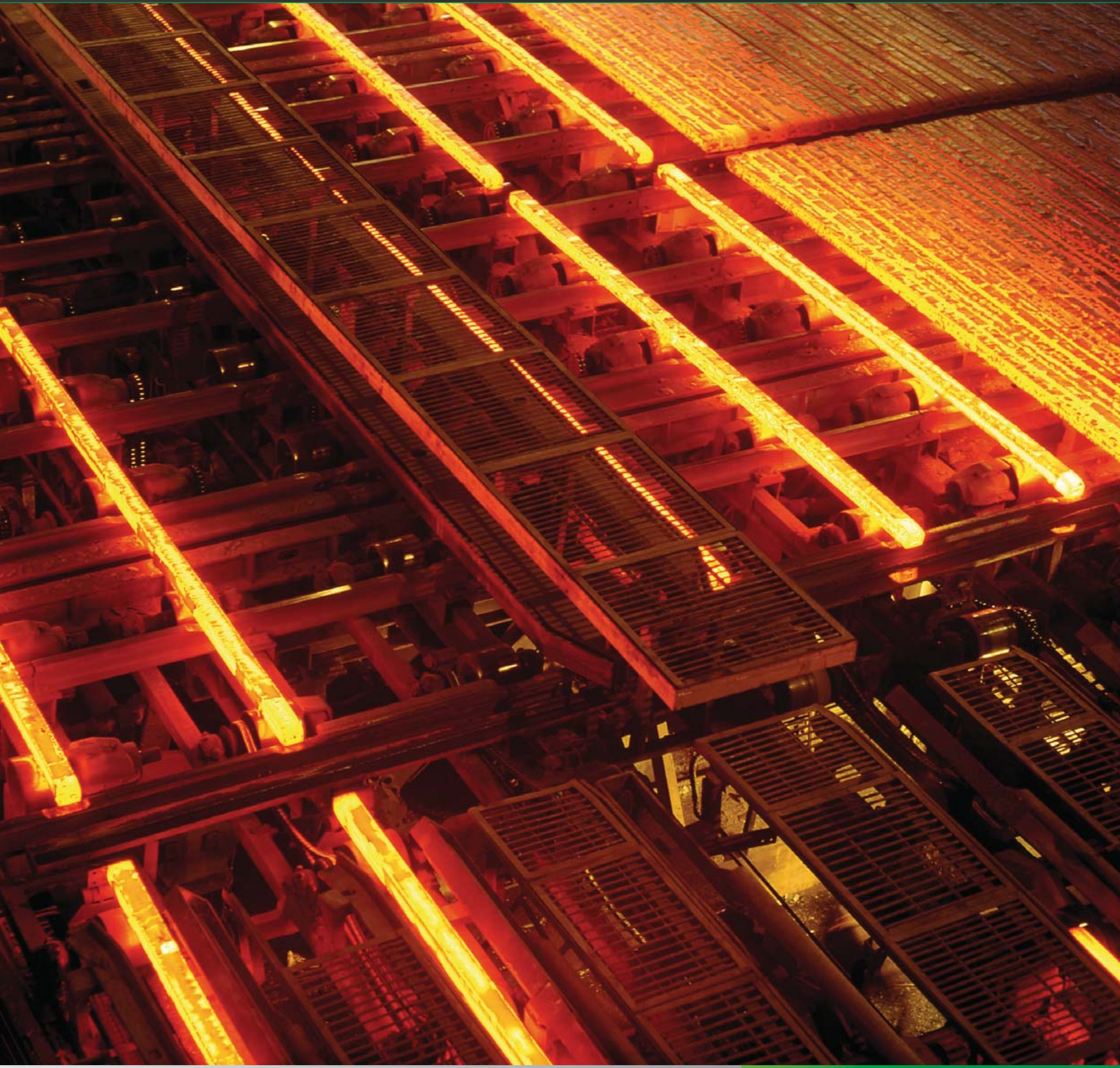
DIAS
Infrared Systems

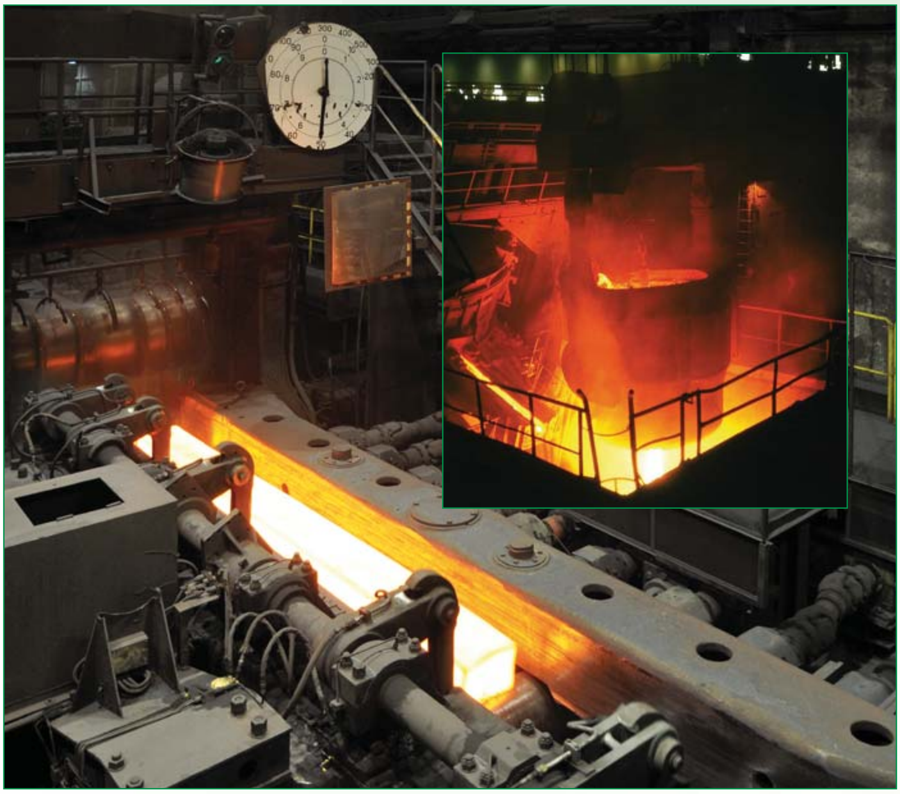
Quality Management in Strand Casting Factories

With Fixed Infrared Cameras

PYROVIEW



Quality Management in Strand Casting Factories



High temperatures are mostly coupled to a high energy input. The quality of the final goods quite often depends on the temperature control.

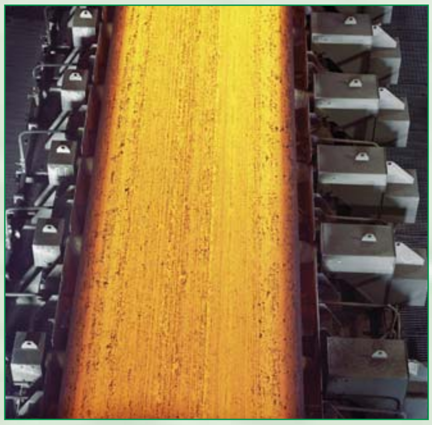
The **product quality as well as the energy demand can be deciding affected** with the appropriate measurement devices. The measurement system amortizes very fast in many cases, so that a better quality is achieved with a less energy input.

Typical applications can be found for instance in the steel industry. A mostly rectangular strand profile is formed out of liquid steel with a mold. Afterwards, the strand profile has to be cooled down in several levels.

Depending on the size of the factory there can be several strands too. The optimal cooling-down of the strands can be controled with several water nozzles in several zones.

Also the writing speed (e.g. 2-3 m/s) affects the cooling down and of course directly the **efficiency** of the factory. After the steel strand has left the cooling zone, it is completely set. Afterwards it gets usually cut with the help of blowpipes into the desired lengths.

The optimal material properties are only achieved when all process parameters are right in the casting process and the steel is set in a homogeneous alloy structure. It can get particulary expensive if quality defects are recognized later in the further processing. Typical examples are steel wire for car tires or steering components for trucks as well as other safety components which must have an increased economic life-time. If the process temperature is too high, the material structure is seriously affected. If the process temperature is too low, cracks can be formed quickly when straightenig the strands. The most important process parameter for the optimal control is thereby the temperature measurement on the outflow zone of the strand if a high surface temperature and a crack-free internal structure are required.



Because the typical temperature are in the range between 800 °C and 1000 °C and the measurement object is moving, optical temperature detectors are used. Conventional pyrometers have proven particulary useful that detect infrared radiation preferably short-wave and calculate out of it the surface temperature of the steel. Devices that measure long-wave (8 µm to 14 µm) are less usefull because the steel surface oxidates when cooling and thereby the radiation characteristics change intensly in the range from 8 µm to 14 µm and secondly because the water vapor disturbs in this wavelength range.

The traditionally used pyrometers measure though only one point on the strand or one line if a IR scanner or a pan-pyrometer is plugged. Only one side of the strand is reached with it. Because all sides of the strand should be cooled all-over, the detection of the entire surface (top, bottom, left side, right side) should be aspired.

with Infrared Cameras PYROVIEW

That can be realized best with minimum two infrared cameras **PYROVIEW 640N compact+** that measure from the left side and right side one strand or several strands. In this way, three temperatures of the steel strand can be generated (left side, right side, 2× top side – is seen by both cameras).

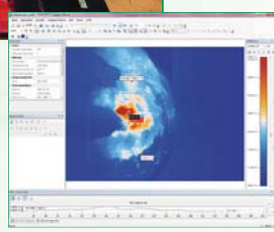
If the bottom side should be measured too, a third camera is necessary. However, a suitable mounting position is not available in mostly factories. An easy validation of the measurement values is possible because the top side of the strand is detected by both cameras. In addition you get a certain redundancy.

The infrared camera **PYROVIEW 640N compact+** provides thermography images with a high resolution of 640 × 480 pixels and allows a more flexible temperature data acquisition on the entire strand output, independent from the particular geometry that is produced.

The convenient online software **PYROSOFT** allows the easy definition of the particular measruement zones on the computer.

The camera can be used for process monitoring as well as for R & D tasks (IR video recording for later detailed analysis, testing of other steel qualities, change of parameters, data evaluation via mathematical composition, and so on).

Because of the high geometrical resolution of 640 × 480 pixels, temperatures can be detected very well even from great distances. The influence of the measurement by tinder is improved substantially in contrast to a point-shaped evaluation (pyrometer), because minimum non-scaled positions are enough for the temperature detection (maximum value evaluation). Special evaluation functions allow an automatic display of the hotspot temperature that is specifically importontant for the process control.



Depending on customer demands the thermography system can work autonomically as a support for the factory operator in the control panel or it can be connected directly to the programmable controller. The automatic control increases not only the product quality but also possibly reduces personnel costs because one operator can supervise several factories. The temperature measurement data and the camera image can be notified to the operator on a screen and are displayed in trend charts. In addition, all relevant data can be tied to the custom-quality system to enable a long-term recording and documentation.

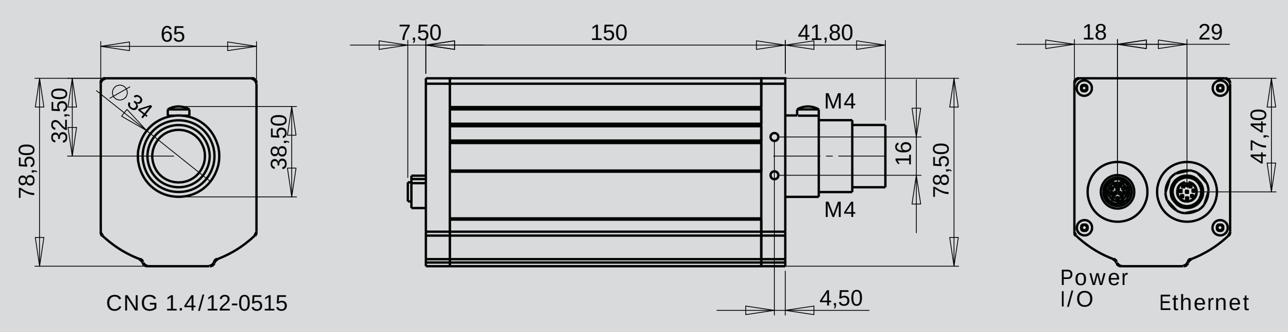
DIAS
Infrared Systems

Technical data

Spectral range	0.8 µm to 1.1 µm
Temperature measurement range[1]	600 °C to 1500 °C, optional 2500 °C
Sensor	high dynamic 2D Si CMOS array (640 × 480 pixels)
Lens[1]	32° × 24°, spatial range 0.9 mrad optional 46° × 35°,spatial range 1.3 mrad, optional 23° × 17°, spatial range 0.6 mrad, optional 17° × 13°, spatial range 0.5 mrad, optional 11° × 8°, spatial range 0.3 mrad, optional borescope lens 71° × 55°, spatial range 1.9 mrad (PYROINC 640N)
Measurement uncertainty[2]	2 % of the measured value in °C (object temperature > 1000 °C)[3]
Noise equivalent temperature difference[2]	< 2 K (600 °C, 25 Hz)[4]
Measurement frequency	internal 25 Hz, selectable: 25 Hz, 12,5 Hz, 6,25 Hz, …
Response time	internal 80 ms , selectable: 2/measurement frequency
Interfaces	Fast Ethernet (real-time, 25 Hz)
Digital inputs	2 galvanically isolated inputs (trigger)
Digital outputs	2 galvanically isolated outputs (alarm)
Connectors[3]	round plug connector HR10A (12 pins, power supply, digital inputs and outputs), round plug M12A (Ethernet)
Power supply	12 V to 36 V DC, typically 7 VA
Housing	65 mm (W) × 160 mm (D) × 79 mm (H) (camera aluminium compact housing without lens) optional with weatherproof housing or furnace probe lens with cooling jacket (IP 65), incl. retract unit, auto-closure device, control and supply cabinet (PYROINC 640N)
Camera operating temperature	–10 °C to 50 °C (without water-cooling), –25 °C to 150 °C (with water-cooling)
Storage conditions	–20 °C to 70 °C, rel. humidity 95 % max
Software	Control and imaging software PYROSOFT for Windows ®,customized modifications on request

[1] Other available. [2] Specification for black body reference and ambient temperature 25 °C. [3] From 1000 °C additionally 0.75 % per 100 K increase of object temperature.
[4] Additionally 0.75 K per 100 K increase of object temperature.

Dimensional drawing PYROVIEW 640N compact+



Wir sind langjährig
zertifiziert nach der
ISO 9001

Telefon: +49 351 896 74-0
Telefax: +49 351 896 74-99
E-Mail: info@dias-infrared.de
Internet: www.dias-infrared.com

DIAS Infrared GmbH
Pforzheimer Straße 21
01189 Dresden
Deutschland