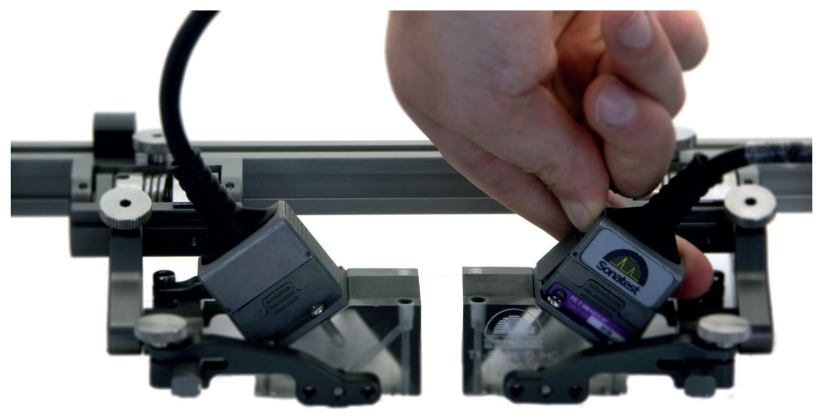
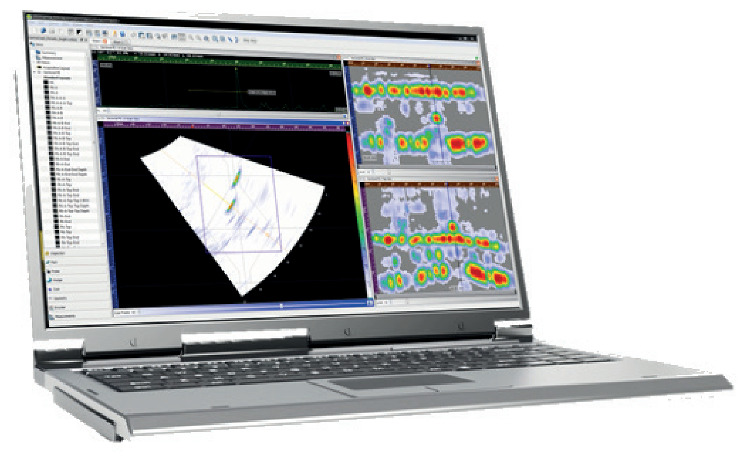
Phased Array Ultrasonic Testing (PAUT)

Sonatest VEO+ and Prisma phased array instruments



DAAH (Detachable Active Array Head) allows the use of multiple probes, covering a wide range of application requirements

QuickTrace Encoder enables efficient data recording



User friendly data analysis with UTStudio+

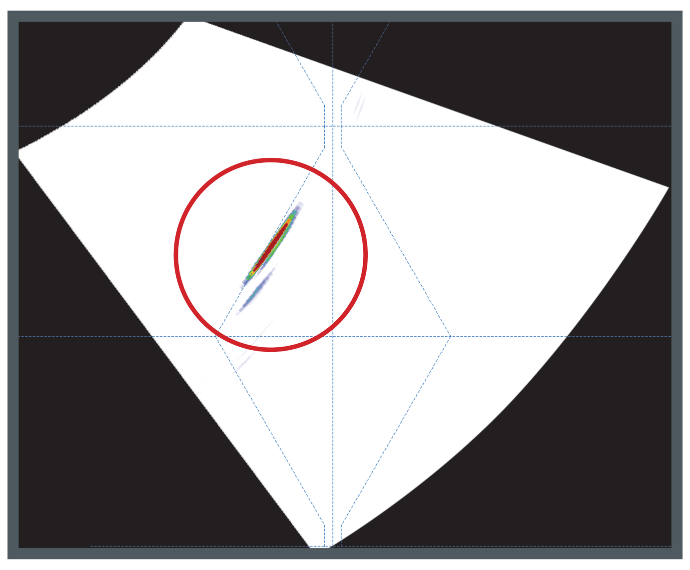
Imaging of common weld flaws

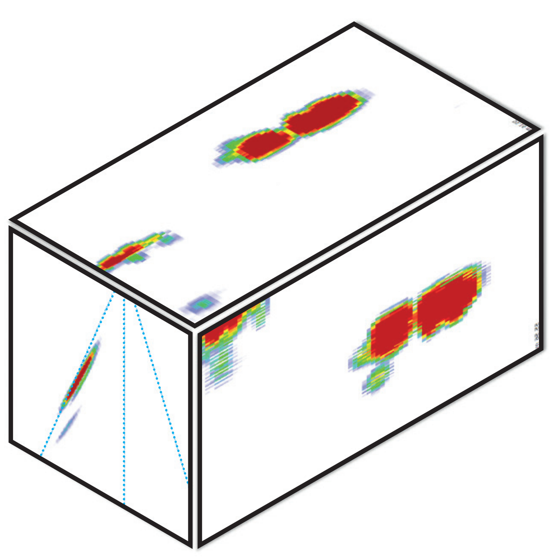
Phased-Array technology is based on delayed signals utilising advanced electronics. The transducer is made from multiple small piezo-electric crystals that are evenly spread across its aperture. Such technique provides the capability to steer the beam around the natural refracted angle of the inspection material.

Moreover, by changing the delay and with the appropriate pulsing speed the cross section of the weld can be displayed, this is generally referred to as the S-scan. All the required volumetric information for full analysis as well as the proof that the weld has been properly inspected are usually covered by the S-scan.

Advanced systems such as the VEO+ & Prisma have embedded modelling tools and support scan plans enabling quick and efficient set up. Application scenarios from a range of weld geometries, renders and visualised probes on the test piece along with the sound path and skips ensures proper coverage in the scan plan.

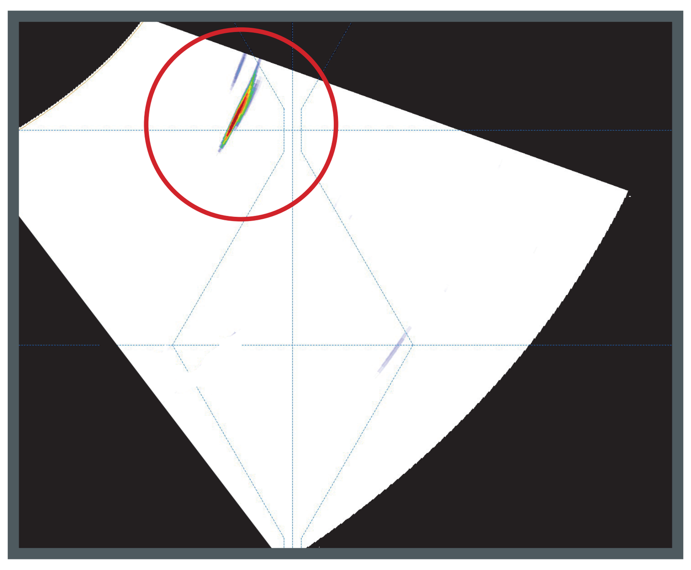
Lack of fusion

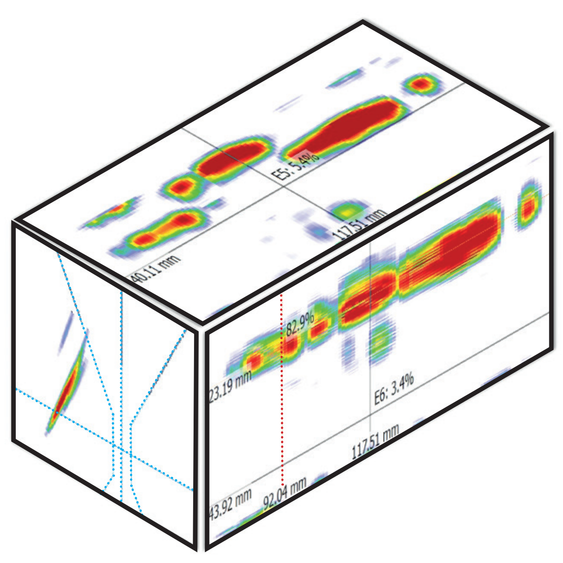




A flaw can occur during welding due to lack of heat for the plate metal to reach its melting point, this is generally localised on the bevel of the weld seam. If the defect is properly oriented towards the ultrasonic beam the amplitude response is generally strong and highly responsive to the probe alignment regarding the weld axis. Consequently, such flaws are usually identified on one or the other side of the weld orientation.

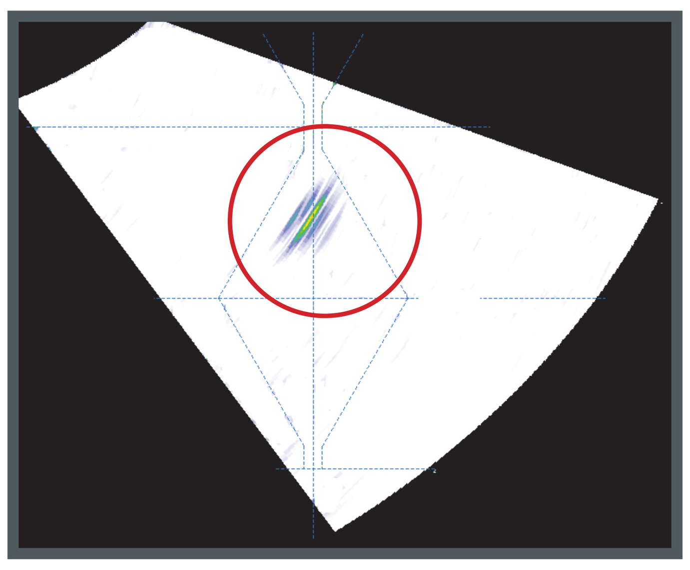
Lack of penetration

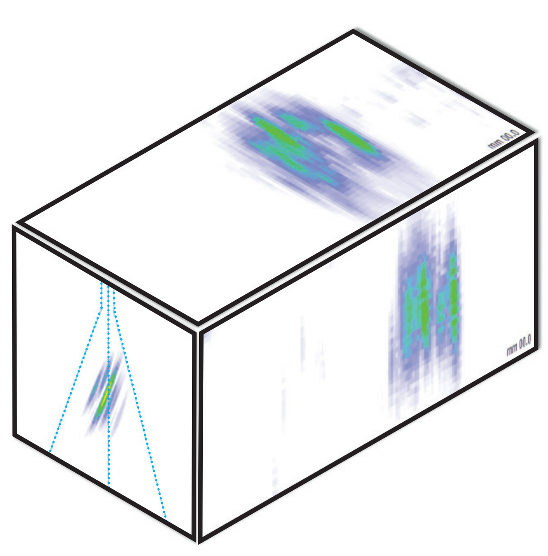




In the event of the weld root being part filled by the filler material a flaw at the root and inter-section of the weld volume can occur for double V, U & J type of welds, such flaws would generally have a recognisable signal response. The display of the flaw in relation towards the geometrical root signal are generally the most valuable information to characterise the defects.

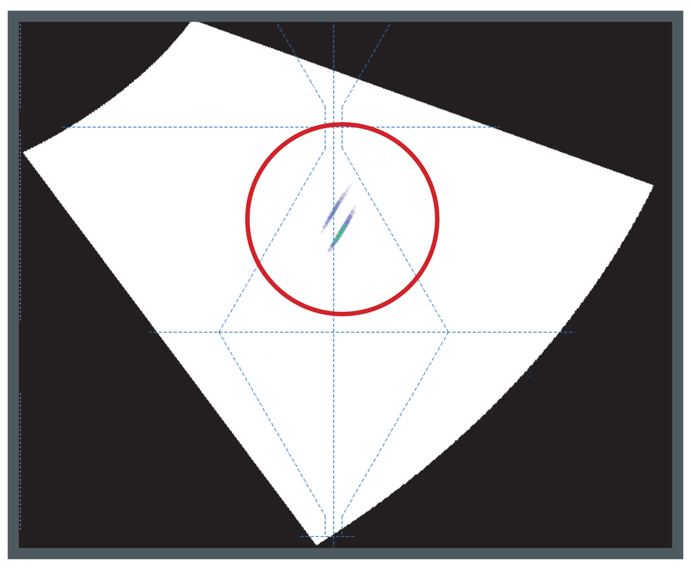
Porosity

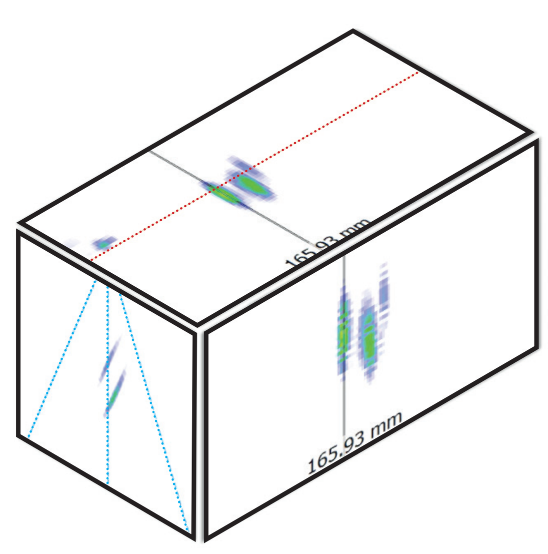




If air is trapped during the solidification of the weld it can form a flaw, such defects are generally localised in the filled portions of the weld volume. Being a volumetric flaw, sensitivity of the probe orientation towards the weld axis is lower, like planar flaw. The signal response is highly influenced by the initial calibration and off course the size of the porosity and generally a lower amplitude response is a common observation in comparison to other type of defects. However, from a signal characterisation point of view it is one of the easiest to identify, since it has the cluster type shape.

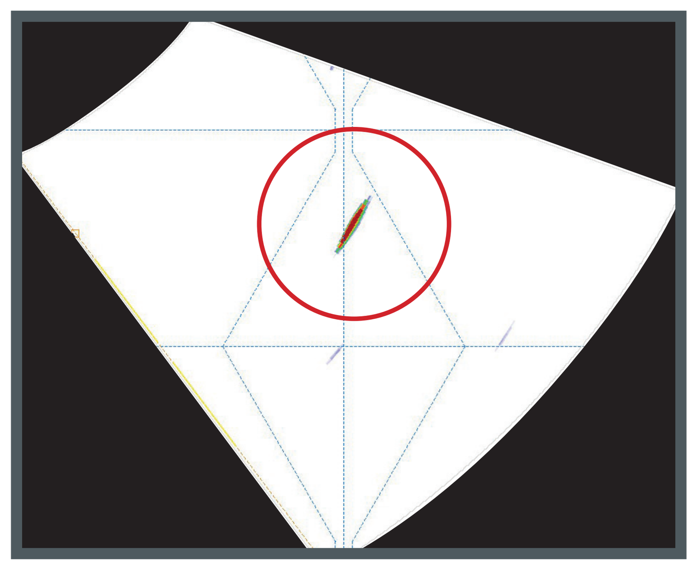
Crack

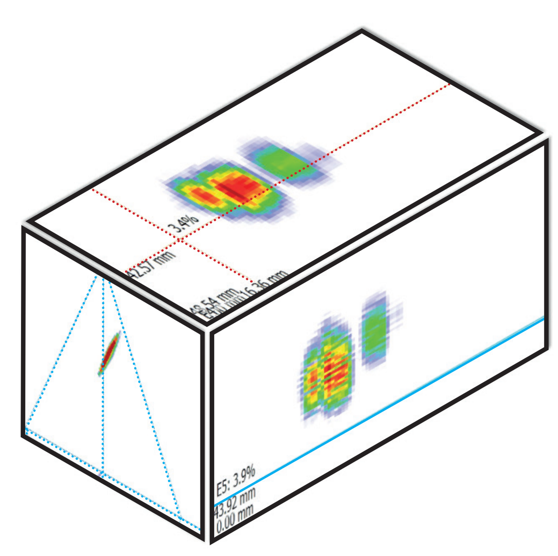




There are several mechanical properties of the weld and the base-material that could cause a crack. However, the most common cause by far is brittleness, which usually occurs during the actual welding process or the heat treatment, cold cracking (presence of hydrogen in the weld) or service crack (fatigue) are less common. Since cracks are planar defects the amplitude response is fairly distinguished. The crack in the example above is a centreline crack.

Slag





Slag inclusions are non-metallic impurities or flux particles trapped in the weld. They usually occur only with specific welding techniques and are generally localised in between weld seams and the filling material. Such defects are volumetric type of flaws and normally less sensitive to the probe orientation. It's also common to confuse them with other types of defects due to the signal characteristic similarities to other flaw detection scenarios.