

The image shows a close-up of an industrial laser cutting machine. A bright, intense orange-red laser beam is directed horizontally across the frame. The machine's body is a dark, metallic color, and there are various cables and components visible. The background is a warm, orange glow, suggesting a high-temperature industrial environment.

tecnar

lut 2.0 DPS

Lut versus Lut 2.0

lut.tecnar.com



I would like to express our warmest gratitude and appreciation to all of our early Lut customers who, through perseverance and dedication, collaborated with us in getting the most out of the emerging non-contact laser ultrasonic technology and helping us shape the vision of what would be the future.

These efforts paid off and gave birth to Lut 2.0 which is much more advanced than the previous versions. Since 2020, Lut 2.0 gauges are operating 24/7 flawlessly worldwide on six production lines, providing quality and productivity insights to plant operators, in conditions never matched by the industry.

Today, Lut 2.0 is becoming the ultimate production monitoring tool in hot tube wall diagnostic because it is accurate, safe and versatile. This document is addressed to all early Lut users who want to learn more about the proprietary technology that was designed over the last 10 years that make Lut 2.0 one of the best productivity tool of the industry.

Alexandre Nadeau
CEO, Tecnar

"The Lut 2.0 gauge system is the right choice when the time comes to replace older gauges or add new ones."

Founded in 1989

Tecnar designs, develops, manufactures and markets advanced sensors for industrial process monitoring and control. From its close collaboration with the National Research Council Canada (NRCC), Tecnar has made technological breakthroughs available to the industry. Four highly specialized sectors of application were developed:

- Online thickness measurement
- Automated pipe and vessel welding
- Thermal and cold spray monitoring
- Molten metal chemistry analyzing

tecnar
Innovate to differentiate.

Major technical differentiators between Lut and Lut 2.0

Generation Laser

Lut 2.0's generation laser is a diode-pumped system with 10G shots life cycle.

Detection Laser

Lut 2.0's detection laser is a diode-pumped system with 10G shots life cycle.

Optical probe

The probe is a sealed Durabeam design, protecting all optics for the exterior environment.

Software

Lut 2.0's software is a web-based multi-access platform connected to a database architecture.

Intelligence

The Lut 2.0's automatically decouples and informs operators of various sources of defects.

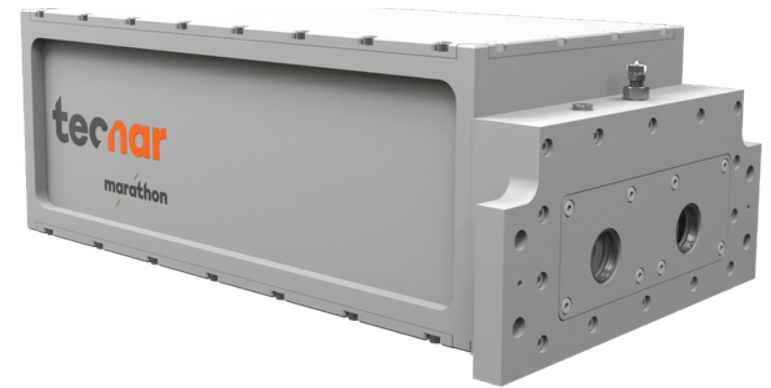
Maintenance

Lut 2.0 required maintenance is reduced to window cleaning, and chiller/blower fluid and filter change.

Generation Laser

The generation laser is the hammer that generates the ultrasonic probing pulse. The stronger the laser, the better the information.

Lut 1.0	Lut 2.0
Lamp-pumped	Diode-pumped Marathon™ (proprietary)
Scientific optical components (exposed)	Sealed optical housing Durabeam™ (proprietary)
Prone to severe optical degradation due to extended UV exposure from flash-lamp	UV free diode-pumped system
200 mJ/pulse (commercial laser)	Up to 350 mJ/pulse (heavy duty laser)
60 Hz per probe	100 Hz per probe
60M flash per lamp 4-6 weeks of service life	10G shots per diode Years of service life



Marathon™

A diode-based, high-power, q-switched laser that delivers a fast firing rate with unmatched reliability. This proprietary Tecnar product was specifically designed for use in harsh and difficult environments. Based on diodes rather than flash lamp technology, the Marathon requires much less periodic maintenance.

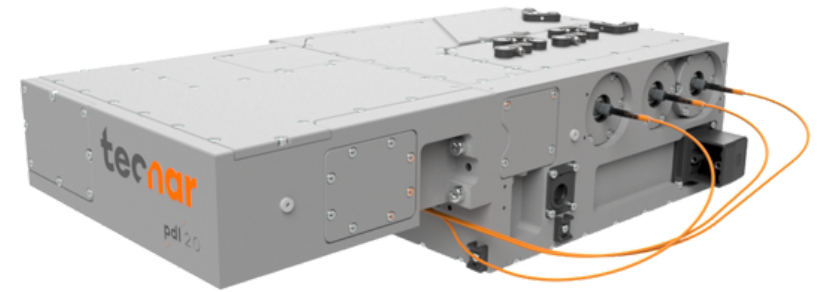
From start to finish, the Marathon truly goes the distance for years of trouble-free operation in all kinds of environments.

- Firing rate 100 Hz (in most applications)
- Power per pulse up to 350 mJ
- Optical wavelength 1064 nm
- Pulse width >8 ns (8×10^{-9} sec)
- Diode lifespan 10 billion shots

Detection Laser

Carries the ultrasonic information from the tube to the detection unit

Lut 1.0	Lut 2.0
Lamp-pumped	Diode-pumped PDL 2.0 (proprietary)
Open air optical (exposed)	Sealed optical housing Durabeam (proprietary)
Optical fiber injection: complex for onsite maintenance	Optical fiber injection: plug and play
300 watts peak power	700 watts peak power
60M flash per lamp	10G shots per diode



Although the original PDL has been a true workhorse for 20 years, it was essential to convert it to diode-based excitation in order to increase its longevity and to make Lut 2.0 a truly low maintenance and easy to use product.

PDL 2.0

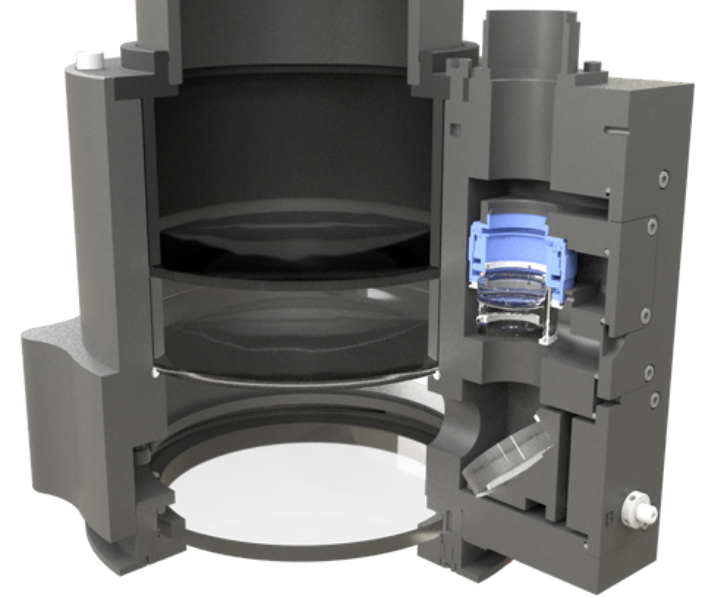
Designed for 10 billions shots before a diode replacement is required, it was engineered so that fiber injection and seed laser replacement is just a plug and play technology, no longer requiring specific optical expertise or Tecnar's direct assistance. Furthermore, it was designed using the Tecnar Durabeam technology, hence protecting optical components for decades.

- Firing rate: 100 Hz
- Peak power: >500 W
- Pulse width: >80 μ s (80×10^{-6} sec)

Optical Probe

Collects and delivers the laser light from the tube
Flexible optical system for easy beam collection and delivery using large core optical fibers with a simple connection to the detection unit.

Lut 1.0	Lut 2.0
Open optics made with exposed scientific components.	Sealed optical delivery device for maintenance free operation. Durabeam (proprietary)



Durabeam™

Dust and humidity can seriously impede the performance and reduce lifetime of high-power optical systems. Tecnar tackled this challenge by developing Durabeam, a novel design concept for industrial optical systems.

The Durabeam technology isolates all optical components from the environment while maintaining serviceability in the field, ensuring long-term reliability and low-maintenance costs for the Lut 2.0 inspection probe.

Software

Acquires and processes the ultrasonic information

PC-based data acquisition and processing package

Lut 1.0	Lut 2.0
Closed architecture	SQL-based Open architecture
Pascal language	C# language
-	Web-based user interface
-	Unlimited display points
-	Customizable dashboards
-	Remote support
-	Software upgrades



Intuitive user interfaces

The Lut 2.0 thickness gauge continuously monitors tube production to attain better mill yield. Through the user interface, operators can access all critical information in real time and any archived data can be recalled and visualized at any time.

The customizable user interface allows the user to visualize:

- Tube profiles
- Average values
- Production trends

The Lut 2.0 advanced analytics module:

- Detects and quantifies eccentricity orders individually
- Measures the position of heavy/light ends

Intelligence

Lut 2.0 translates thickness profiles into intuitive data that can be linked to specific manufacturing causes.

Lut 1.0	Lut 2.0
Limited intelligence	Advanced frequency domain analysis
Basic eccentricity evaluation based on thickness overall envelope	Decoupling each and all rolling stage signatures
-	Advanced radial profile analysis
-	Elongation stages control



With its 100 Hz cadence, programmable scanning structures and ultrasonic accuracy, Lut 2.0 is capable of detecting various types of defects and automatically informing the operators of the source of a problem so that corrective actions may be taken as soon as possible.

For example, by automatically analyzing the profiles in the frequency domain, defects from uneven billet heating are decoupled from defects caused by a worn piercing plug.

As for longitudinal defects, polygonization is not only detected, it is decomposed between even and odd stages to better inform operators.

Maintenance

Make all clients autonomous in managing their systems with the level of skills available.

Lut 1.0	Lut 2.0
Flash-lamps: Very delicate handling	Diodes: No maintenance for years
Generation laser (4 weeks) rebuild (18 month)	No replacement for years
Detection laser (4 weeks)	No replacement for years
Window cleaning & rotation (1 month)	Window cleaning & rotation (1 month)
Chiller filter (6 months)	Chiller filter (6 months)
Cooling fluids (6 months)	Cooling fluids (6 months)
Blower filter (6-12 months)	Blower filter (6-12 months)



The main weakness of early versions of Lut was the use of commercial lasers, their low reliability and their high maintenance requirement. This demanding constraint prevented designing it to be thought off as a stand alone or plug and play system.

Now, thanks to Tecnar's proprietary diode-based lasers, everything was redesigned to make Lut 2.0 reliable and easy to service by plant personnel, with minimum training.

Maintenance is reduced to window cleaning, cooling fluid and filter replacement.

Satisfied users

Tecnar has continuously improved and developed its technologies. This translates to complete confidence among many users such as:



Ovako

TM-4
Taking advantage of their cross rolling sizing mill, Ovako installed the Lut 2.0 SPF at the last step of the manufacturing process

2016



Benteler

"We are very pleased with the Lut 2.0. We recommend the gauge to any seamless line that wants to improve productivity and achieve higher wall thickness tolerance."

2017



Ovako

TM-5
"We are pleased with how our two Tecnar Luts are working for us but most of all we appreciate the responsiveness of the Tecnar team."

2020

Satisfied users

Tecnar has continuously improved and developed its technologies. This translates to complete confidence among many users such as:



Baosteel

"Lut 2.0 is very effective at detecting even minute variations in WT while displaying a very good level of industrial availability."

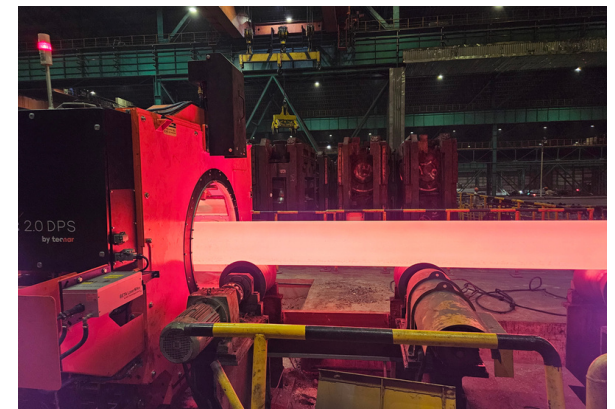
2021



Baotou

At the outlet of a 3-roll mill, the Lut 2.0 directly shows roll-stands typical polygonization WT profiles.

2023



Daye

95 mm – New record set for WT measurements.

Assel Mill specific signature captures

2023



Alain Saint-Louis, B.Sc.,
Strategic Key Account Manager -
Laser-ultrasonics Lut 2.0
M +1 438 376 4352
astlouis@tecnar.com
lut.tecnar.com