

THE **3DS-SHAPER** SERIES

HiR - ULTRA-PRECISE 3D LASER PROFILOMETRY

WeldAn

Weld Shaper

Base Model Weldan 245

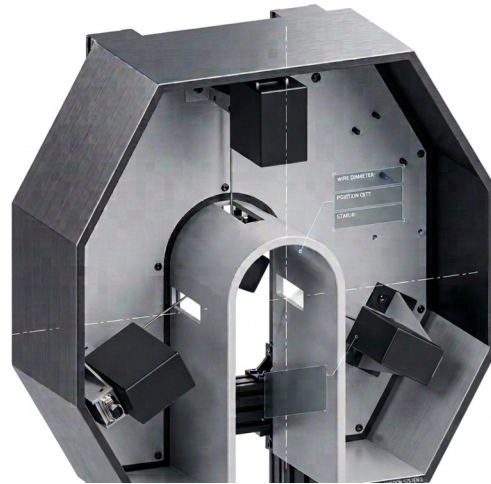
The WD is based on wide arrays of 2D Laser Profilometers, suitable to cover pipes and profiles welding areas of various dimensions.

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Guiding Principle

To ensure dimensional compatibility, accuracy, and budget alignment, the starting point is the user's **minimum acceptable requirement**. The objective is to avoid over-dimensioning the system while meeting all functional requirements.



Installation Preference

Systems are preferably installed at the **end of the production line**, where the part is guided and before the cutting stage. This allows reconstruction of:

- Cross-section profile
- Longitudinal profile along the length (capturing **straightness**, often critical for long products)

WeldAn (WD) Series – Dedicated Weld Inspection Sensors

Overview

The **WeldAn (WD)** series represents a family of dedicated, high-precision weld inspection sensors designed specifically for **external weld seam geometry analysis**. Unlike the 3DShaper (3DS) models, which provide full 360° section reconstruction, the WeldAn series focuses exclusively on the weld area—delivering superior accuracy and resolution in the Y (width) and Z (depth) axes where it matters most.

The WeldAn sensors operate as **mobile heads**, automatically positioned via a linear slide according to the diameter measured by the static shape sensors. This ensures the sensor always operates at its **optimal working distance (RD)**, delivering consistent, high-accuracy measurements regardless of pipe size or profile shape.

Key Principle

Aspect	3DShaper (3DS)	WeldAn (WD)
Function	Full 360° section reconstruction	Dedicated weld area inspection
Coverage	Complete cross-section	Weld seam only
Accuracy	Standard (system-level)	3–5× more accurate
Working Distance	Static – varies with pipe size	Mobile – always optimal
Resolution Y/Z	Varies with distance	Consistently high

The WeldAn is **not** a 360° system—it is a **targeted, high-resolution weld inspection tool** that complements the 3DShaper platform.

Model Range

WD-20

Parameter	Value
Reference Distance (RD)	20 mm
Blade Width (at RD)	7 mm
Sensor Accuracy	0.15 microns
System Accuracy	1.5 microns (×10)

Best for: Ultra-small diameter pipes, micro-weld inspection, precision tube applications.

WD-30

Parameter	Value
Reference Distance (RD)	30 mm
Blade Width (at RD)	15 mm
Sensor Accuracy	0.3 microns
System Accuracy	3 microns (×10)

Best for: Small diameter pipes, fine weld seam analysis, high-precision tubing.

WD-60

Parameter	Value
Reference Distance (RD)	64 mm
Blade Width (at RD)	15 mm
Sensor Accuracy	0.4 microns
System Accuracy	4 microns (×10)

Best for: Medium-small pipes, general weld inspection, standard tube production.

WD-80

Parameter	Value
Reference Distance (RD)	73 mm
Blade Width (at RD)	35 mm
Sensor Accuracy	0.5 microns
System Accuracy	5 microns (×10)

Best for: Medium pipes, wider weld seams, enhanced weld geometry analysis.

WD-245

Parameter	Value
Reference Distance (RD)	245 mm
Blade Width (at RD)	72 mm
Sensor Accuracy	1 micron
System Accuracy	10 microns (×10)

Best for: Large diameter pipes (up to 400 mm OD), standard weld inspection, high-speed lines.

Summary Table

Model	RD (mm)	Blade Width at RD (mm)	Sensor Accuracy	System Accuracy (×10)
WD-20	20	7	0.15 µm	1.5 µm
WD-30	30	15	0.3 µm	3 µm
WD-60	64	15	0.4 µm	4 µm
WD-80	73	35	0.5 µm	5 µm
WD-245	245	72	1 µm	10 µm

Why WeldAn?

1. Superior Weld Area Accuracy

The WeldAn series delivers **3–5× better accuracy** than standard 3DShaper static heads in the Y (width) and Z (depth) axes. This is critical for detecting:

- Weld seam depression
- Convexity / concavity
- External weld seam geometry
- Fine surface defects

2. Always at Optimal Working Distance

The mobile head is automatically positioned via a linear slide, descending according to the diameter measured by the other static heads. This means:

- No variation in resolution** due to pipe size
- Consistent blade width** at the weld area
- Optimal laser intensity** and focus

3. Targeted Inspection

The WeldAn does not attempt to cover the full 360° section. Instead, it focuses **100% of its capability on the weld seam**, providing:

- Higher point density in the weld area
- Better signal-to-noise ratio
- More reliable defect detection

4. Cost-Effective Enhancement

Adding a single WeldAn mobile head to a standard 3DShaper configuration adds **20–25%** to the overall architecture cost—a modest premium for significantly enhanced weld inspection capability.

Typical Configurations with embedded WD on 3DS Shaper

Configuration	Description	Best For
3DS-380-4 + WD-245	4 static + 1 mobile WD-245	Standard Shape inspection Enhanced weld inspection, large pipes
3DS-380-4 + WD-80	4 static + 1 mobile WD-80	Standard Shape inspection Enhanced weld inspection, medium pipes
3DS-380-4 + WD-60	4 static + 1 mobile WD-60	Standard Shape inspection Enhanced weld inspection, small-medium pipes
3DS-380-4 + WD-20	4 static + 1 mobile WD-20	Ultra-high-precision weld inspection, micro pipes

Environmental & Operational Considerations

Aspect	Detail
Product Temperature	No issue up to 250°C; changes begin at 250°C; max 1000°C
Frame Thermal Management	Peltier cells (standard Rittal top-mounted thermoelectric cooler)
Temperature Drift	0.0315 mm/°C
Surface Oil	Air-spray required; oil drops seen as part of pipe
Line Speed	Up to 50 m/min (833.33 mm/s)
Sampling Rate	16,000 profiles/s (16 kHz)
Profile Data Count	3,200 points

Minimum Detectable Defect

Axis	Parameter	WD-245	WD-80	WD-60	WD-30	WD-20
X (length)	Sampling rate + speed	0.15 mm	0.15 mm	0.15 mm	0.15 mm	0.15 mm
Y (width)	Points per profile	~0.03 mm	~0.02 mm	~0.01 mm	~0.01 mm	~0.005 mm
Z (depth)	Sensor accuracy	~0.04 mm	~0.02 mm	~0.016 mm	~0.012 mm	~0.006 mm

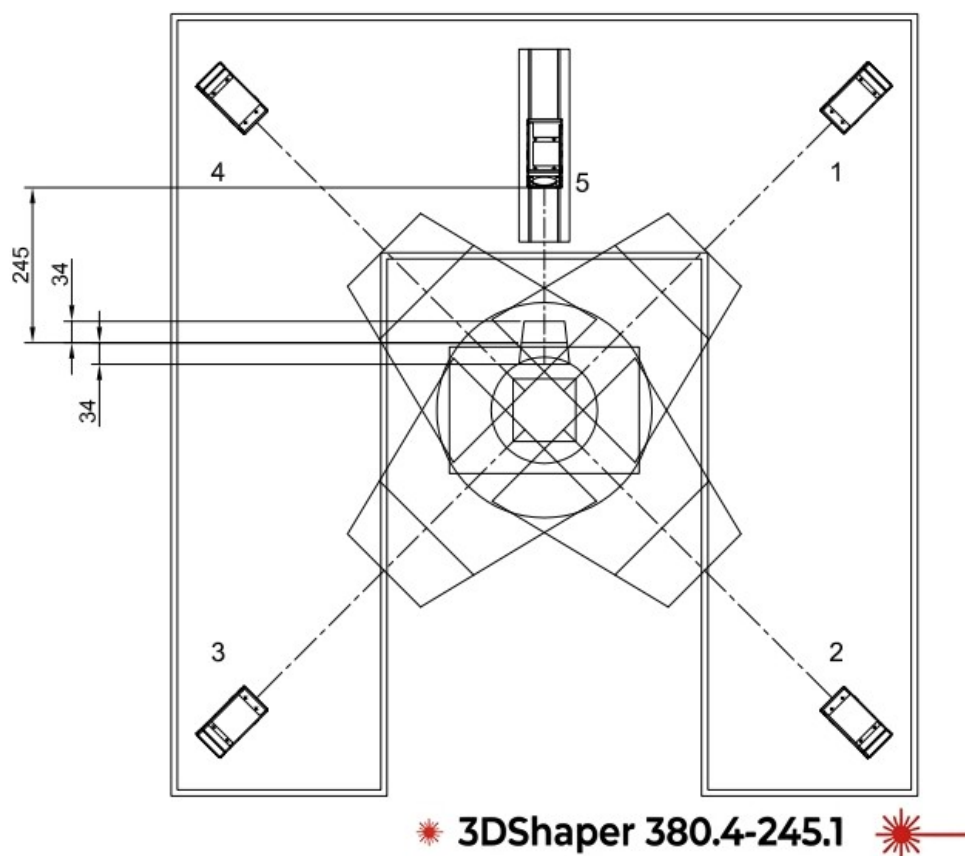
Note: Y and Z values are approximate and depend on specific configuration, line speed, and surface conditions.

Commercial Summary

Model	Application	Cost Premium
WD-20	Ultra-small pipes, micro-weld	Highest
WD-30	Small pipes, fine weld	High
WD-60	Medium-small pipes	Medium
WD-80	Medium pipes	Medium
WD-245	Large pipes (up to 400 mm)	Standard

Recommended: For most standard pipe production, the **WD-245** offers the best balance of accuracy, coverage, and cost. For smaller pipes or higher precision requirements, the **WD-80**, **WD-60**, **WD-30**, or **WD-20** may be specified.

Dimensions



Measurable Features

The system can measure:

Feature	Capability
Ovality	Yes
Corner radius	Yes
Convexity / concavity	Yes
External weld seam geometry	Yes

Cost Impact of Moving Sensors

- Moving sensors add **20% to 25%** to overall architecture cost
- Three moving heads could cover same sizes of 4 statics, but overall system cost would be **far higher** than static heads

Sampling Rate Consideration

- Both sensors have the **same sampling rate**
 - Adopting the 245 does **not** provide significant improvement on X-axis
 - 245 does deliver improvements in **Y and Z directions**
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Key Discussion Points

1. **Seam height tolerance** actually experienced in their lines → determines whether 245 model is sufficient or a higher-performance model is needed
 2. **Weld area accuracy** – 0.05 mm is standard for external defects but somewhat coarse for welding area → requires detailed discussion
 3. **Surface oil** – air wiping/cleaning system required before measurement station → advise required surface condition for reliable measurement
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