

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 fan control.

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. As an option, the system profiles a fully featured Refractory Management data base.

Rotary Kiln Applications

- Cement Kilns
- Lime Kilns
- Metals and Chemical Processing

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

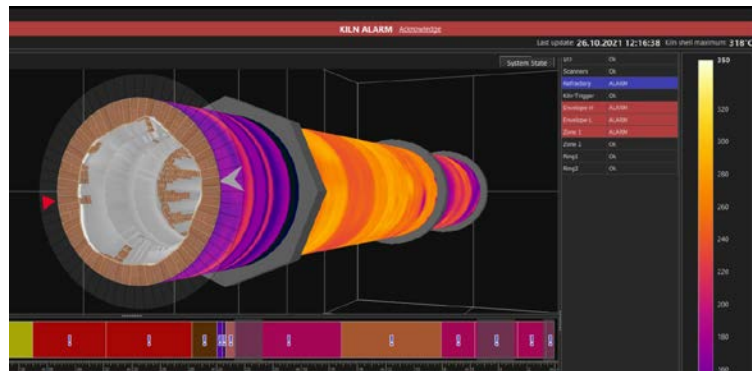
- Map entire kiln surface and display in real-time thermogram format
- "One brick" resolution hot spot detection, even in shadowed areas
- Fail-Safe "hot spot" alarm outputs (PC independent)
- On board Ethernet TCP/IP communication
- Interface with other programs via OPC
- Refractory Management software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

Accessories

- Tire Slip Monitoring
- Fan Control
- 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. These events can be permanently linked in an extremely versatile Refractory Management database.



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 in turn 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 and/or CPM 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

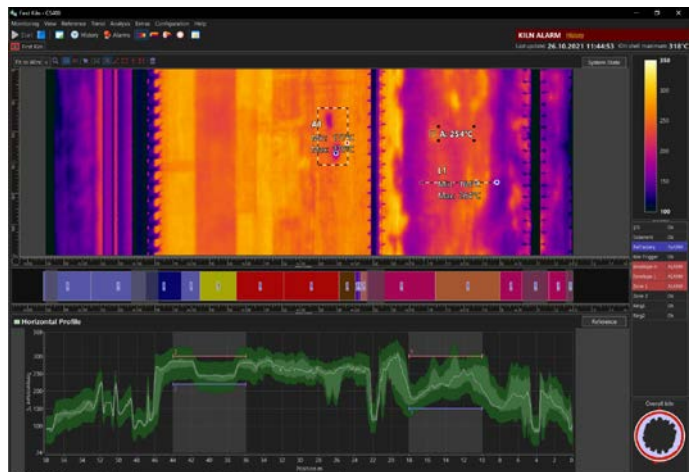
Using intuitive set up screens, operators can easily enter the kiln's physical dimensions and linescanner position. Once established, the software displays the resulting configuration and manages temperature profile calculations.

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. Other useful information, such as burning zone temperature, lap time and the scanner's internal temperature, is displayed in the status bar to provide a complete system status without changing screens.



Historical Data Analysis

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

Integrated Live Ring Migration

Proximity sensors measure the rotation of each tire and calculate the tire slip at each location. Results are calculated and displayed for each rotation as well as being stored for data analysis. Any deviation beyond user-defined limits results in immediate alarms.

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.

Fan Control

Fan control software is included with the CS software to control up to 48 discrete zones. The optional fan control hardware allows the user to provide outputs to up to 16 fans per module.

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 Module Database 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 content of the database will be related to the kiln and refractory. Examples of this input data are: time of last maintenance, brick types and properties, brick/refractory zone names and positions, as well as flame/burning zone temperature (with optional hardware).

The software features easy user interface for entering standard data with predefined dropdown lists, as well as easy to use history tracking that includes all related refractory and kiln data, maintenance data, date, time and record of changes made by user name.

The Refractory Management Module will help cement manufacturers and rotary kiln operators 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	450 : 1 (2.2 mradians) (50% of energy)
Sampling rate	1024 pixel per scan line (2048 for CS402)
Scan motor	MTBF: 40,000 hours
Ambient operating temp.	-40 to 45 °C (no direct sunlight)
Position indicator temp.	-25 to 230°C
Zone alarms	48 software, 3 hardware (PC independent)
Kiln rotation rate	Up to 10 rpm
LRM accessory	Supports up to 6 tires
Fan Control accessory	Supports up to 16 fans per module (48 total)
Burning Zone Accessory	MR Ratio Pyrometer 700 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	MIH 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 CS400) (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
Documentation	Documentation Binder with Operators Manual and MP Manual
Startup Service	On-site startup commissioning/training available

CS400 Part Numbers

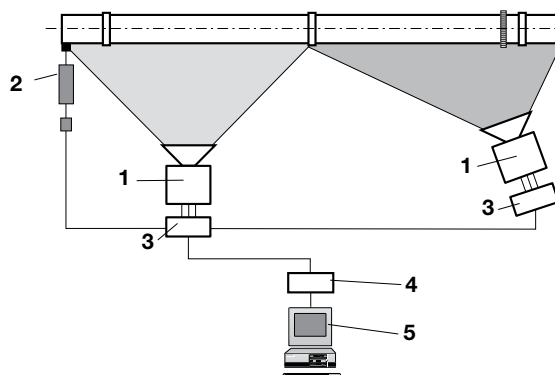
CS401-MP150-KIT	CS400 Kiln Shell Monitoring System
CS402-MP150-KIT-2	Dual scanner system for longer kilns
CS403-MP150-KIT-3	CS403 Rotating Kiln System (3 scanner system)
CS404-MP150-KIT-4	CS404 Rotating Kiln System (4 scanner system)
A-CS-CONV-ETH485	Serial RS485 / RJ45 Ethernet Converter (req'd for 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-CS210-UPG	Basic upgrade from old CS210

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.



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