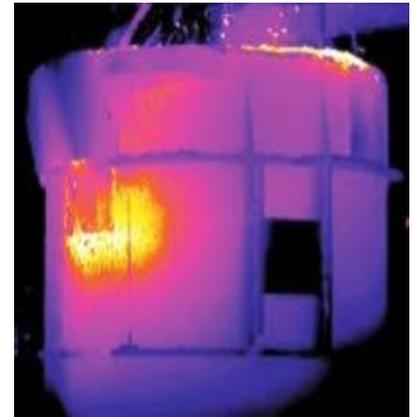


### Ladle Hot Spot Detection

VISIR-LadleSafe infrared monitoring of your steel ladles minimises the risk of liquid steel breakout and maximises your ladle refractory lifetime. The system also improves operator safety through more efficient ladle fleet management.



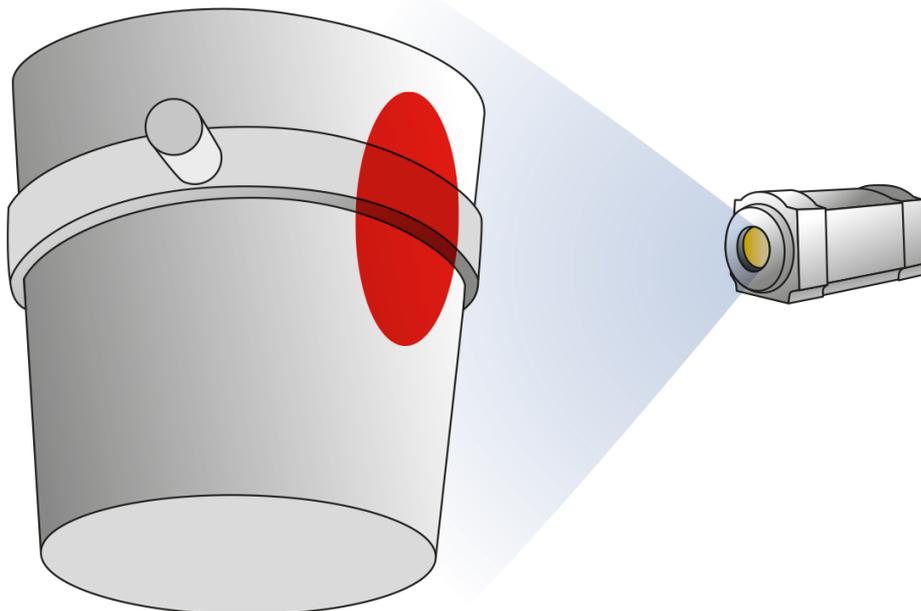
The risk of a ladle breakout will always be present in steelmaking with equipment damage and loss of production as the costly consequence. Your production and operation routines could minimise this risk, but the fact remains; as long as liquid steel is transported using ladles – breakouts will occur from time to time. Besides the economic impact of a ladle breakout is it a very dangerous event and there

is a potential risk of personnel injury or loss of life. The VISIR-LadleSafe system is designed to help you avoid this costly and dangerous situation.

By setting up the system with full and fixed view of sides and bottoms, an instant picture of the ladle is taken and stored in a database, which can be used to compare each ladle with itself to

see changes on the surface. It will add about 5 seconds to the production process.

VISIR-LadleSafe can pay for itself very quickly, by avoiding only one breakout. There are great savings to be made with control of ladle use and refractory wear.



Agellis follows a policy of continual improvement of design and we must therefore reserve the right to supply equipment differing in detail from that described herein.

## Key Features

### Breakout Early Warning

Early warning of potentially dangerous ladle hot spots. VISIR-LadleSafe detects hot spots long before they are visible to the naked eye (red hot), thus allowing preventive actions to be taken long before a critical situation occurs.

### Temperature Trending

A VISIR-LadleSafe measurement of the ladle steel structure temperature distribution also presents the temperature evolution over time. This information is useful for the refractory maintenance personnel.

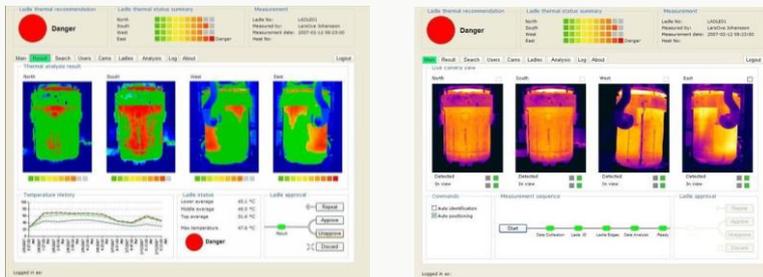
### Ladle Refractory Lifetime

VISIR-LadleSafe allows ladle refractory lifetime to be maximised. A direct measurement of the ladle steel structure temperature when in use is likely to reflect the refractory status. Thus, as long as the temperature stays below a predefined value, the refractory should be safe to continue using.

### Data Mining

VISIR-LadleSafe contains a measurement results database to be used for evaluation purposes. This opens the way to a more precise ladle fleet management that avoids excess thermal loads on some individual ladles and prolongs ladle refractory lifetime. Database mining is also useful in tracking down production actions harmful to the ladle refractory.

## User Friendly Interface



VISIR-LadleSafe automatically rates and analyses each ladle view and a summary is presented to the operator.

## Principles of Operation

### Technical Overview

VISIR-LadleSafe is based on the thermal imaging technique, using infrared cameras to feed data to the system analysis software. A Windows based server hosts the VISIR-LadleSafe analysis models, vision system and databases. The server communicates with plant systems (Level 1/2/3), operator clients, and peripherals using TCP/IP and industry-standard protocols for data exchange.

The VISIR-LadleSafe technological package is built as a web-application for easy installation and maintenance. The user has access to the system by using the standard web-browser and a local Ethernet – no client installation required.

A typical VISIR-LadleSafe set-up consists of one or several operator panels that control the measurement by using a touch screen client mounted at the work station pulpit, in a crane, or on the shop floor.



### Thermal cameras

VISIR-LadleSafe uses Thermovision thermal cameras from Flir Systems, the world's leading supplier of infrared imaging equipment. The Thermovision A-series cameras are designed for continuous 24/7 operation and is a highly accurate temperature measurement system, offering tens of thousands of individual measurement points per image.

## Technical Information

### Imaging performance

**Resolution:** 76 800 measuring points per camera

**Thermal sensitivity:** 70 mK at 30°C

**Focusing:** Automatic/Manual

**Detector type:** Focal Plane Array (FPA), uncooled microbolometer

**Spectral range:** 7.5 to 13 μm

### Measurement

**Measure temperature range:** -20°C up to +1200°C

**Accuracy:** ±2°C or ±2% of reading

**Emissivity correction:** Variable 0.1–1.0

### Physical specifications (camera)

**Weight:** 0.7 kg

**Dimensions:** 170 mm x 70 mm x 70 mm

**Operating temperature range:** -15°C up to +50°C

**Humidity:** < 95%, non-condensing

**Encapsulation:** Aluminum IP40 (determined by connector)

### Camera protection housing

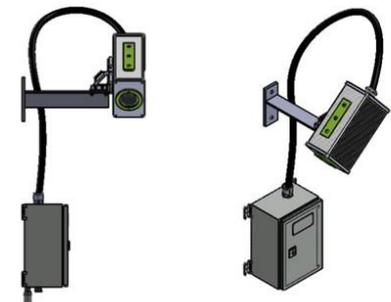
**Type:** Different options depending on local condition

**IP Rating:** 67 and above

### Others

A number of standard lenses are available to adapt to different measurement scenarios.

Typical VISIR protective housing solution:



Agellis follows a policy of continual improvement of design and we must therefore reserve the right to supply equipment differing in detail from that described herein.

### AGELLIS Group AB

Tellusgatan 15  
224 57 Lund  
Sweden

Phone: +46 (0)46-10 13 60  
Fax: +46 (0)46-10 13 61  
Email: info@agellis.com  
www.agellis.com

### Your local representative: