

LaCam[®] system measuring principle and general functions

The **LaCam[®]** profile measuring system has been developed for non-contact measurement of refractory linings in metallurgical reaction and transport vessels (converter, ladle, torpedo ladle or EAF). It is based on a new generation laser scanner of the new generation where a laser product of safety class 1 (eye safe) is used.

Since 1985, MINTEQ International GmbH, FERROTRON DIVISION has been successfully developing advanced Laser Technology. Due to its high quality, Ferrotron Division became a leader on the market. The **LaCam[®]** profile measuring system enables the shortest duration of measurements and an improvement of the production process in steel plants. If requested, a measurement can be made within a few seconds after each tapping.

This result is achieved by rapid scanning of the object via a pulsed laser beam which is deflected by a rotating mirror system. Thus, a three dimensional frame of the vessel's inner surface is created within a few seconds; in short, a photograph of a **LaCam[®]** camera. By comparison with a previous reference measurement, the residual brick thickness of the refractory is evaluated by the built-in industrial PC.

A user-friendly graphical interface allows an extremely simple handling of the **LaCam[®]** system. The **LaCam[®]** system software is installed, which can also be used on external computers for comfortable evaluation of the measuring values. The simple handling of the **LaCam[®]** system at the touchscreen-monitor also allows usage without computer knowledge. The **LaCam[®]** system software provides detailed investigations of the brick development as well as an automatically made documentation of measurements at the **LaCam[®]** system computer or at an external computer. We also offer an additional software (**LaCam[®] View**) for graphical printouts or trend data.

All **LaCam[®]** system computers run under the Microsoft XP[®] Professional operating system and can be linked to the computer factory network. They can also be equipped with a modem connection, which enables remote service.

The **LaCam**[®] system is available in the following models:

- | | |
|---|---|
| LaCam [®] M 007 | - LaCam [®] system in a compact, sturdy mobile housing |
| LaCam [®] CI (converter installed)
LaCam [®] CIE | - LaCam [®] system for installation at a converter
- LaCam [®] system extension unit converter |
| LaCam [®] LI (ladle installed)
LaCam [®] LIE | - LaCam [®] system for installation at a ladle stand
- extended unit ladle |
| LaCam [®] EAF | - LaCam [®] system for installation at an electric arc furnace |

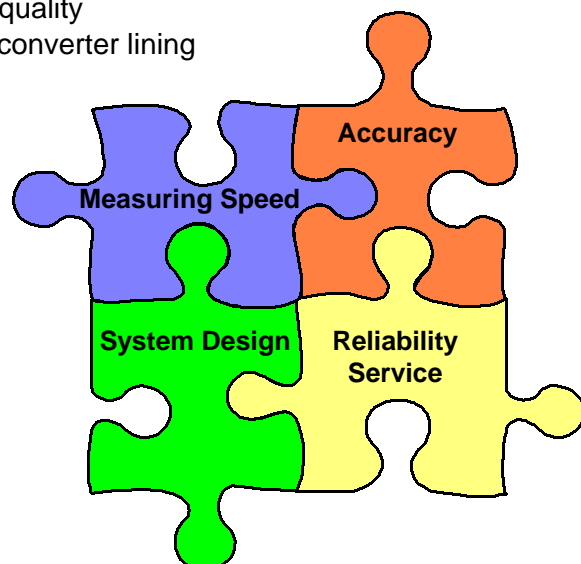
The **LaCam**[®] system determines:

- Residual brick thickness of the refractory lining
- Wear of the refractory lining
- Wear speed of the different refractory materials
- Volume of converters
- Bath level for optimal lance positioning
- Optimal tapping angle
- Deformation of converters

Furthermore, the **LaCam**[®] system enables

- the maximizing of converter life time
- control of gunning material consumption
- area dependent optimization of lining material quality
- trend analysis and forecast of the durability of converter lining

The **LaCam**[®] system introduces the best performance for:





Measuring Speed

**Reduce over all measurement time due to flexible positioning methods
Immediate Positioning System (IPS)**

**Significant reduction of measurement time due to
Instant Result Scanning (IRS)**

Benefits:

- Results available after each single scan
- Ability to decide after each scan if areas of interest are already measured (measurement can be completed at an early stage)
- Ability to recognize interference of dust or smoke after each scan (decision to repeat one scan can be taken, no need to repeat the whole measurement sequence)



Accuracy, Positioning

High accuracy, due to the use of one scanner for positioning and measurement

Advantages compared with competitors:

No additional errors based on:

- Second laser for positioning
- Reflecting targets
- No additional surveying measurement by a third party company necessary

High flexibility in choosing structures for positioning due to multiple positioning methods (patented).



System Design

Active water cooling allows unlimited use.

The light construction of the LaCam[®] M 007 system enables an easy movement.

Benefit:

- No down time between measurements required
- Permanent network access and remote access
- Safety: Overhead protection for operator against skulls or debris
- Integrated Pyrometer (optional)
Benefit: allows temperature maps and tuyere determination
- Operation mode: Battery or AC-power 85 V – 265 V
Benefit: enables operator to perform measurement even if the battery is not fully charged



Reliability, Service

- **Reduced temperature stress on mechanical and electrical components due to active water cooling**
- **No need for maintenance of positioning system**
- **User-friendly due to modular setup**
- **The water flow is monitored and displayed on-line**

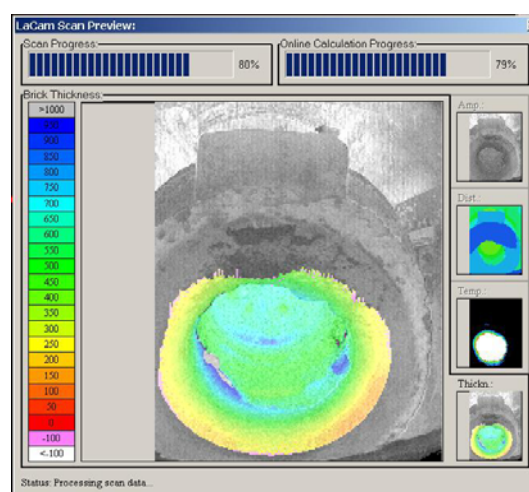
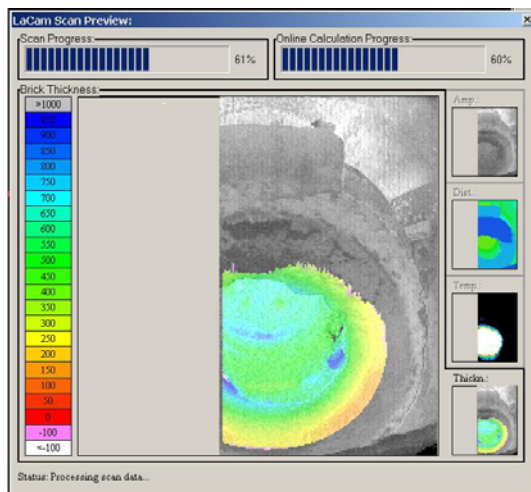
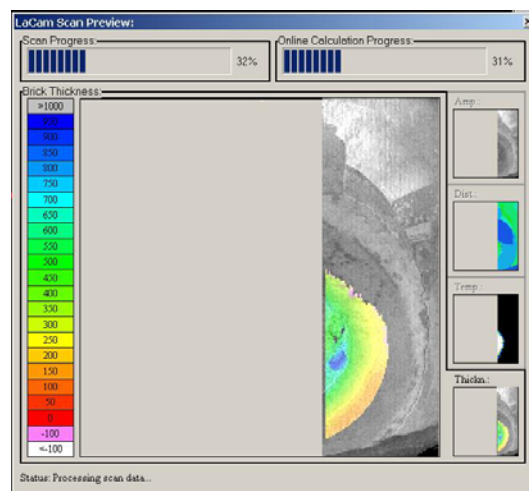
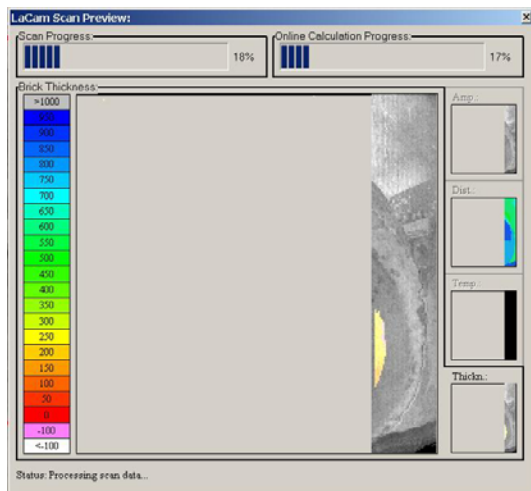
Competitor needs to clean the reflecting targets and align the different coordination systems (external targets, laser for position, laser for scanning) by a third party surveyor.

- Service teams available world wide, company owned infrastructure in more than 40 countries.
- Most experienced manufacturer of laser profile measuring equipment with more than 200 sold units world wide.

IRS – Instant Result Scanning

The operator can see the measurement online on the LaCam® system display when the scan is performed. A big advantage is that he could choose only one area of interest, measure it and then he could decide if he ends the measurement at that moment or continue it. No waste of time for evaluation. The operator can switch between amplitude view, distance view or residual brick thickness and optional he can go into temperature view. The scan of residual brick thickness is possible direct after finding the position.

The evaluation of the brick thickness is immediately available on the PC.



IPS - Immediate Positioning System

is an additional method for structure finding:

In case of IPS the positioning measurement (or positioning scan) for the central measurement position has to be carried out only once at the beginning of the measuring procedure before the first wear scan. In some cases the positioning measurement can even be carried out at the same time as the first wear scan.

The positioning (or fixing) of a subsequent measurement position of the mobile unit is carried out by means of the first measuring scan at the new position: For this purpose temporary marks or structures are used which can be observed within the area of the first wear scan and the subsequent scans. These marks can be either any items which are temporarily put into the scanned area or any permanent or accidental structures within, at or outside the vessel.

The positioning scan can be an IPS-Backscan or an IPS-Frontscan depending on the situation on site.

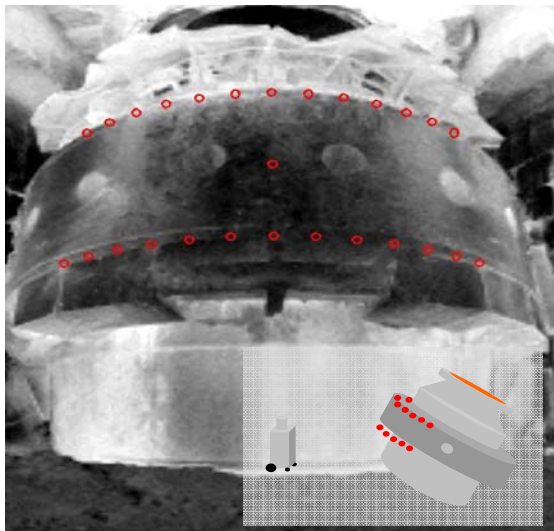
In every case the LaCam[®] system measurement does not require the time consuming positioning scans in between the measurement procedure anymore.



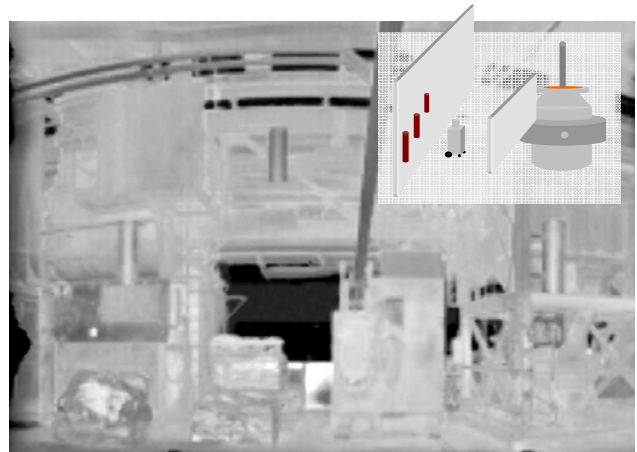
Due to multiple positioning methods (especially by using IPS), the LaCam® system is highly flexible in choosing structures.

Example of permanent structures:

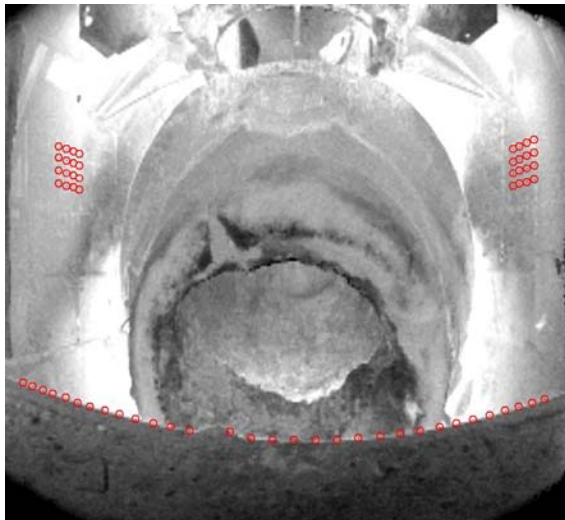
Trunnion ring as permanent structure,
IPS Frontscan



Cylindrical structures in the back of LaCam®
system as permanent structures,
IPS-Backscan

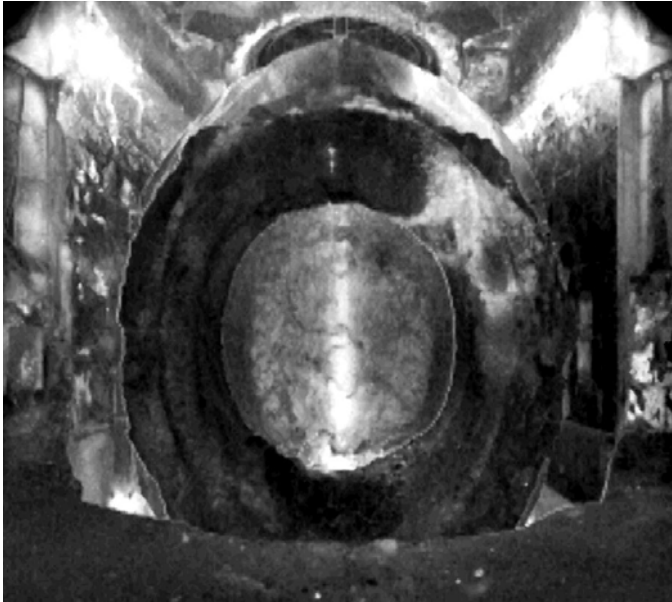


The converter housing and the floor in front of the converter as permanent structures.
IPS-Frontscan

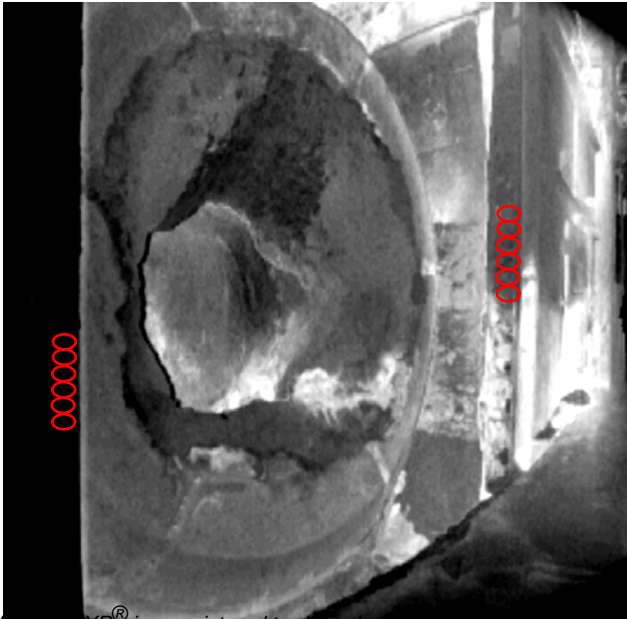


The mouth of a converter as temporary structure. IPS Wearsan

In most cases, temporary cylinders are too pedestrian, therefore we give some examples for temporary structures:



The door in front of the converter as temporary structure, IPS Wearsan



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