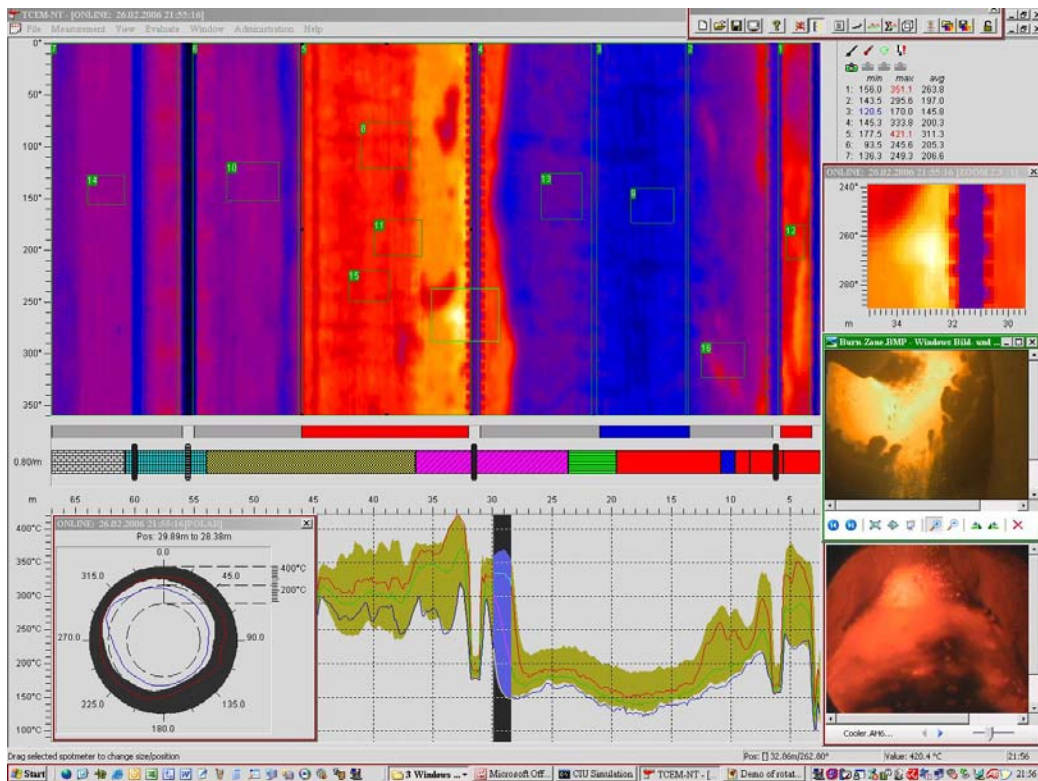
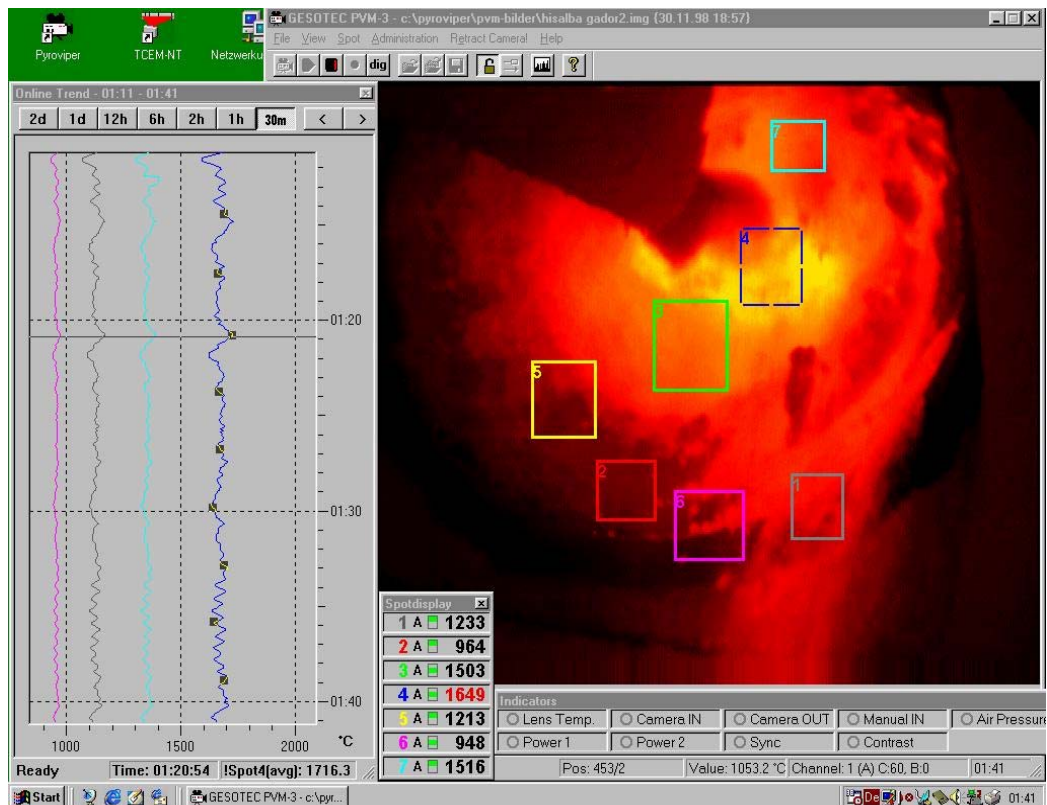


GESOTEC® KTCx.NET-XP™

Temperature Measuring Imagers for the Process Industry



OPERATOR INTERFACE "TEMPERATURE SCANNER FOR THE KILN SHELL"



OPERATOR INTERFACE "THERMAL IMAGER FOR THE KILN BURN ZONE"



Millennium-TMCx Kiln Shell Temperature Scanner

GESOTEC's Millennium TMCx-series of high performance infrared linescanners define a new industrial standard for mechanical scanning electro-optical high-speed pyrometers. With the unique modular design for easy maintenance and customizing the Millennium scanners incorporate state of the art components for non-contact infrared linescanning, allowing both, high speed and high resolution continuous process monitoring. Eight standard versions of the TMCx- linescanners are available, with a variety of temperature ranges, thermal- and spatial resolutions, and with an optimal spectral filtering adapted to the specific application. The modular design of the TMCx- sensors allows GESOTEC to customize every unit individually at very reasonable cost to the users technical- and commercial advantage.

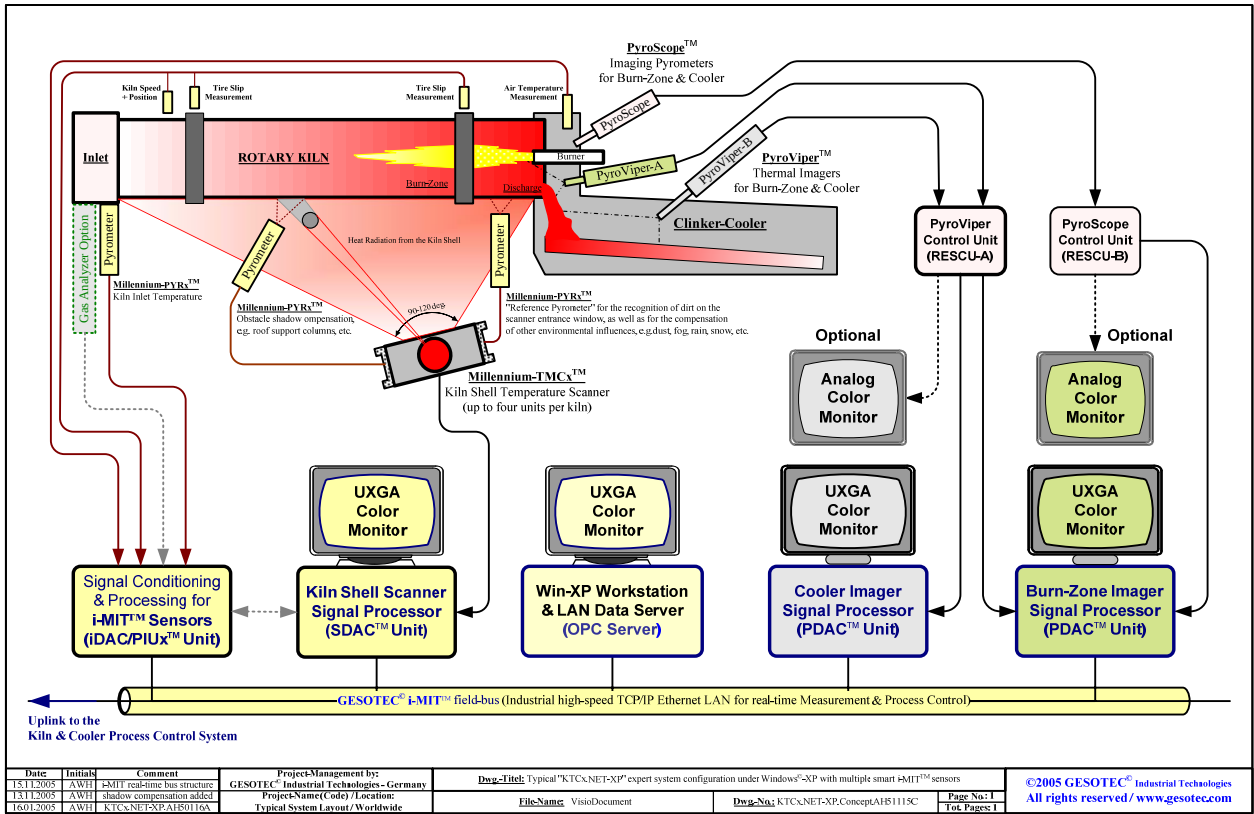
Application Example: Rotary cement kilns

In the cement industry infrared linescanners have become a standard temperature-measuring tool for checking kiln shell conditions, not only for the emergency hot spot detection and preventative maintenance, but also for optimized energy- and refractory lining management...

PRINCIPLE OF OPERATION

The "opto-mechanical" deflection unit of all TMCx-Sensors is designed to withstand a continuous high-speed operation up to 100Hz. The speed of this "scan-mirror" is digitally controlled. For every scan-line (360° mirror rotation) the effective scan-angle, or field of view ("FOV"), is max 120°. During the scanning the heat radiation of the object is continuously picked-up and transferred by the scan-mirror through a lens assembly to the TE-cooled infrared detector. The detector signal is digitized by a 12bit ADC at a sampling rate that results to 8192 points per complete 360° scan-line independent of the actual scan speed. The resulting spot measurement information is intermediately stored into a 16 bit pixel buffer together with additional 4 bit sensor status information and then transmitted in real-time at a rate of up to 20 MHz via the integrated fiber-optic Data-Link "DaLi-Tx" to the Scanner Data-Acquisition-Controller "SDAC" located up to 2km away.

KTCx.NET-XP™ series of sophisticated Kiln & Cooler Temperature Controllers/Thermal Imagers/Imaging Pyrometers, embedded in a TCP/IP NETwork environment:
Typical GESOTEC® expert system configurations under Windows®-XP with multiple smart i-MIT™ sensors for advanced industrial Measurement & Imaging Technology



OVERALL KTCx.NET-XP™ SYSTEM CONCEPT

KTCx.NET-XP KILN SHELL TEMPERATURE SCANNER SYSTEMS Typical Specification Data			
GENERAL			
1	TAG NO.	1 SET	GESOTEC KTCx.NET-XP (KTCem & TMCx-HT)
2	COLOR		MANUFACTURERS' STANDARD
3	PROTECTION		Dust Proof / Weather Proof (IP54/65)
4	LOCATION		Indoor / Outdoor
5	POWER SUPPLY		90-240 VAC, 50/60 HZ, 16A
6	CONDUIT CONNECTION		Manufacturers' Standard
SCANNER			
1	MEASURING RANGE		75 -750 deg. C (with atmospheric optical filter)
2	ACCURACY		+/- 1% or depending on the model between +/- 5deg. C and +/- 3deg. C
AIR PURGING OF IR-WINDOW WITH AIR FILTER & REGULATOR (System Option)			
1	TYPE		Manufacturers' Standard
2	MATERIAL		Manufacturers' Standard
3	CONNECTION		¼" NPT quick disconnect
SYSTEM DISPLAY/EVALUATION WORKSTATION & NETWORK-DATA-SERVER			
1	TYPE		Industrial 19" Rack Mount Type
2	MODEL		3.4GHz CPU
3	MEMORY / HARD DISK DRIVE / BACKUP MEDIA		512MB RAM, 2x160GB HD, 4.8GB DVD-DRW for data backup
4	POWER SUPPLY		90-240 VAC, 50/60 HZ, 10A
5	OPERATING SYSTEM		Windows-XP
6	INTERFACES		<u>Line-Scanner:</u> Digital fiber-optic <u>Data-Link "DaLi-TxRx™"</u> <u>Printer:</u> ECP/USB or Ethernet <u>Control System:</u> 100/1000 Mbit Ethernet LAN via file transfer Isolated digital -I/O, 0/4-20mA analog out (optional) OPC Server (optional)
7	COLOR DISPLAY MONITOR		20 Inch TFT UXGA, 1600x1280 Pixels @ 60-85Hz
8	STANDARD SOFTWARE		Kiln Shell Temperature Maps & Profiles (max/min/avg values) 2D & pseudo 3-D rotating kiln display, Cross-Section Profiles <u>Depending on the individual system hardware configuration:</u> Data Communication via Ethernet-LAN or RS232/485 Kiln Tire Slip Monitoring Reference Pyrometer for continuous system recalibration Obstacle Shadow Compensation ("Stereo-Scanner" and/or Pyrometer) "Temperature-TV" of Kiln & Cooler Interior Enhanced Refractory Management (Option)
9	DATA BASE / HARD DISK DRIVE CAPACITY		ORGANIZATION OF THE STORED DATA: <u>5-MIN-LOG:</u> hour, day, month, year <u>HOURLY-LOG:</u> day, month, year <u>DAILY-LOG:</u> month, year <u>EVENT-LOG:</u> day, month, year STORAGE CAPACITY: minimum 2 years plus LAN File-Server capacity
10	CRT VIEW OF THE KILN SHELL TEMPERATURES		2D and 3D Color Coded Kiln Temperature Map (updated every kiln rotation) MAX / MIN / AVG Thermal Profiles
11	ALARM OUTPUT		Hot Spot, Temperature Trend, Tire Slip System Health & Error Status
LAN-PRINTER OPTIONS			
1	TYPE		High Performance Color Ink Jet or Laser
2	MODEL		Manufacturers' Standard
3	SPARE INK CARTRIDGE		For 2 Years Operation
SERVICE CONDITIONS (exact system specifications are depending on the specific hardware configuration)			
1	AMBIENT OPERATING TEMPERATURE	MAX/MIN +80°C / -40°C	NORMAL OPERATION -20°C to +55°C
	PURGE AIR OPTION:	MAX/MIN 200 kPa / 20 kPa	NORMAL OPERATION 50 kPa
2	Pressurized plant air or low pressure blower	@ 5°C to 70°C	@ 5°C to 70°C

Millennium-TMCx Infrared Line-Scanner Specifications* (High-Temperature Models)



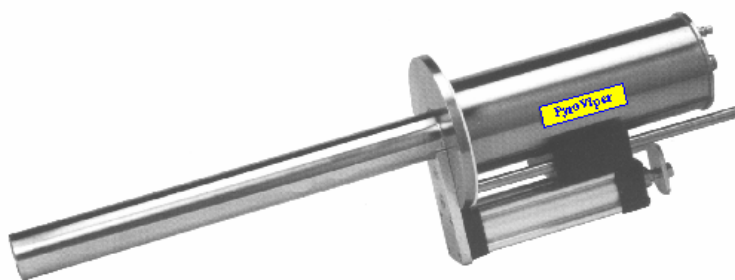
Millennium TMCx-HT Models	TMC5-HT*	TMC6-HT*	TMC7-HT*	TMC8-HT*
Temperature Measurement				
Standard Temperature Range	65° to 650°C (no Filter)	65° to 650°C (no Filter)	65° to 650°C (no Filter)	65° to 650°C (no Filter)
Measurement Accuracy**	<±1% of reading or ±5°C	<±1% of reading or ±5°C	<±1% of reading or ±3°C	<±1% of reading or ±3°C
Repeatability (short term)	<±2°C	<±2°C	<±1°C	<±1°C
Repeatability (long term)	<±5°C	<±5°C	<±4°C	<±4°C
Thermal Sensitivity (NETD)	<1.5°C at 100°C	<1.0°C at 100°C	<1.0°C at 100°C	<1.0°C at 100°C
Field of View (FOV)	60°-120° adjustable	60°-120° adjustable	60°-120° adjustable	60°-120° adjustable
Focus Range	0.3m to Infinity	0.3m to Infinity	0.3m to Infinity	0.3m to Infinity
Optical Filter (optional)	adapted to application	adapted to application	adapted to application	adapted to application
Geometrical Resolution				
Spot-Detection (SRF @ 50%)	2.2 mrad (<1:435)	1.8 mrad (<1:550)	1.4 mrad (<1:710)	0.8 mrad (<1:1200)
Measurement (SRF @ 90%)	6.0 mrad (<1:165)	4.5 mrad (<1:220)	3.5 mrad (<1:285)	2.0 mrad (<1:500)
Deflection Unit (Scan-Mirror)				
Scanning Rate (Scan-Speed)	8 to 20Hz	8 (20) to 20 (40)Hz	8 (40) to 40 (80)Hz	8 (50) to 50 (100)Hz
Momentary Scanline Accuracy	<±0.6 mrad	<±0.6 mrad	<±0.6 mrad	<±0.6 mrad
Scanline Stability	<±1 mrad	<±1 mrad	<±0.8 mrad	<±0.6 mrad
Detector-Unit and Signal-I/O				
IR-Detector Type, TE-Cooler	MCT, 2 stages	MCT, 2/3 stages	MCT, 3 stages	MCT, 3 stages
Spectral Range (no Filter)	2.2µm – 5.2µm	2.2µm – 5.6µm	2.2µm – 5.6µm	2.2µm – 5.6µm
A/D Conversation	12 bit (72db) 0.5Mhz	12 bit (72db) 1.0Mhz	12 bit (72db) 1.5Mhz	12 bit (72db) 2Mhz
Number of samples / 360° scan	8192	8192	8192	8192
External analog / digital input	2 / 4 channels	4 / 4channels	4+2aux. / 4 channels	4+2aux. / 4channels
Sensor status signals	4 bit + internal Temp.	4 bit + internal Temp.	4 bit + internal Temp.	4 bit + internal Temp.
Build-in digital PC-Data-Link				
Fiber optic data transmission via	2 fibers 50/125µm	2 fibers 50/125µm	2- or 4 fibers 50/125µm	2- or 4 fibers 50/125µm
Realtime transm. (Data+Clock)	16 bit at 4Mhz (10Mhz)	16 bit at 10Mhz (16Mhz)	16 bit at 10Mhz (16Mhz)	16 bit at 16Mhz (20Mhz)
Environment / Dimensions				
Ambient operating temperature	-15°C to 55°C	-15°C to 55°C	-15°C to 55°C	-15°C to 55°C
Classification (Standard/Option)	IP54/IP65	IP54/IP65	IP54/IP65	IP54/IP65
Size (W x H x D)mm / Weight	244x250x145 / 7.5kg	244x250x145 / 7.5kg	244x255x150 / 8kg	244x255x150 / 8kg
Power Supply				
DC Power Requirements	+5V (2A) and ±15V (1A)		+5V (2A) and ±15V (2A)	

* More details are available on request - specifications are subject to change without prior notice, ** the higher value applies

PyroViper-3™:

Multi-spectral industrial Thermal Imagers for the Kiln's Burn Zone and for the Clinker Cooler

GESOTEC's Thermal Imaging system "PyroViper-3™" with its different models "PV3x-xxxx" combines state-of-the-art digital high temperature video/infrared-imaging with enhanced "two-channel/two-dimensional-pyrometry". This unique combination of two rugged industrial solid-state CCD/Infrared-FPA area sensors has the advantage of no "moving system parts". It gives the operator the ability to observe the process conditions with great visual details while simultaneously measuring accurate temperatures of virtually any object- or region- of interest within the systems field of view (FOV). The PyroViper™-3 sensor is mounted to the "process wall" together with an air-cooled wall-box. No additional water-cooling is required. A heat resistant housing and an automatic retracting device ensure safe operation. PyroViper™'s lens- & sensor- assembly is air-purged and cooled by just one air supply line. Its heavy-duty furnace lens is available with usable lengths between 410mm and 1150mm, thus covering most installation conditions.



The visual image- and the temperature- information of the process is captured and transferred through a special patented optical system to the High-Tec Sensor-module of the PyroViper™-3 system, i.e. a two-channel solid-state "Pyrometer-Imager".

The resulting signals are transmitted via coax- or via fiber-optic cable (up to 2km) to PyroViper™'s smart Data-Acquisition-Controller "PDAC", that usually is located in - or near - the process control room.

Both, the video and the temperature information of an object are processed in real time by the PDAC unit. All image information and all results are displayed on an industrial type high-resolution TFT UXGA/S-Video color monitor. Also possible is a separate display of images and results on two monitors. Up to 48 Areas-of-Interest of variable size and position (also called "AOI's") may be selected by the operator. AOI's can be checked for HI/LO- temperature alarm limits.

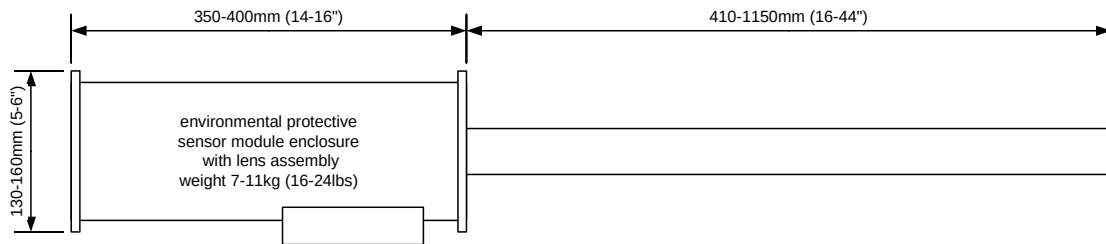
Max./Min./Avg.- temperature values of AOI's can be linked to separate numerical- and/or graphical trend- display windows.

All temperature values and alarm conditions, as well as all other significant status information, can be linked to isolated analog signal 4-20 mA output channels and/or to relays. Measurement values are continuously recorded and stored in an easy-to-access-format (ASCII) for further analysis. Difficult process conditions are supported by a variety of special integrated system features, e.g. standard functions for automatic dust detection and for automatic contrast enhancement.

The system features a "Digital-VCR" with image snapshot- and hardcopy functions (file formats: BMP, JPG, Tiff, etc), as well as time controlled automatic -data storage, -image printout, or even -data transfer through Dial-Up-Networking. For a long-term trend analysis common spreadsheet programs may be used, e.g. MS-EXCEL™. PyroViper™ has a build in "Master/Slave-Function" for easy digital online access to PyroViper™'s continuously updated video and measurement information through the standard 10/100/1000Mbit TCP/IP Ethernet-Interface via other dedicated LAN-PC Workstations. "LAN-Data-Exchange" with process control systems (e.g. via "OPC") is also a build-in feature of PyroViper™ and can be done in most cases any time onsite without the need for expensive software engineering.

Advantages of PyroViper™-3 against conventional High Temperature CCTV-Systems	Industrial Process
Continuous- & detailed observation of combustion conditions in the burning zone by "Infrared-TV". Accurate measurement of product- and refractory temperature (optional flame temperature).	Cement- & lime- production. Waste burning.
Monitoring of the clinker- temperature distribution and the clinker- flow along the grates. Reliable "Red-River-Detection". Control of the blower efficiency and clinker bed depth.	Cement clinker coolers.
Quantitative observation & control of heating uniformity-, product quality, and combustion. Control of smelt bed size & shape. Improved boiler performance, reduced pollution, optimized fuel consumption.	Reheat furnaces & Boilers.
A typical PyroViper™-3 system configuration consists of the following basic components	
Extremely heat resistant air-cooled industrial sensor housing with "quick change back plate". Air-purged stainless steel furnace optics, a rugged lens assembly with patented "Bright Image Optical System". Heavy-duty air-cooled furnace wall-box, automatic-retract assembly, and air filtration system with regulator assembly. Calibrated-, high precision-, solid-state area sensor assembly, an enhanced 2-channel "Visual- and/or Thermal- Imager". Smart data acquisition controller & display unit (UXGA+SVideo signal output, standard TCP/IP Ethernet-LAN).	

PyroViper™-3x Specifications:



PyroViper™-3x sensor assembly for high temperature imaging and measurement

Imaging- and/or measurement- channels:	Two channels: Combination of two (2) solid state area sensors adapted to the requirements.
Sensor type(s):	Calibrated high performance solid state Silicon-CCD's and/or "Infrared-FPA's" .
CCD "imaging resolution", S/N-ratio:	> 450 TV lines horizontal (> 750H x 580V pixels), > 48 dB.
CCD/FPA "measurement resolution":	320x240 / 128x128 / 64x64 temperature measurement spots (complete image FOV).
CCD/FPA Signal output:	Analog: EIA RS-170/CCIR. Option: high speed digital link (IEEE1394, USB2, Ethernet).
Control Signals (Option):	RS-232/422/485 or high speed digital link (IEEE1394, USB2, Ethernet).
Typical calibrated temperature ranges (customized ranges available on request):	R1: 500 – 1200°C (932 – 2192°F). R2: 900 – 1600°C (1652 – 2912°F). R3: 1200 – 2000°C (2192 – 3632°F). R4: 1800 – 2700°C (3272 – 4892°F).
<u>Every sensor comes with a calibration certificate for ten traceable temperatures.</u>	
Spectral sensitivity ranges for single- and/or dual- wavelength pyrometry:	High quality industrial Silicon- CCD sensors for standard temperature ranges: - Single mode: 0.75-1.1 or 0.9-1.2µm / dual mode: 0.84-1.2µm and 1.0-1.2µm.
(Optical filters adapted to standard- and/or individual- requirements)	Optional: Infrared-FPA sensor(s) with special optical filters adapted to the application: - E.g. low temperature mode 1.2-2.7µm/2.2-4.7µm or CO2 mode 4.25µm.
Measurement accuracy:	<±1.0% (full scale).
Repeatability:	<±0.5% (full scale).
Temperature resolution:	<5°C (<9°F).
Spot size 90/50% SRF (FOV=90°D):	CCD sensors: <5/<2mrad, Optional Infrared-FPA sensors: <10/<4mrad.
Multiple Spot measurement cycle:	<10 ms (continuous measurement).

PyroViper™-3x high temperature lens assembly (standard models)

Usable length:	410mm, 550mm, 840mm, 1150 mm (16", 22", 33", 44").
Overall length / Shroud Diameter:	460mm, 610mm, 910mm, 1210 mm (18", 24", 36", 48") / 41 mm (1.625").
Field of view (FOV):	72°H x 54°V x 90°D (other standard FOV's between 36° and 110° are available).
Angle of view (AOV):	Standard AOV is "straight ahead" ("right AOV" and "obtuse AOV" on request).
Environment:	Ambient operating temperature 950°C (1742°F) without additional wall-box cooling.
Air purging/cooling requirements:	Instrument-quality air, typical 6 l/sec at 0.7MPa (17 SCFM at 100 PSI).

PyroViper™-3x sensor module enclosure (environmental protective housing)

Material:	STEELON™.
Environment:	Ambient operating temperature up to 80°C (176°F).
Protection:	IP65 (NEMA 4X).
Air purging/cooling requirements:	Identical air flow as used for the lens assembly (see above).

PyroViper™-3x data acquisition controller "PDAC" and signal I/O-interface "SIOx"

Signal input:	2 channels for imaging- and temperature measurement, imager control, system status.
Display signal output (up to 2 monitors):	SVGA 1024x768 / 1280x1024 and UXGA 1600x1200 pixels (true color, 32 bit).
Digital PC- and/or LAN- interface:	100/1000Mbps Ethernet Link
Number of measurement areas:	48 areas of interest of variable position and size ("AOI's").
Digital control signal output:	16 potential free TTL-channels for control/alarm signals (optional up to 48 dry contacts).
Analog control signal output (option):	Up to 32 channels 4-20mA continuously updated "AOI"-values (adjust. read-out interval).
PDAC-3 Dimensions/Weight/Protection:	19" aluminum rack-mount version: 380x240x120mm / 12kg / IP34 (NEMA 12X).
SIOx Dimensions/Weight/Protection:	Painted wall-mount steel box: 380x380x210mm / 12kg / IP54 (NEMA 8X).

PyroViper™-3x sensor and system accessories/options

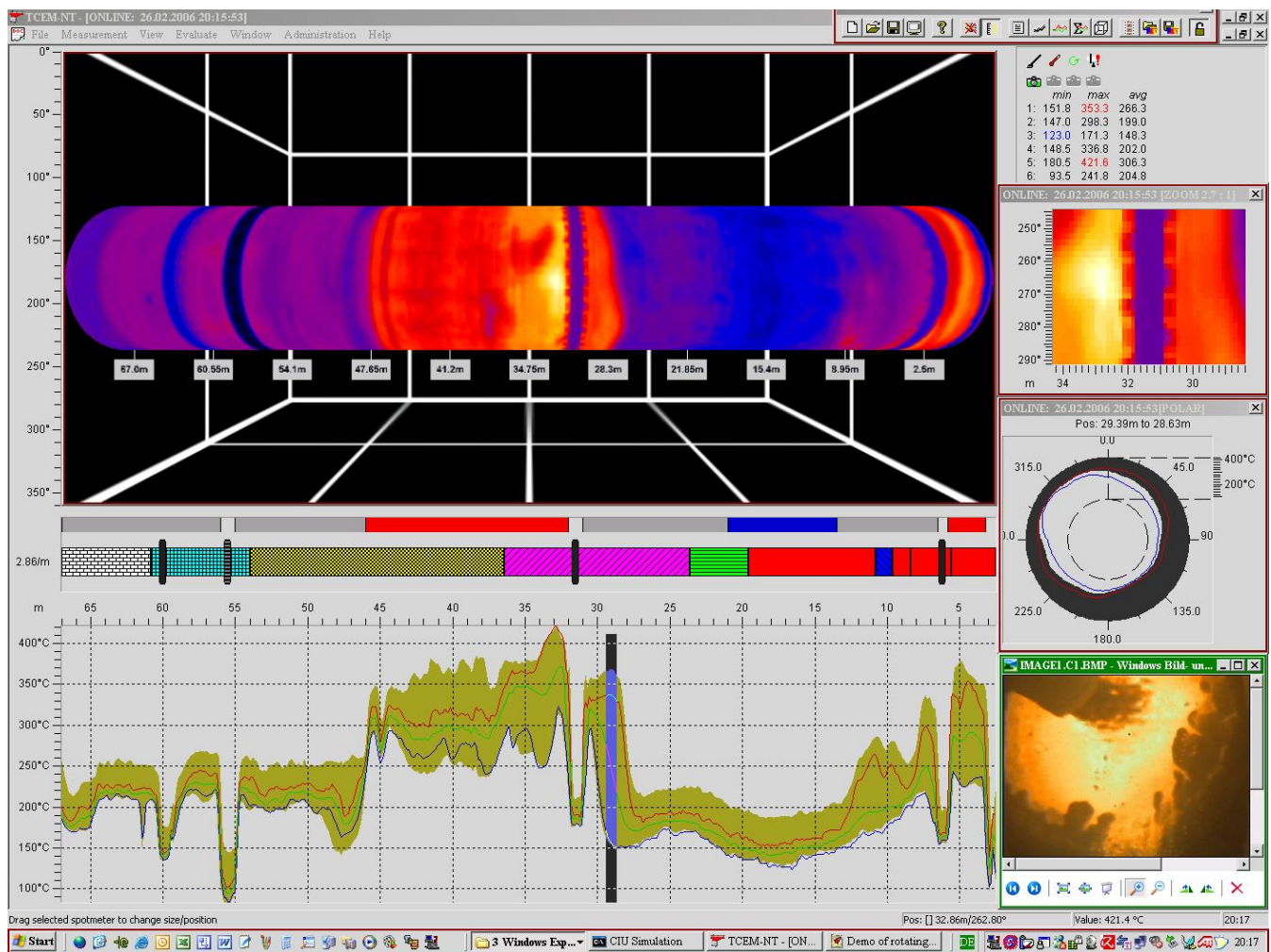
Customized optics/optical filters & CCD/FPA-sensors with calibrated temperature measurement ranges (adapted to the application).
 Air cooled heavy-duty furnace wall-box with shutter flap for continuous operation at very high ambient lens temperatures (extra water cooling is normally not required). Options: Adjustable mounting flanges, dust-tight ball-head mounting, ambient air turbine blower...
REtract- and **S**ensor **C**ontrol **U**nit **RESCU**" including Sensor power supply, signal conditioning, automatic retraction control.
 High performance auto-drain air filtration/mist separation systems. Automatic retract assembly including emergency air reservoir.

FUNCTIONAL SYSTEM DESCRIPTION:

Item 01: KTCx.NET-XP Network Application Software

KTCx.NET-XP is a modular instrumentation concept for combined industrial Temperature Measurement- and Multimedia Video applications with GESOTEC's line of state-of-the-art Kiln- and Cooler Temperature Controllers.

"KTCx.NET-XP™" is a sophisticated 32-Bit Windows Network Application Software Package for the continuous online monitoring and for the evaluation of thermal scenarios with "Millennium-TMCx" IR-Line-scanners (Kiln-Shell-Temperature) and/or "PyroViper-PVMx/CIPx" Thermal Imagers (Sinter-Zone & Cooler). The unique multiple sensor design features a variety of essential functions like a "Digital-VCR" for the recording- and retrieval of thermal images or the comprehensive trend analysis and online/offline evaluation of historical data with standard spreadsheet software like Microsoft EXCEL™. The standard software license allows simultaneous operation on up to 20 Windows-XP Workstations per plant, and includes a free of charge software update for 3 years from the date of delivery.



Operator Interface: 3D moving kiln shell temperature representation with actual burn zone camera image

Supported Sensor Modules:

- "Millennium-TMCx" Kiln Shell Scanners
- "PyroViper" Thermal Imagers for the Sinter Zone and the Clinker Cooler
- "DISCO" Clinker Cooler Scanners

Display elements on one PC-Workstation (for up to 8 Kilns and/or Coolers):

- 2D thermal image area or 3D rotating kiln for a live temperature map
- 2D thermal image area for the comparison with saved temperature maps
- Thermal profile area for live temperature data display
- Thermal profile area for the comparison with saved temperature data of kiln shell, sinter zone, cooler clinker bed
- Object (kiln) symbol with location of tires and gear
- Alarm sections
- System status area
- Spot-meter readout area

Colored representation of the temperature distribution (Kiln Shell Temperature Map):

- Scalable display of current thermal image (Line-scanner, Thermal Imager, etc.)
- Adjustable temperature map size (spots per line x lines): from 512x200 up to 3200x800
- Horizontal and vertical scales (units: m, ft, degrees, %, user)
- Temperature resolution 0.25°C, Temperature Range 0-1024/2048°C
- Linear temperature scale (units: °C, F, K, W/m2, %, user)
- Display in pseudo colors (5 pre-defined and 3 user-defined palettes)
- Selected temperature range: fixed or automatic
- Zoom display in separate window, variable zoom up to 1:10
- Indicator rectangles for spot-meters and zoom area
- Read-out cursor for position and temperature data

Current representation of the temperature profile of the kiln shell (horizontal temperature profile):

- Summarizes current image into 3 linear temperature profile curves: min, max, average
- Linear horizontal scale (units: m, ft, degrees, %, user)
- Temperature resolution 0.25°C, Temperature Range 0-1024°C
- Linear temperature scale (units: °C, F, K, W/m2, %, user defined)
- Selected temperature range: fixed or automatic
- Horizontal and vertical gridlines on/off
- Select from up to three user-defined reference profiles (displayed as background)
- Read-out cursor for position and temperature data

Thermal cross-section temperature profile (vertical temperature profile):

- Summarizes a selected section into 3 linear temperature profile curves: min, max, average
- straight or circular ("polar") vertical scale
- Linear circumference scale (units: degrees, m, ft, %, user)
- Linear temperature scale (units: °C, F, K, W/m2, %, user)
- Horizontal and vertical gridlines on/off
- Read-out cursor for position and temperature data
- Polar display for showing "relative wall thickness" (relative thickness of coating + brick)

Spot-meters with trend- and alarm features:

- Within the thermal image display area up to 32 freely adjustable (size and position) measurement spots
- Display of min, max, and average temperatures on screen
- Temperature range check (upper and lower alarm limits) with digital alarm signal output
- ASCII file table containing alarm results
- Spot-meter trend data logging
- Analog signal output (Option)

Alarm sections with trend feature:

- Up to 32 freely adjustable (size and position) horizontal alarm sections
- Individual temperature alarm limits for each section
- ASCII table file containing section alarm results
- Display of min, max, and average temperatures on screen
- Alarm status can be bound to digital output channel

Long-term data storage

- Save current image with comments to file
- Time-controlled automatic storage of complete thermal images
- Time-controlled automatic storage of thermal profiles (min, max, average - values)
- Storage intervals are freely selectable in time and/or every kiln rotation
- Long-term data storage in historical data-base is freely selectable, e.g. week, month, year, unlimited
- Size of data-base is limited only by hard-disk capacity

Evaluations:

- Live 3D-display of current image (MS-Excel)
- Reload and display historical profile data (MS-Excel)
- Generate trend plots (min, max, avg.) from arbitrary sections over arbitrary time intervals (MS-Excel)
- Reload and evaluate previously saved single images or image series
- Digital "thermal VCR" (replays series of thermal images like a Video Cassette Recorder)

Object symbol (kiln):

- Colored display of refractory zones with definition of different refractory lining (or other information)
- Display of kiln tire and gear positions
- Display of rotational speed
- Display of tire-slip measurement results (if optional hardware is available)
- Colored coded display of current alarm section status
- Double-click shortcuts to obtain more detailed information on alarm sections and lining zones

Status display area:

- Operational status for Infrared- Sensors (status and fault signals)
- Status of data communication, kiln sync.- and optional tire slip sensors
- Spot-meter values (max, min, average values + alarm status)

Operation:

- Context-sensitive menus at various places
- Tool-Tips and status bar give short information for toolbar buttons and menu entries
- Context-sensitive online-help with index and search functionality
- All menus, dialogs and other texts can be modified on site to suit foreign operator languages
Standard scope of supply: English, Spanish and German, other languages are available on request

Configuration:

- Selectable colors and character sizes for spot-meters, scales, etc.
- Definition of all program parameters via dialogs (saved in readable INI files or in the Win-xx registry)
- All relevant system settings are restored upon program start (storage only in Administrator-mode)

Security:

- All relevant settings and measurement parameters are secured by password (administrator-mode)
- Windows-XP file and system security can be used
- Program cannot be terminated or suspended in operator-mode

General:

- Operating System: Windows XP
- Controls multiple Infrared Line-scanners and/or Thermal Imagers that are connected via suitable GESOTEC Data-Acquisition Controllers (xDAC-units).

Item 02: Kiln tire slip monitoring (optional)

The system can monitor the slip or clearance between kiln and supporting tires for up to eight tires per kiln.

The package consists of:

- one heavy-duty precision proximity type switch for each tire (high temperature resistant up to 260°C)
- interface electronics for signal conditioning and alarm output, application software

Item 03: Refractory Management

It consists of a MS-EXCEL/ACCESS™ database system. It provides the combination, evaluation and representation of all relevant refractory and lining data for rotary cement kilns. Installed at the very beginning of thermal kiln monitoring, and consequently fed with necessary data, it will provide a powerful database with the following functionality:

- storage and retrieval of all relevant lining management parameters for the entire kiln life, e.g. brick types, drilling data, wear rates, etc.
- efficient long term data storage
- forecast near brick wear-down
- rapidly figure out which brick types live longest in which kiln zones
- look over the complete relining history for the entire kiln
- review brick consumption for selected periods or selected kiln zones

Administration of kilns	unlimited
Number of different brick types	256
Number of different lining segments per kiln	65536
Number of drilling points per drilling chart	65536
Number of drilling charts	65536
Number of relining events	65536
Access control	user name / password

General Data Input and Data Display / Listing

- measured brick/coating thickness (from drilling data)
- production rate (tons per day)
- production hours per day
- time elapsed since last relining action (brick age)
- thermal conductivity of lining material (bricks)
- format of lining material (bricks)
- brick wear rate per day (from relining data)
- brick wear rate per ton clinker produced (from relining data)
- min., max. and average temperature and/or heat-loss profile for any lining section

Data Evaluation and Display of Trend Charts

- measured brick/coating thickness (from drilling data)
- production rate (tons per day)
- production hours per day
- min, max and average temperature versus
- estimated brick thickness (from wear rate per day data)
- estimated brick thickness (from wear rate per ton data)
- estimated wall (brick & coating) thickness calculated from temperature/heat-loss- and drilling- measurement data

Documentation

- color hardcopy printout
- tabular and/or list printout

Item 04: INSTALLATION, COMMISSIONING, TRAINING

Installation supervision

For supervising installation of the equipment offered by local personnel, we recommend the assignment of a supplier's site manager. The time required for the supervision of system, installation and setup works is an estimated figure. It takes at under normal conditions approximately 3-10 man-days per Line-scanner or Imaging-Pyrometer. Invoicing will be on a time and cost basis at the actual rates plus fees and extra costs.

Commissioning

For commissioning the equipment, we recommend the assignment of a supplier's start-up engineer.

Invoicing will be on a time and cost basis at the actual rates plus fees and extra costs.

If installation is carried out properly, we estimate that the following times will be required for the system:

- Hardware see Item 05
- Software: see Item 05

Traveling and waiting times, times for modifications, training and information of the operating personnel are not included and thus will be charged separately.

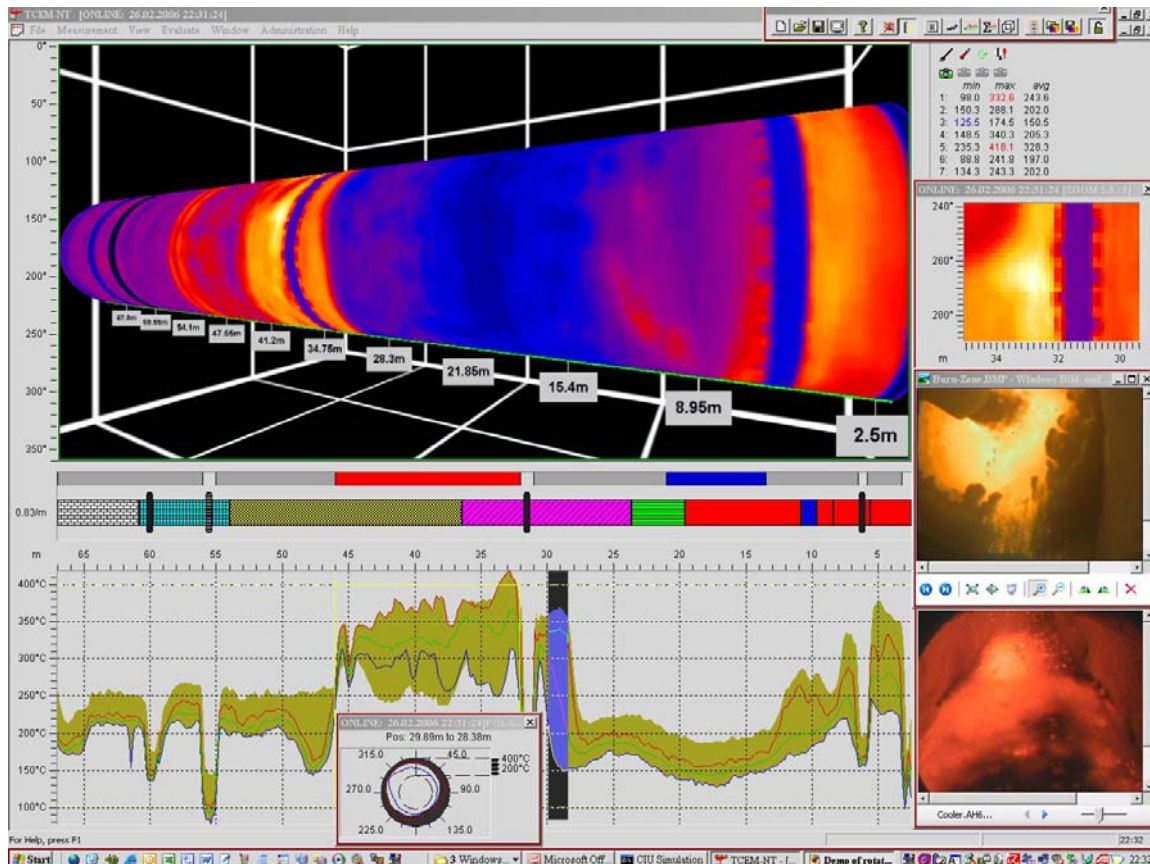
Customer training

Kiln shell scanners require regular routine maintenance to ensure continuous operation. We therefore recommend that the customer's local service personnel be instructed by our start-up engineer. This should be done on site after commissioning and enable the local service technicians to carry out maintenance work.

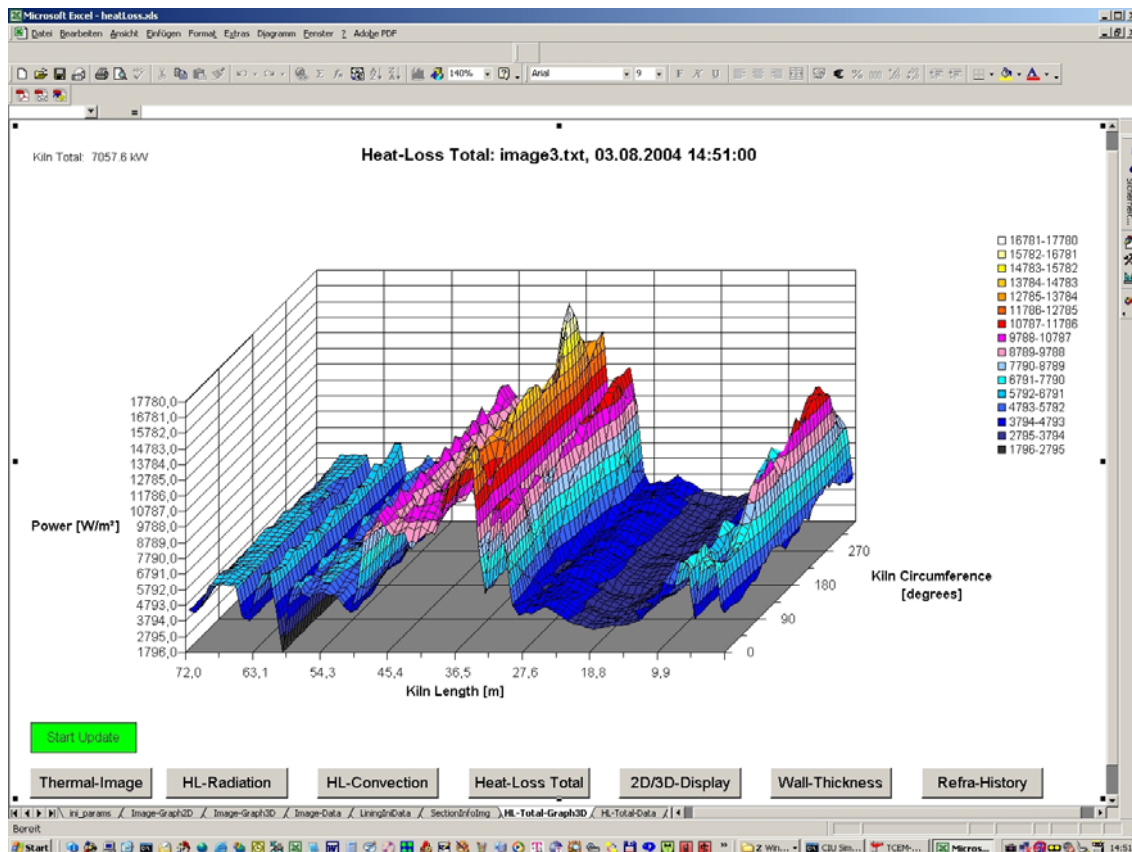
The estimated time required for training is at approximately 1 to 2 man-days.

Invoicing will be on a time and cost basis at the actual rates plus fees and extra costs.

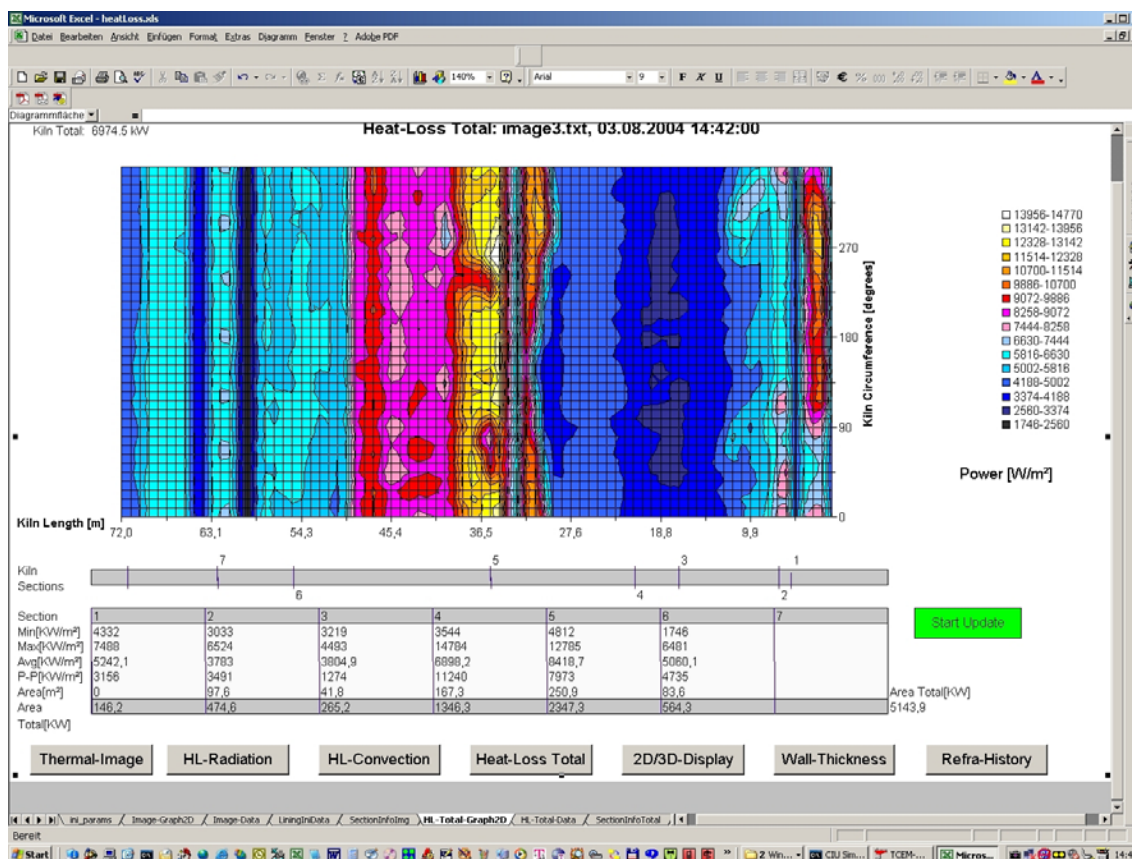
Item 05 Detailed Scope of Supply and Prices: See separate Document



Operator Interface: 3D moving kiln shell temperature representation with actual burn zone and cooler camera images



Operator Interface: 3D kiln shell heat-loss representation



Operator Interface: 2D kiln shell heat-loss representation