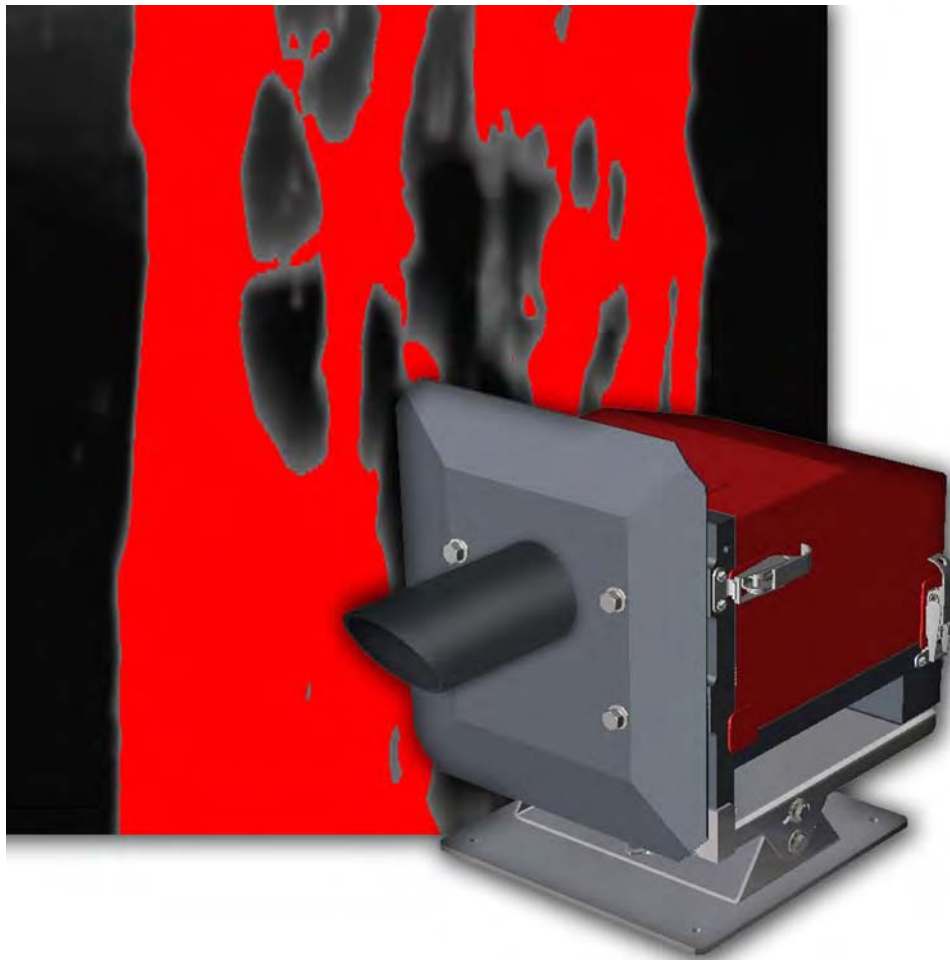


LAND
instruments international



SDS

The definitive infrared thermal imaging
system for steel slag monitoring





The definitive infrared thermal imaging system for steel slag monitoring

THE PROBLEM

When liquid steel is tapped from a basic oxygen or electric arc furnace, it is essential to minimise the quantity of slag carried over into the ladle.

In the past this has been done by visual observation of the tapping stream or by the use of electromagnetic induction coils mounted onto the furnace. However, neither of these methods has proved to be entirely reliable.

PROBLEMS OF SLAG CARRY-OVER

- Slag layer hinders addition of alloys and conditioners
- High levels of FeO and MnO results in high oxygen content of steel leading to increased processing time and treatment costs
- High inclusion formation, steel cleanliness problems and increased risk of nozzle clogging in the caster
- Phosphorous reversion in the ladle
- Poor ladle desulphurisation
- Ladle refractory wear

THE SOLUTION

The new LAND thermal imaging Slag Detection System SDS has been developed using Land's expert knowledge of the application and over 58 years of experience in the steel industry to monitor and aid control of slag carry-over from one process to another.

The SDS system is specially designed to withstand the harsh conditions of continuous operation in the steel plant, with minimum maintenance required. The industrial thermal imaging sensor is housed in a rugged water-cooled and air purged enclosure, continuously viewing the tapping area. As the tap commences, the dedicated LIPS SDS software automatically begins to record the tap as well as producing a data log and graph of the relevant steel/slag data.

When the level of the slag reaches the predetermined level an alarm is generated to stop the tap. The recording will end and the files saved by tap number. Full access of the tapping data is available to the operator for quality control purposes.



Rugged SDS thermal imaging sensor using the latest focal plane array detector

BENEFITS OF THE SLAG DETECTION SYSTEM

- Automatic operation
- Enhanced data output for tap analysis
- Accurate detection independent of charge weight
- Reliable alarm independent of operator
- Improved yield
- Lower slag content improving steel quality
- Lower maintenance on BOF/ EAF vessel
- Reduced energy costs

The SDS display allows users to observe critical tap information such as the live thermal image, steel and slag percentages, time versus percentage graph, alarm level and alarm status.

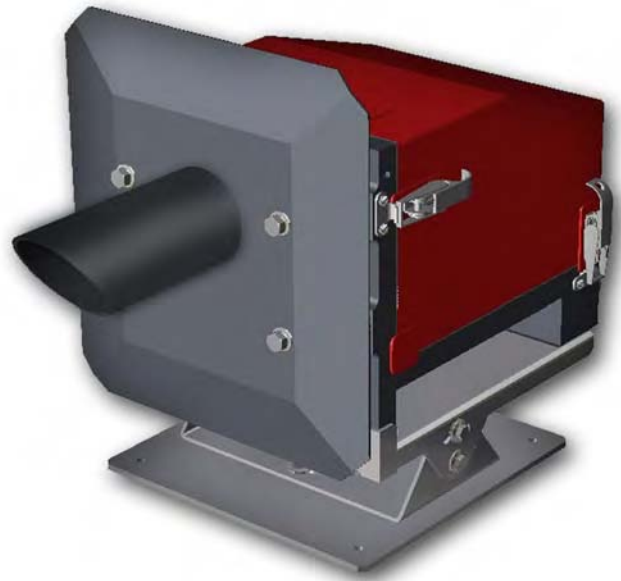


PROTECTIVE ENCLOSURE

Rugged water-cooled enclosure with an integral air purge, sacrificial protection plate, water cooling and adjustable mounting bracket, supplied as a complete assembly for ease of installation.

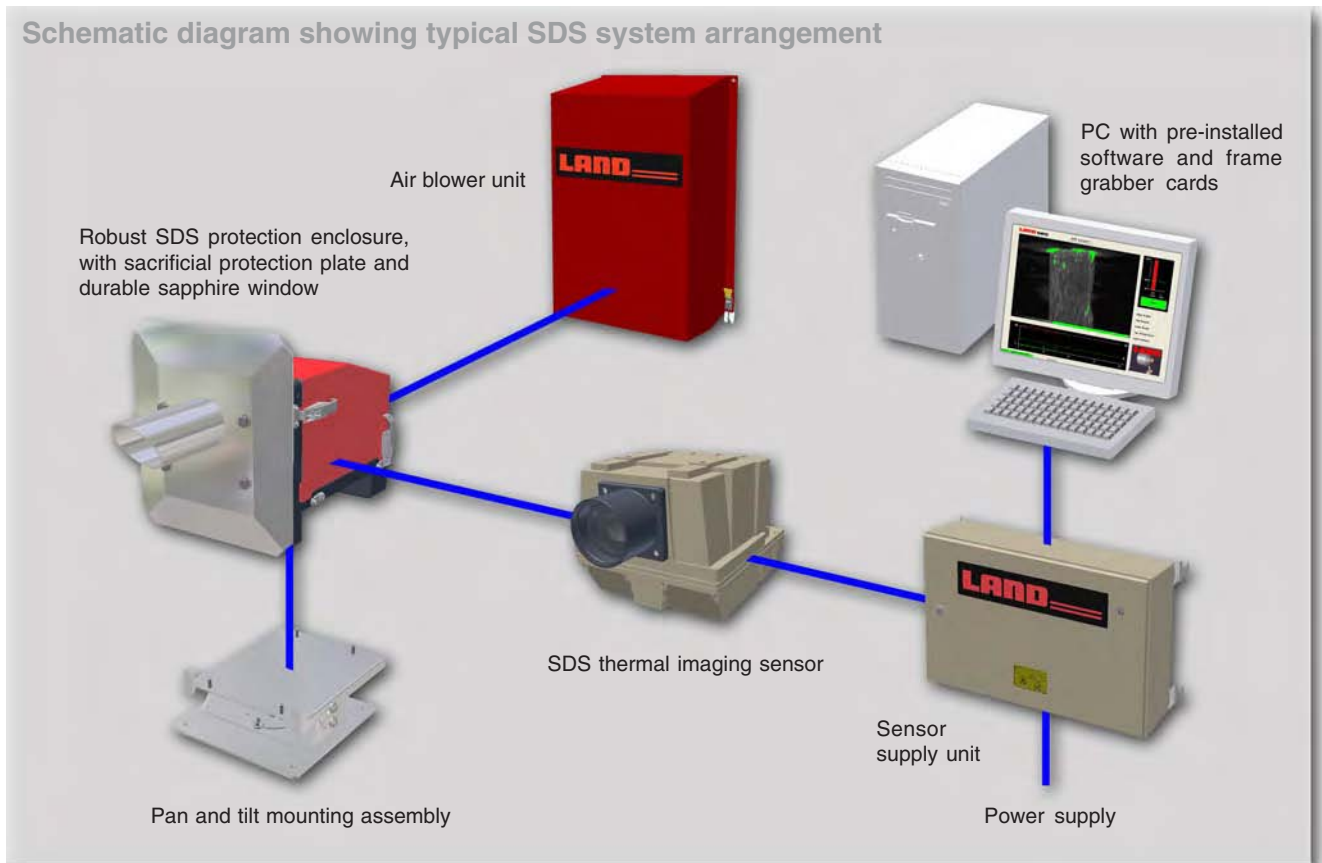
FEATURES

- The sacrificial protection plate and sighting tube, available as a spare part, is supplied to protect the main enclosure from direct impact of liquid metal.
- All electrical, water and air services, and system signal connections are located at the rear of the enclosure for added protection.
- The sighting tube also significantly reduces the risk of direct impact of liquid steel against the sapphire window which protects the imaging sensor.
- The imager can be removed from the enclosure without the need of tools.
- The housing is supplied with one cable for serial communications, video and power supply, protected by conduit supplied as standard to provide further protection.
- Once mounted to the steel plant, the adjustable bracket allows both pan and tilt movement to precisely align the imaging sensor to the tapping stream.



Robust housing assembly complete with durable sapphire protection window, pan and tilt mounting, air purging and water cooling services

Schematic diagram showing typical SDS system arrangement



SDS

New powerful thermal imaging slag detection software system

This comprehensive, fully featured software system has been developed to provide the steel plant engineers and managers with the tools to develop and improve the transfer of steel from one process to another.

SDS offers the steel plant a number of interconnectivity methods for on-line control and, more importantly, it automatically records the tap data in three forms for post analysis and future process improvement.

In addition to this, the image processing system has been pre-installed and configured to work straight out of the box – minimum set-up is required. Once the system hardware is installed onto the steel plant, the moment the system is

turned on, the steel plant can immediately begin to reduce slag carryover. No other thermal slag detection system currently available offers these features.

Pre-installed on the powerful image processing system, the display allows users to observe critical tap information such as the live thermal image, steel and slag percentages, time versus percentage graph, alarm level and alarm status.

Secondary information such as tap number, sensor temperature, comms status, tap duration, steel / slag ratio and record status are less prominent so as to not distract the user during the tap.

● Full Screen Display

Allows users to observe the critical live tap information.

The three main display screens show the live thermal image, alarm level window and display graphs.

Also on screen are the location identifier, tap number, system status bar and an area for the plant logo.

● Display Graphs

A bar or line graph displays the steel and slag percentage versus time. A pie chart illustrates the total steel slag pixels during each tap, this is extremely useful when comparing taps. This screen also shows alarm condition status.

This information, along with the thermal video and all text data, is automatically recorded as soon as the tap commences.

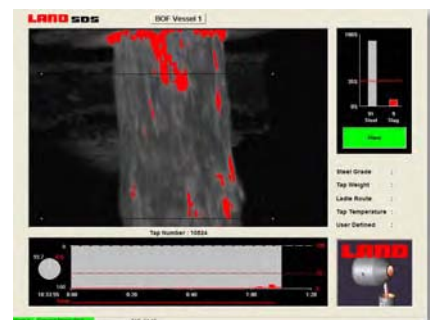
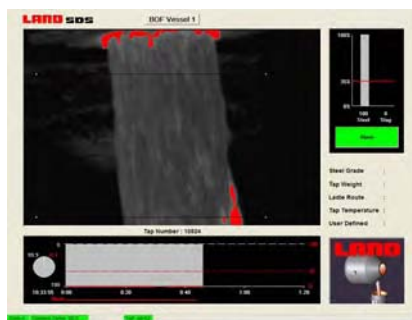
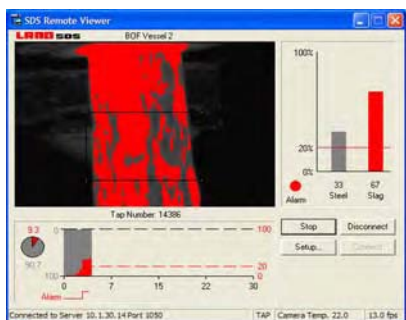
● System Status Bar

Displaying communication status, imager temperature status, tap duration and Ethernet connections.

● Remote Viewer

Up to 4 remote connections allow viewing of live tap information to be viewed anywhere on the plant network.

Remove Viewer screen shown below



Up to four users can also view remotely a condensed view of the live tap anywhere on the plant network by using the remote viewer software.

At the end of the tap the video, text data and graph are saved by tap number for later analysis and can be automatically deleted after a user defined number of days.

Inputs and outputs from the steel plant and slag detection system include: digital output, DDE, OLE, Ethernet and OPC.

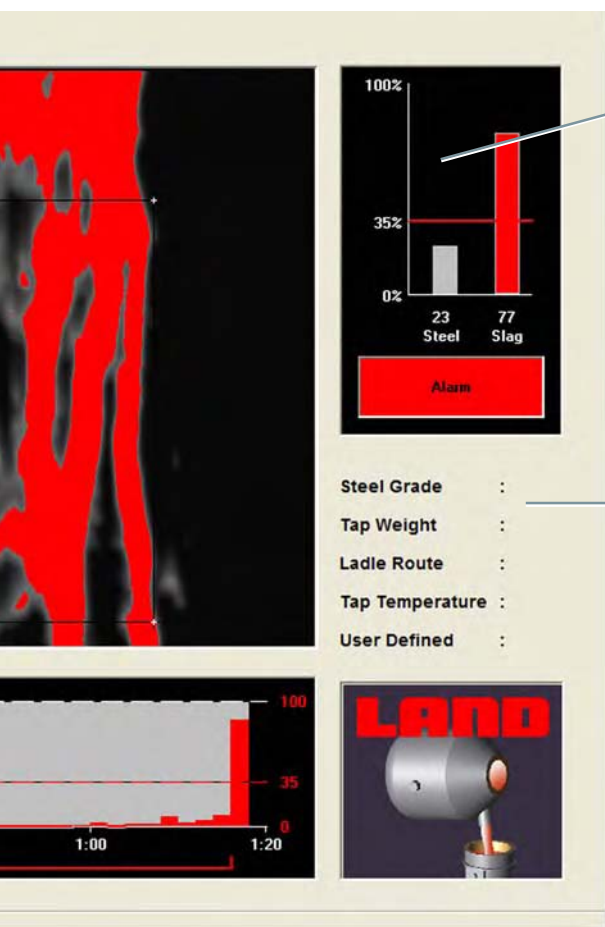
Connecting the image processing system to the plant network via either OPC or Ethernet protocols allows live

data transfer to and from the slag detection system to improve the steel transfer process.

Data to the slag detection system includes tap number, alarm level and five unique variables specified by the steel plant such as charge-number, heat-number, steel grade and tap temperature. When used, these data are recorded in the saved text data file.

Data output from the system can be transmitted at the equivalent of 25 frames per second.

This information includes steel slag percentage, alarm status, sensor temp and communications status.



Alarm Level Window

- Steel and slag percentages
- Alarm level
- Alarm status
- Steel, slag alarm percentage, steel/slag alarm status, available via OPC and Ethernet connection. Values can be transferred to SDS from the steel plant via OPC or Ethernet.

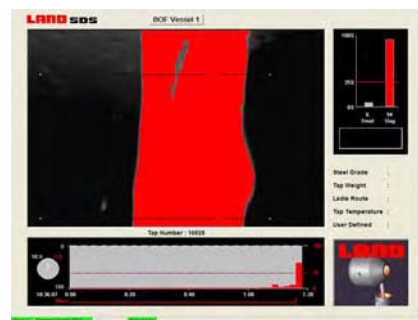
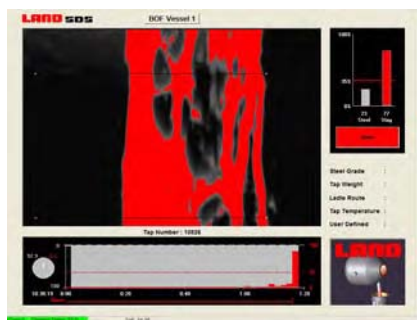
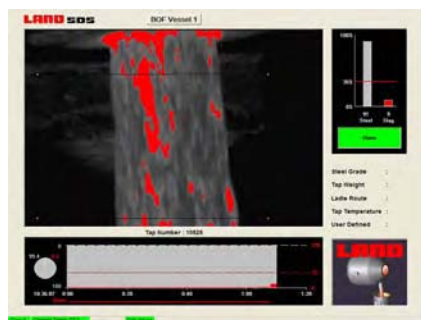
User Defined Variables

Any five user defined variables can be chosen with corresponding values altering as determined by the steel plant.

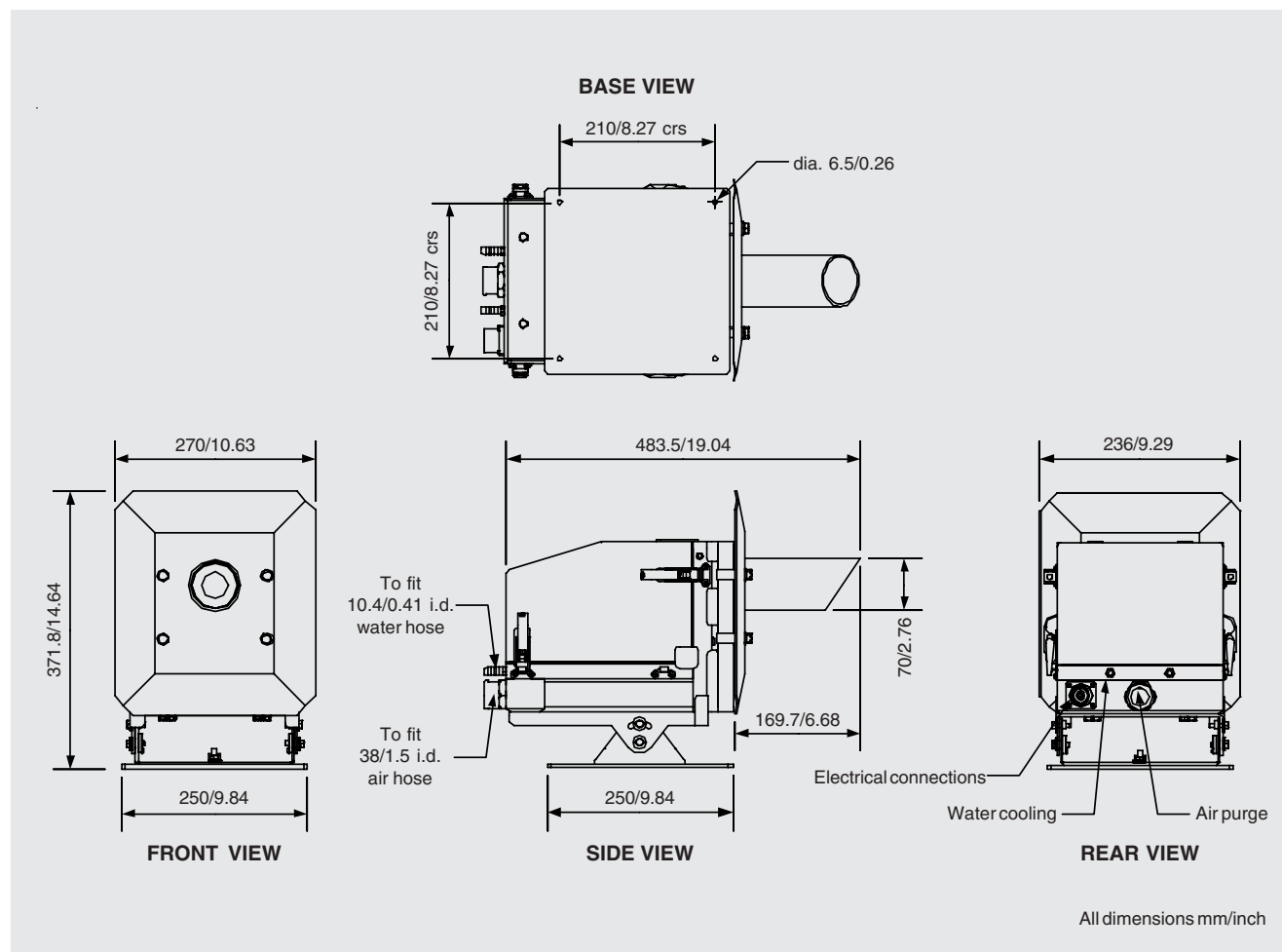
This information is included in the auto record data for each tap.

Language

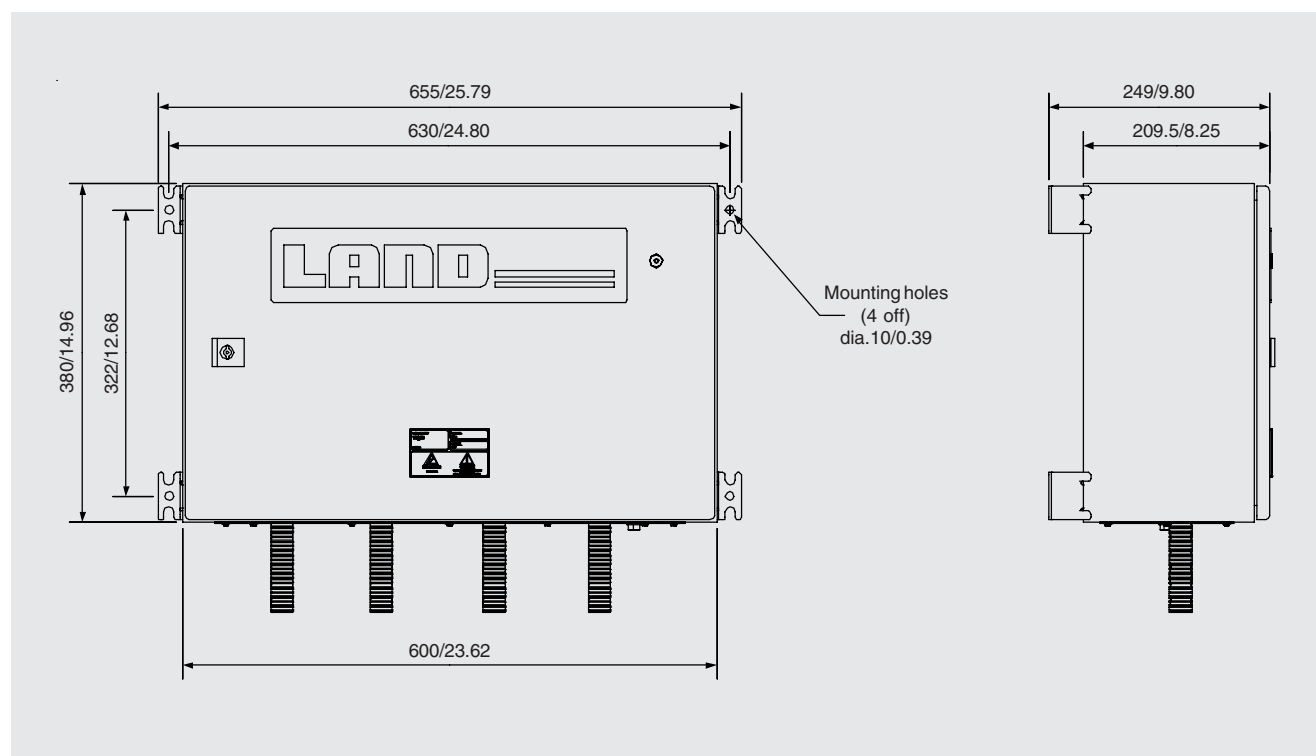
All text displayed on the full screen can be user configured to suit the required language.



SENSOR PROTECTIVE ENCLOSURE DIMENSIONS



SENSOR SUPPLY UNIT DIMENSIONS



TYPICAL SYSTEM

- Pre-configured image processing system
- Serial communications and video cable set pre-wired and labelled to suit plant
- Power, communications and video connection service panel mounted up to 10m from the sensor enclosure
- Pre-wired 10m cable and conduit supporting serial communications, video and power connections
- Rugged water-cooled enclosure with an integral air purge and adjustable bracket
- High-resolution FPA thermal imaging sensor and integrated telephoto lens
- Optional air purge blower unit and hose mounted up to 30m from the sensor enclosure

OUTLINE SPECIFICATIONS

Image Processing System	
Slag detection:	Alarm activation when a preset percentage of either slag or steel detected within defined window
User display:	Front page information display, plant logo and location identifier
Frame rate:	25 frames/sec
Automatic functions:	Auto tap detection, steel/slag ratio, video file, log file of all data, steel/slag percentage graph, all saved as tap number.
Language:	User defined
Outputs:	Digital output card, DDE, OLE, Ethernet and OPC Options
Sensor Supply Unit	
Functions:	Local connection interface between imaging sensor and image processing system
Cables:	30/150/300m pre-wired and labeled, greater distances to 1km are available
Enclosure	
Service:	Water, air, power input, communications, video, located to the rear of the enclosure
Added Protection:	Sacrificial plate protects the main enclosure from direct impact
Sighting tube:	Design significantly reduces the risk of direct impact of liquid steel against the field replaceable sapphire window
Air bleed:	Provides positive pressure within the enclosure
Environmental rating	IP65
Thermal Imaging Sensor	
Temperature measurement range:	600 to 2000°C
Thermal image resolution:	320 x 240 pixels
Detector:	Microbolometer, focal plane array
Wavelength:	3.9µm
Field of view:	6° x 4.5°
Motorised focusing range:	3m to infinity
Options	
Blower unit, setup monitor, sensor carry case	

*For further information please contact the appropriate office or
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