure Control

Sizeable diameter variations can be caused by the slightest pressure change during the extrusion of thin-walled products, such as medical hoses, where supporting air at a very low pressure is often used. Where an **ODAC®** laser diameter measuring head and **USYS** processor are used to continuously measure and control the extruded tube or hose, the possibility exists to automatically keep the diameter within tolerance by using the support pressure.

Zumbach offers different valves and controllers, capable to control precisely even slightest pressure variations with the necessary dynamic:

Micro pressure controller MPG 150

For controllable outlet pressures between 0.5 up to 150 mbar



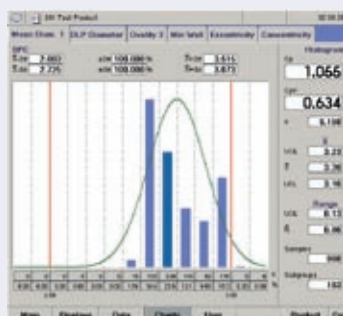
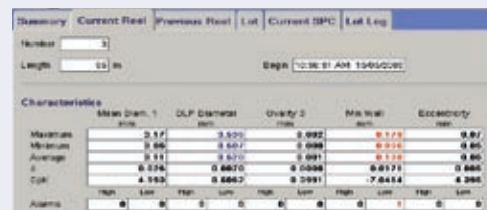
Electronic servo valves PS 11130

The nominal pressure can be preset using a potentiometer for outlet pressure ranges up to 0.2 or 2 or 8 bar.

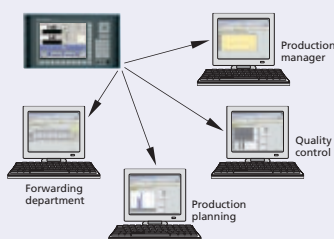


Improved Quality Assurance & Product or Process Validation

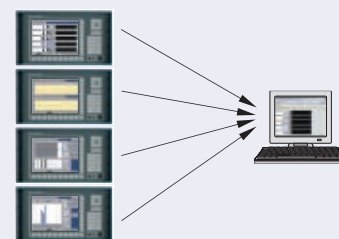
For medical and other tight tolerance tubing manufacturers new product developments require that the product and process is validated prior to official release to production. It is vital to establish process conditions that will yield product results that are within the established specifications of the newly developed product. The on-board statistics and data collection prove useful to gather data for validating process parameters and product specifications can be met. The data can be printed locally, saved to a USB storage device, and/or saved on the plant network system via our **USYS Data Log** software package.



The statistical graphs can be viewed on the local workstation or viewed through the local network by utilizing the **USYS Web Server**.



The **USYS Web Server** will allow multiple users to access the USYS screens on the plant floor by simply using the web browser on a PC.



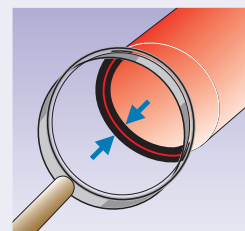
For example

- Process engineer can view the SPC charts
- Production manager can view the real time trends
- Quality control can view the reel reports

Application Specifications and Capabilities

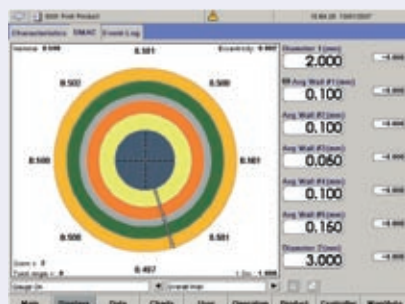
Thin Wall Measurement

- Wall measurement down to 0.01 mm (depending upon materials)
- Thin wall measurements possible with 20 Megahertz (MHz) transducers using proprietary **UTM** (Ultra-Thin Mode)



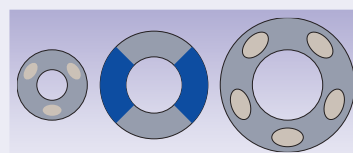
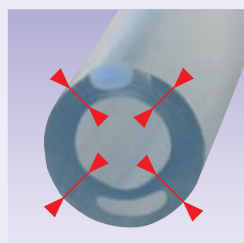
Multi-Layer Measurement

- Up to 8 layers



Special Products

- Singlelumen (catheters etc.)
- Multilumen tubing
- Striped tubing



Data Acquisition, Processing and Display

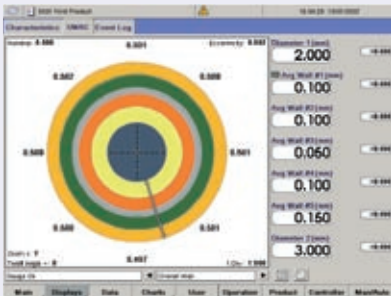
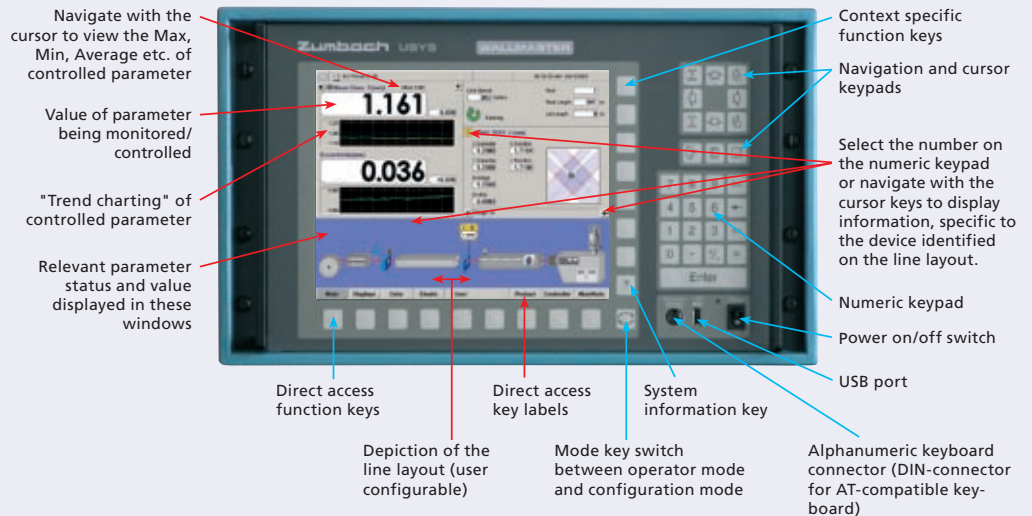
USYS 8100 WALLMASTER

Robust industrial data acquisition, processing and display unit. The **USYS 8100 WALLMASTER** offers a complete hardware solution in one package. It is offered with a touch screen or non-touch screen version with built in

keypads, keyboard input, and USB ports (front and rear).

Complete with Ethernet connection, RS-232/422, and parallel printer port.

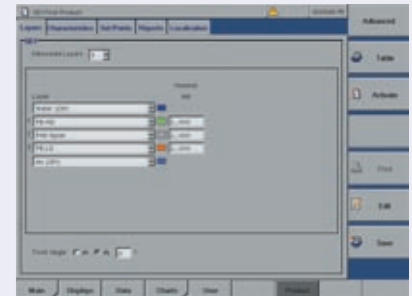
Various I/O modules are available for alarming, control, process analog inputs, and analog outputs.



Multi-layer cross section display



Bar display of wall thickness values



Simplified layer definition

UMAC® CI

Advanced Signal Processing

The Zumbach **UMAC® CI** also includes advanced signal processing capabilities for use when measuring more complex products:

For specific applications, a high speed measurement mode (**SHR = Super High Rate**) may be employed sampling a product at a rate of 15'000 measurements per second.



For very thin wall tubing, the **Ultra-Thin Mode (UTM)** can be used to measure wall thickness down to 0.01 mm (depending upon material). On thin wall tubing, one can not always depend on a clean separation between echoes. Rather than increasing the transducer frequency and being forced to deal with considerably weaker signals, shorter focal distance and increased sensitivity to product position, the **UTM** uses advanced mathematical models to determine the proper position for each echo, providing accurate measurements, even when the echoes overlap.

For best signal-to-noise ratio and increased resolution the digital signal processor (DSP) uses our unique **Echo Optimization Mode (EOM)** algorithm to minimize the effect of noise and enhance the shape of the echo wave form, thus providing an optimal signal for accurate and highly repeatable measurements. This mode is especially useful in applications where the echoes are weak and/or where environmental conditions, such as air or particulate matter in the water or compound, result in noise in the echo signal.

Operator Friendly and Robust Software



Hard and robust software by utilizing an embedded operating system. We run our software from a flash disk to eliminate hard drives which fail in an industrial environment.

We also have full control over the system resources to prevent crashes often seen in other operating systems.

Solid State Flash Disk

Zumbach SmartWall®

Zumbach ultrasonic wall thickness measurement utilizes the intelligent **SmartWall®** algorithm to dynamically analyze, configure and optimize all signal parameters during the set-up of each production run taking the guess work away from the operator.

Advantages

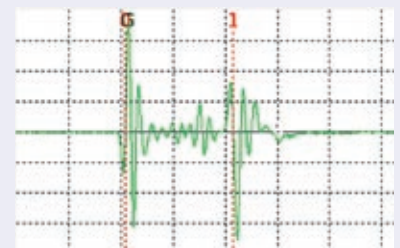
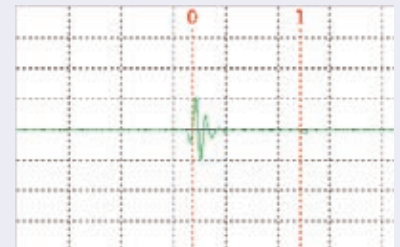
- Fully automatic signal optimization setting all key parameters to insure reliable ultrasonic wall thickness measurement.
- Advanced real time digital signal processing (DSP) and flexible trigger functions for best possible resolution and repeatability.
- True echo wave signal processing minimizes the effect of echo shape on accuracy.
- Dynamic signal analysis continuously monitors the quality of the signals being processed.

Operation

The system analyzes the raw echo trace to find and evaluate each echo position and polarity.

The velocity of sound in the material is calculated from the time between the echoes and the nominal wall thickness specification. The result is an approximate calibration of the measurements.

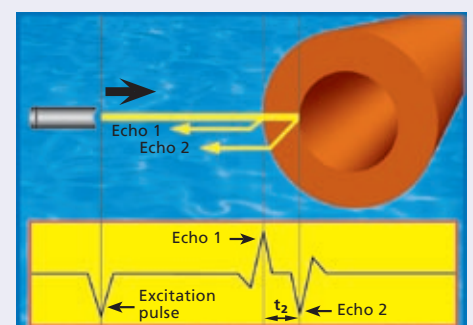
The signal gain is automatically determined for maximum accuracy and repeatability.



Ultrasonic Measurement Principle

It is based on the "Pulse-Echo" principle. A piezoelectric crystal is excited by a short electrical pulse. The crystal converts electrical energy into mechanical energy, i.e. sound waves. When the sound waves encounter a difference in the propagation medium (for instance when passing from water to a synthetic material), a part of them is reflected to the crystal (echo).

$$\text{Wall thickness} = \text{Sound velocity of material} \times t_2 \times \frac{1}{2}$$



The Measuring Instruments

UMAC® – Ultrasonic Wall Thickness Scanners

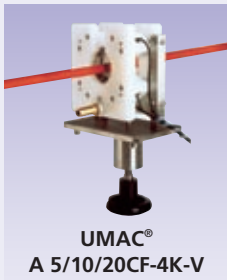
UMAC® scanners measure the wall thickness at multiple points of the product.

Numerous scanner models are available for specific products such as tubing, pipe, flexible hose, cable and more. The measured data is sent e.g. to the sophisticated **WALLMASTER** processor which displays easy-to-understand information of product geometry and thickness values.



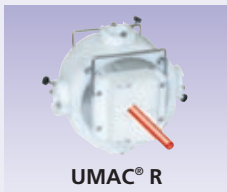
UMAC® A5CF-4K-K

K version for standard water trough (free extrusion) with the height adjustment from the top.



UMAC®
A 5/10/20CF-4K-V

V version for inside vacuum mount with height adjustment from the bottom.



UMAC® R

UMAC® R
Ring-shaped measuring chamber with two pairs of precision sliding guides, opening up automatically; each diameter requires 1 set of guides.



UMAC® Z50/Z100

Adjustable transducer position control for symmetrical movement for different product sizes; provides a large measuring range.

Model	No. of measuring points	Diameter range mm
UMAC A5CF-4K	4	0.2 ... 5
UMAC A10CF-4K	4	1.0 ... 10
UMAC A20CF-4k	4	6.4 ... 20
UMAC R40-4K	4	1.5 ... 40
UMAC R40-6K	6	1.5 ... 40
UMAC R63-4K	4	2 ... 63
UMAC R63-6K	6	2 ... 63
UMAC R63-8K2	8	2 ... 63
UMAC R63-8K	8	20 ... 63
UMAC Z50-4K	4	5 ... 50
UMAC Z50-6K	6	5 ... 50
UMAC Z100-4K ¹⁾	4	10 ... 100
UMAC Z100-6K ¹⁾	6	10 ... 100

¹⁾ UMAC Z scanners for bigger diameters or customer specific solutions upon request.

Accessories



F Version

Additional water basin for the accommodation of the scanner (with or without H version).

H Version

For UMAC R and Z scanners. Comprises holder with scanner for direct mounting into existing cooling trough or water basin of the F versions.



Typical UMAC® Scanners Installations



Ultrasonic Diameter Measurement

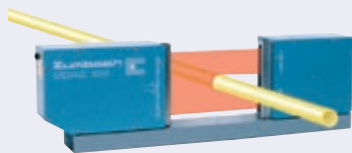
For large tubing, the Zumbach ultrasonic system will utilize the transducers to measure the outside and inside diameters. For systems with four transducers, a two-axis measurement is provided. For systems with eight transducers, a four-axis measurement is provided.

ODAC® – Diameter and Ovality Measuring Gauges

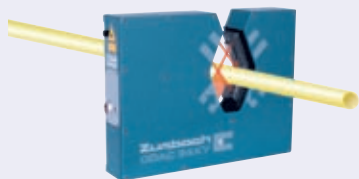
The Zumbach **WALLMASTER** system also offers outside and inside diameter measurement and control by varying the level of vacuum. Depending upon the size of the pipe and the accuracy required, we have two methods for measuring the outside diameter: with **UMAC®** ultrasonic scanners or **ODAC®** laser scanners. In both cases, the inside diameter is calculated by aligning the wall measurements with the diameter measurements.

Laser Diameter Measuring Gauges

1-, 2- or 3-axis measurement



1-axis	
Measuring field	2 ... 310 mm
Min. product diameter	0.012 ... 1 mm
Repeatability	± 0.15 ... ± 2 µm
Scanning frequency	240 ... 1000/s (option 2000/s)



2-axis	
Measuring field	3 x 3 ... 150 x 150 mm
Min. product diameter	0.015 ... 0.5 mm
Repeatability	± 0.1 ... ± 0.7 µm
Scanning frequency	2 x 200 ... 2 x 1200/s

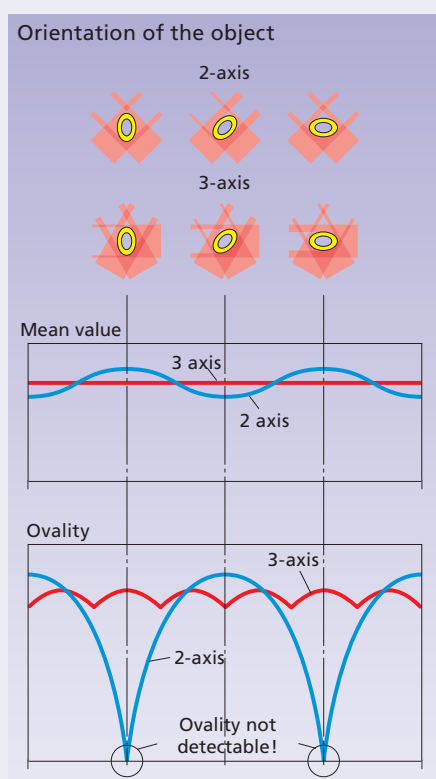


3-axis (ODAC TRIO)	
Measuring field	3 x 34 ... 3 x 64 mm
Min. product diameter	0.15 ... 0.25 mm
Repeatability	± 0.1 ... ± 0.3 µm
Scanning frequency	3 x 600/s

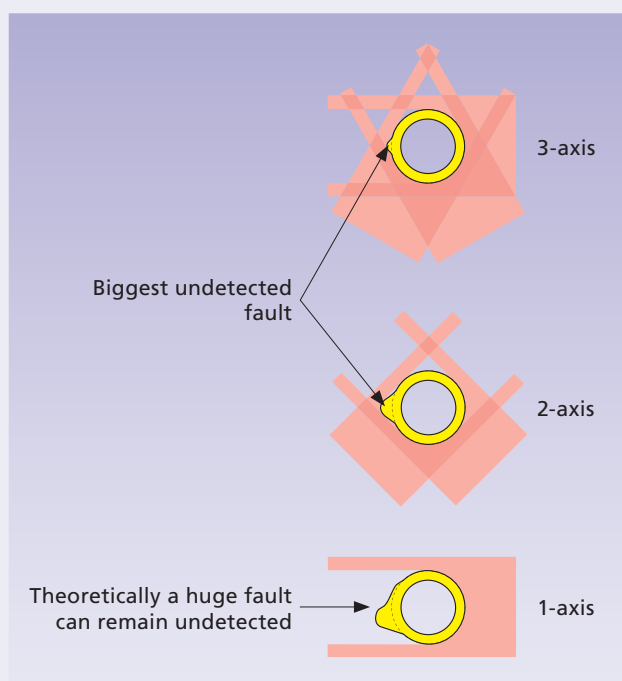
3-Axis Measurement

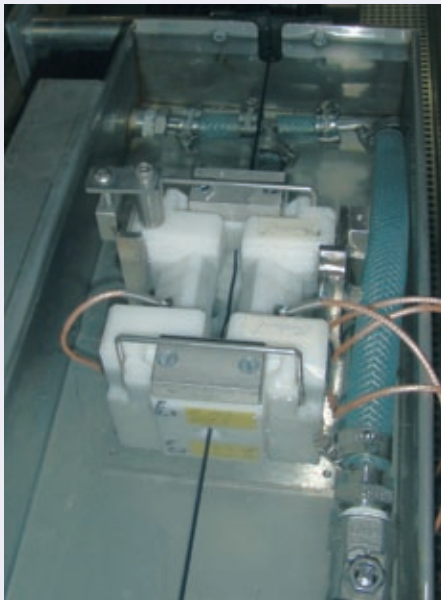
3-axis measurement is the perfect solution for accurately measuring the ovality of the pipe. This is very important when considering the connector requirements for pipes such as PEX and CPVC.

Comparison of 3- and 2-axis measurement:



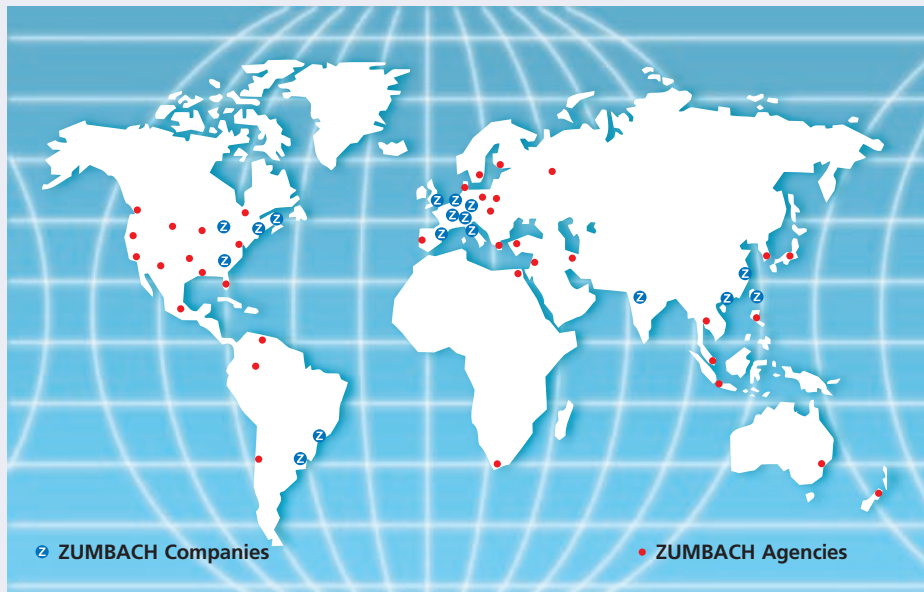
By using a 3-axis arrangement the ability to detect faults in the pipe is vastly improved.





- Why Choose ZUMBACH?**
- Over 20 years of Ultrasonic Measuring System Experience
 - Over 60.000 ODAC Laser Scanners sold Worldwide
 - High Precision, robust Systems
 - Global Presence in 13 Company-Owned Subsidiaries
 - Vast line of products to support future needs

Worldwide Pre and Post Sales and Service Support



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