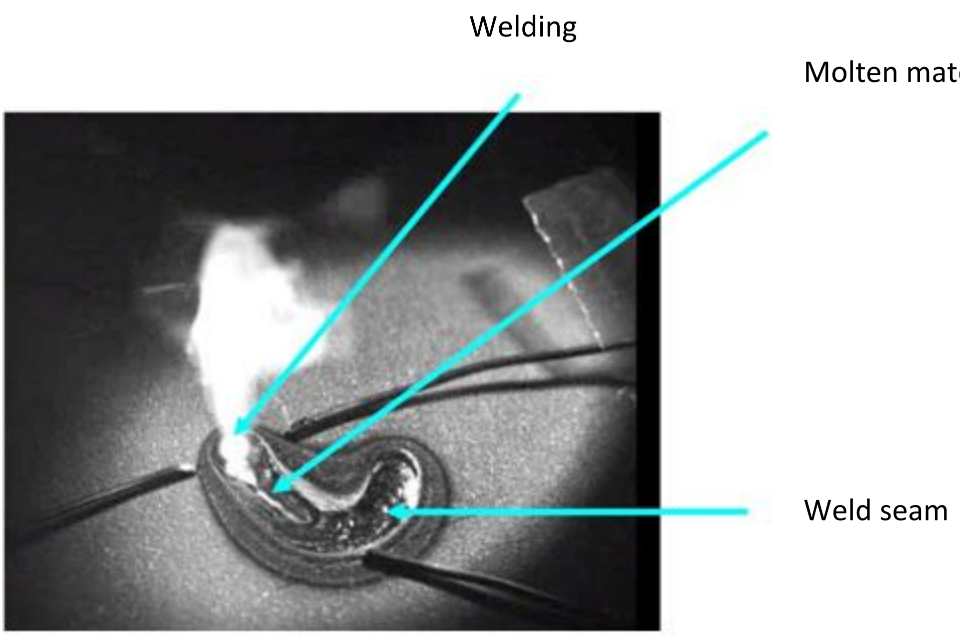
Perfect weld seams for increased safety

Optronis solution optimizes weld seams and processes



If a weld seam is properly executed, it will be every bit as durable as the other surfaces of the welded material. In fact, as ardent welders have always said, a well-made weld seam is even stronger that the material itself. What we know for sure is that an imperfect weld seam that becomes fractured can have fatal consequences. It doesn't bear thinking about what might have happened, for example, if during a routine inspection in Germany in March 2000 cracks had not been found in the weld seams of 13 power cars on 59 ICE 1 trains. This example demonstrates that in many sectors the safety of people depends on a well-worked weld seam.

Optronis solution supports material research

Processes such as X-ray and ultra-sound examination are used to check weld seams for correctness. However, a different process is central to the monitoring of the welding process: Optronis has combined high-speed cameras with special lighting technology for real-time inspection of weld seams and the welding process. This allows visual tracking of the formation of the weld seam during the welding process. At the same time, the high-speed camera is also capable of monitoring super-fast welding processes that are indiscernible to the naked eye. With this solution, Optronis has added a process to existing inspection techniques that not only pinpoints weld seam faults but also reveals weak points and even the source of faults in the welding process. This precision process is used in a number of applications including work undertaken by the Helmholtz Centre for Materials and Coastal Research in Geesthacht to understand the behaviour of different materials during welding and to arrive at conclusions for optimizing both welding procedure and weld face for increased material safety.

Combination of high-speed camera, interference filter and laser light

Normal and logarithmic (nonlinear) response cameras are unable deliver high quality images when recording in very bright and very dark situations, such as are generated by a bright welding arc against dark metal surfaces. The Optronis high-speed camera solution is however able to do this. This solution incorporates an interference filter which almost completely cuts out the intense broadband light of the welding arc and the afterglow of the molten material and a powerful laser light to actively illuminate the welding process. The camera is set to allow only the light of the active lighting system into the camera. As a result, the dynamic required for monitoring the image is reduced to the welding material itself and therefore to the usual values in the camera system.

The use of high-speed cameras as opposed to normal cameras has the advantage of recording in slow motion which delivers a clear performance bonus for very fast welding processes in particular. With the knowledge gained from the detailed monitoring of welding processes, conclusions can be arrived at as to how both the welding technology and the weld seam can be optimized. Thus Optronis has been able to support the Helmholtz Centre's research into increasing material safety.

The GKSS Research Centre in Geesthacht is a leader in the field of research into welding processes and has carried out a wide range of research and development projects since 2000, including working with AIRBUS Germany to investigate and optimize the properties of new laser-welded alloys used in lightweight engineering. Laser beam welding is used increasingly frequently in aircraft construction since it saves on weight and therefore reduces carbon dioxide emissions. It also cuts down on production times.

Optronis
Make time visible

CamRecord CR600x2

Specifications

Resolution	1280 x 1024 pixel
Frame Rate @ Max. Resolution	500 fps
Image Sensor	Progressive Scan CMOS
Exposure Time	1 µs - 1/Framerate
Active Area	17,92 mm x 14,34 mm
Sensor Diagonal Dimension	22,95 mm
Pixel Size	14 µm x 14 µm
A/D Conversion	10 Bit or 8 Bit
Dynamic	60 dB (90 dB optical)
Sensitivity	25 V/lux*s
Shutter	global electronic, >1 µs exposure time
Trigger Signal	TTL, switch, open collector, rising or falling edge, on image content variation
Synchronization	internal, external
Interface	Gigabit Ethernet
Video Output	VGA
Power	12 VDC / 12 W
Lens Mount	Nikon F-Mount (optional C-Mount)

Monochrome sensor
16GB memory
24-85 mm zoom lens with macro mode