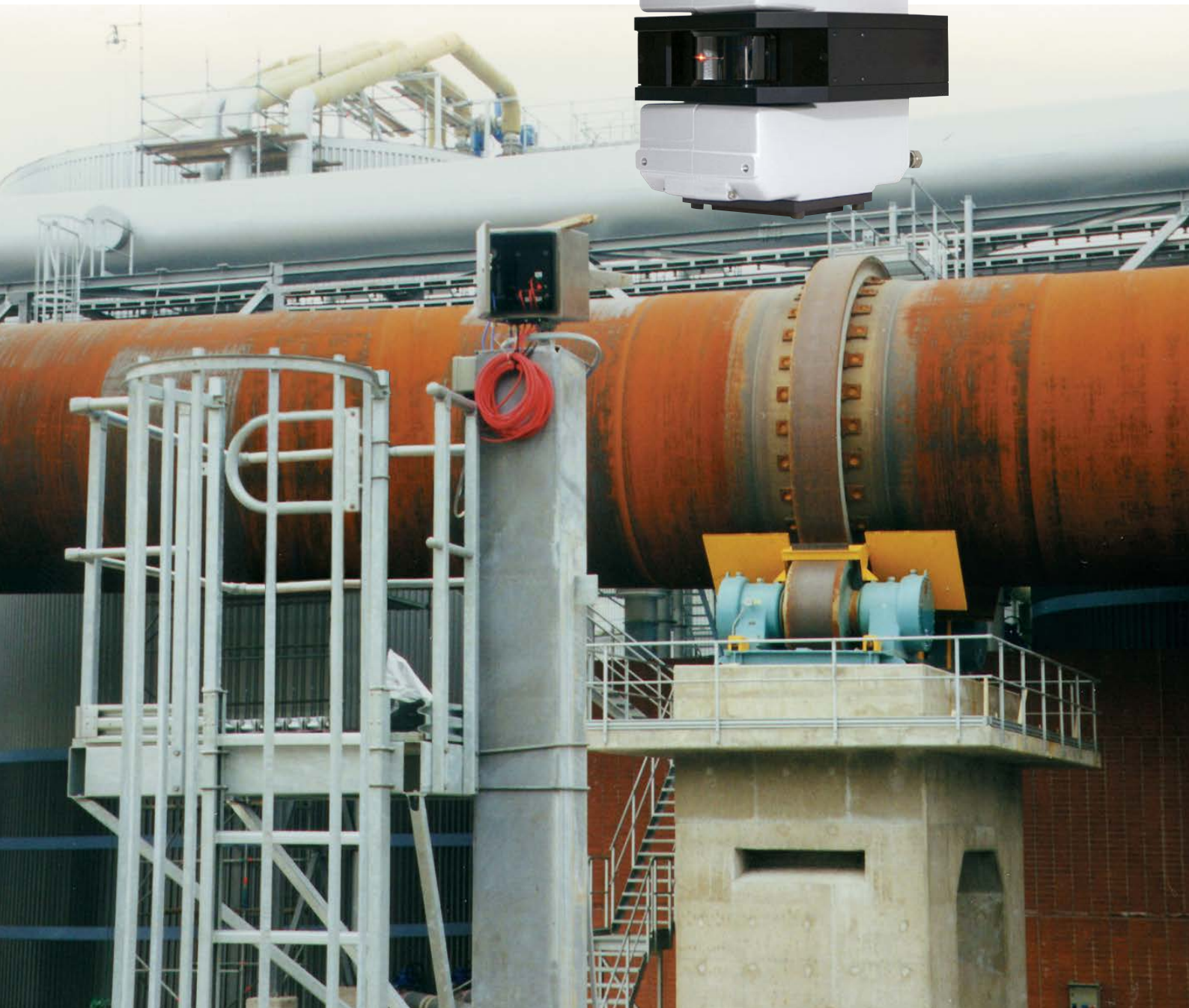


**FLUKE®**

**Process  
Instruments**

## **CS400 Kiln Shell Imaging System**

Picture every brick in your kiln in real-time with continuous infrared monitoring



## Kiln Shell Scanning System

Specifically designed for kiln monitoring, the CS400 is a fully integrated solution that monitors rotary kilns to detect hot spots while avoiding costly damage and unscheduled downtime. Optional, yet fully-integrated, accessories, extend the CS400's capabilities to include shadow sensing, burn zone monitoring, tire slip and I/O modules.

At the core of the CS400 system is the MP150 linescanner, which can scan up to 1024 data points in a single scan, and an integral heater that can be configured specifically for users' unique kiln applications.

## Rotary Kiln Applications

- Cement Kilns
- Lime Kilns
- Metals, Chemical Processing and Waste Incineration

## Benefits

- Detect hot spots due to refractory loss, damage or wear
- Detect abnormal operating conditions such as faulty flame position and shape
- Optimize and manage kiln maintenance
- Extend operational life of kiln and refractory
- Completely integrated monitoring of key kiln parameters

## Features

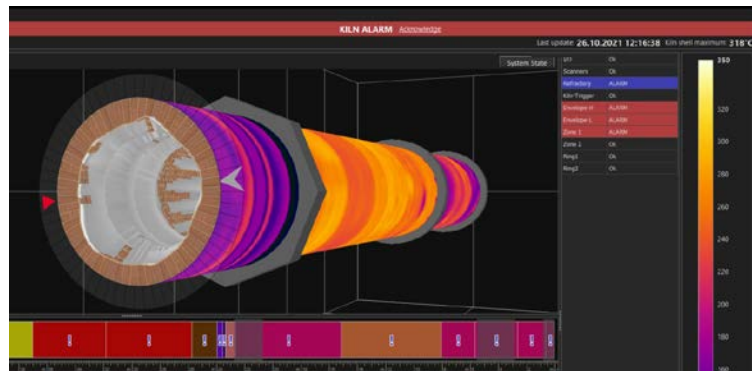
- Map entire kiln surface and display in real-time thermogram format
- "One brick" resolution hot spot detection, even in shadowed areas
- Fail-Safe "hot spot" alarm outputs (PC independent)
- On board Ethernet TCP/IP communication
- Interface with other programs via OPC
- Modular design simplifies installation and service
- All data, alarms and errors stored and accessible in one common environment
- Multiple level security settings
- Multiple Kiln and Scanner Support
- Real time 3D view of the kiln
- Refractory Management

## Accessories

- Tire Slip Monitoring
- I/O Modules
- Burning Zone Monitor Package
- Shadow Sensor Package

## CS400 Provides Complete Kiln Monitoring Capability

Kiln shell temperatures are monitored along the entire length of the kiln, providing an essential indication of the health of the refractory material. Temperature data for areas "shadowed" from the main sensor can be provided by individual point sensors and seamlessly integrated into one complete thermal image. Optional burning zone sensor and tire slip monitoring can be integrated into the system, so that all information is displayed on one screen in the control room. All events, as well as kiln and refractory data, can be viewed in an optional real time moving 3D view.



## Rugged & Reliable for Continuous Kiln Shell Monitoring

Picture every brick in your kiln in real-time with continuous infrared monitoring that can help prevent costly shutdowns and extend production runs. Specifically designed for harsh kiln environments, the CS400 Process Imaging System is a fully integrated solution that continuously monitors kilns for hot spots – helping your team avoid costly damage and unscheduled downtime.

At the core of the CS400 System is the MP Linescanner, which provides accurate, edge-to-edge and real-time thermal imaging and temperature measurements for continuous processes so you can get a complete picture of your application.

To ensure reliable operation in harsh kiln environments, the MP linescanner is designed with rugged, aluminum-cast housing, which is mounted in a robust stainless steel protective housing with provisions for air-purge and water cooling.

The protective housing includes an adjustable mounting bracket to aim the scanner along the kiln axis, a mounting rail permitting fast scanner installation, quick-disconnect fittings for air purge and water cooling and an easily replaced viewing window.



*Linescanner in protective housing is mounted on top of a tower.*

## CS400 System Software

### User Friendly Software Provides Easy Configuration and Startup

The CS400 Kiln Shell Imaging System features specially designed software, which relies on standard Ethernet ports. Because the graphic user interface is designed specifically for kiln applications, the software is easy to set up and use with little operator training required. With a variety of options and accessories, the CS400 system expands to become a comprehensive kiln monitoring tool.

### Rapid Set up

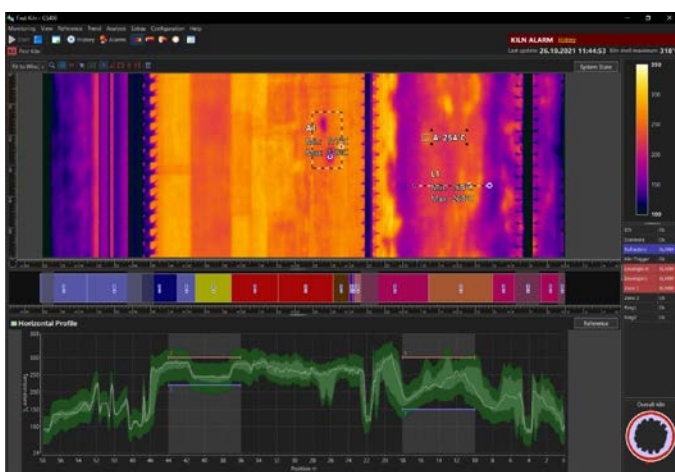
Using intuitive set up screens, operators can easily enter the kiln's physical dimensions and linescanner position. Once established, the software displays the resulting configuration and manages temperature profile calculations.

### Integrated Shadow Monitoring

Point sensors can be quickly configured to cover any shadow areas created by the tires or by physical obstructions, such as buildings or utility poles. All sensors are configured from one screen and, since the software senses any conflicts and notifies the operator, set up errors are virtually eliminated.

### Kiln Shell Thermal Image

The software provides a thermal image of the entire kiln shell surface, with a zoom function that allows detailed examination of areas of interest. Temperature range, color palettes and zone alarms are easily configured within the user-friendly software.



### Historical Data Analysis

Kiln shell temperature snapshots are taken at user-defined intervals and stored for later review. Data can be viewed as thermograms, as line charts to monitor gradual refractory degradation, or other changes.

## CS400 System Accessories

### Tire Slip Monitoring (TSM)

The TSM sensors and connection boxes required to activate the system can be purchased as an accessory. This system records tire slip and can be configured to generate alarms at user-defined limits. The TSM is fully integrated with the system software and is capable of extensive historical data analysis.

### I/O Modules

The optional I/O module hardware provides digital inputs and outputs, as well as analog outputs. These can be used for fan control and hot/cold alarms as necessary.

### Burning Zone Monitor Kit

When the optional Burning Zone Monitor Kit is installed, operators can monitor the condition of the critical burning zone area directly using the CS software. Temperature is displayed alongside the kiln shell temperature and all data is recorded and date stamped for later analysis. The kit consists of a two-color ratio point sensor to "see through" the combustion gases, a protective housing and all of the hardware needed to complete the installation.

### Shadow Monitoring Kit

The CS software can accommodate select pyrometers from Fluke Process Instruments to monitor areas of the kiln shadowed from the main linescanner. The data is seamlessly integrated into a single thermogram, both for real-time display and for later data analysis. For convenience, the most commonly used sensor and all of the necessary accessories are provided as a kit.

### Refractory Management Kit

The Refractory Management Kit is based on an enhanced data management system that can monitor the installed brick – including gathering, storing and analyzing all necessary data to indicate refractory wear during use. The data will be related to the kiln and refractory.

Examples of user input data are: time of last maintenance, brick types and properties, brick/refractory, zone names and positions.

Intuitive user interface to enter data via pre-defined drop down lists, as well as history tracking that includes all related refractory and kiln data, maintenance data, date/time and record of changes made by user name.

This feature enables the full walk through visualization helping decide when to change the refractory of a cement kiln.

### 3D View

The 3D view module will help to easily understand all the data from the kiln and its environment, including life view of the rotating kiln, life rings and zones (with optional hardware), even for the non-refractory related "real-time view", which is part of the standard CS System.



## Specifications

Temperature range	100 to 650 °C
Temperature resolution	0.1 K
Accuracy	± 0.5% of reading or ± 3 °C
Spot detection	510 : 1 (2 mRad IFOV) (50% of energy)
Scan rate	1024 pixel per scan line (2048 for CS402)
Scan motor	MTBF: 40,000 hours
Ambient operating temp.	-40 to 45 °C (without external cooling)
Position indicator temp.	-25 to 230 °C
Zone alarms	Software: unlimited, Hardware: 3
Kiln rotation rate	Up to 10 rpm
TSM accessory	Supports up to 6 tires
I/O Modules	32 modules, up to 16 digital outputs per module
Burning Zone Accessory	Endurance Ratio 600 to 1800 °C, connection box, 15 m high temp. cable, Thermo jacket, blast gate, sighting tube, adj. pipe adapter, adj. mounting base, air flow/ press. regulator
Shadow Monitor Accessory	MI3LTH Sensor (-40 to 600 °C) with 8 m high temp. cable, air purge jacket and adj. mounting base.

## CS400 System Details

Linescanner	MP150 linescanner (2 for CS402) (includes all required cables and connectors)
Protective Housing	Rugged Stainless Steel Housing (2 for CS402)
System Connection Box	2 for CS402
Position Indicator	High-temperature kiln rotation sensor
Software	CS400 System Software
Startup Service	On-site startup commissioning/ training available

## CS400 Part Numbers

CS401-MP150-KIT	CS400 Kiln Shell Monitoring System
CS402-MP150-KIT-2	Dual scanner system for longer kilns
CS403-MP150-KIT-3	CS403 Rotating Kiln System (3 scanner system)
CS404-MP150-KIT-4	CS404 Rotating Kiln System (4 scanner system)
A-CS-CONV-ETH485	Serial RS485 / RJ45 Ethernet Converter (req'd for accessories)
A-CS-TSM-KIT-485	Tire Slip Monitoring (TSM) Hardware Kit
A-CS-BZ-EN-KIT-485	Burning Zone Monitor Kit
A-CS-SM-KIT-485	Shadow Monitor Kit
CS400-SW-STD	CS400 standard software
CS400-SW-ADV	CS400 advanced software

## Easy Installation & Maintenance

The MP150 linescanner (1) is installed to view the desired portion of the kiln. The Position Indicator (2) is a high-temperature inductive sensor that synchronizes thermal imaging with kiln rotation. The System Connection Box (3) provides for local cable/wire termination. The Interface Box (4) connects the scanner to the PC (5) and contains fibre-optics to Ethernet conversion. The scanner communicates to a PC via fibre-optics for distances up to 2000 m.

CS400 System components are easy to install and are field-replaceable. When installing two linescanners, they may each mount at different angles so that each has a clear view of the kiln shell. CS software combines the data from each scanner providing a single thermal image for display and analysis.

The CS400 System installs in a standard PC (local operating system) without need to add expansion cards or open the computer.

