Examples of sensory methods

INN - Surface sensor technology for area-based explosive ordnance probing.

INN – borehole sensors for measurement in cased bores or in drill augers.

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Examples of sensory methods

Surface radar for area scanning of explosive ordnance.

Surface magnetics for area-based explosive ordnance probing.

Borehole magnetics for measurement in cased wells.

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Sensory methods of the Explosive ordnance probe

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Principles and procedures

The risk from explosive ordnance (bombs etc.) is initiated during construction measures by the mechanical / physical intervention.

This includes either a direct mechanical contact between the tool (shovel, pile head or drilling rig etc.) and the suspected object and/or an indirect contact due to registered vibrations during compaction measures, driving with heavy equipment, pile driving or chiselling work.

In principle, appropriate measures must be taken to demonstrably and preventively minimise the occupational health and safety risk and the risk to the public from explosive ordnance

Basis of all work is the sensory anomaly measurement SAM in the probe area. For this purpose, various physical methods are available individually or in combination. The SAM is followed by data evaluation, e.g. for explosive ordnance, cavities etc..

The standard method of explosive ordnance assessment is magnetics, whether surface, borehole or triaxial magnetics.

This is used to detect magnetic iron anomalies in the SAM. After the evaluation, the suspicious areas are uncovered and, if confirmed, the explosive ordnance is recovered.

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A metrological differentiation in SAM between explosive ordnance and other iron is not possible with magnetic methods. This can lead to a high proportion of suspicious cases on industrial/commercial wastelands, rubble areas or properties with technical installations after evaluation.

Iron in slags, as a component of buildings, technical installations, sheet pile walls or anchors etc. cause a spatial measuring shadow in the SAM with magnetics, in which an evaluation of explosive ordnance is only possible to a limited extent.

Electromagnetic procedures such as the **Ground Penetration Radar GPR** are not shaded by iron in the SAM.

The technical basis of the radar sensor technology is a transmitter of electro-magnetic waves and the antenna(s), which receives the reflected electromagnetic waves. The ground is scanned.

A subsoil with a high metal content (cinders, reinforced foundations, RC mat. etc.) or damp, cohesive soils dampen the sounding depth.

All metallic objects (iron, measurement, zinc etc.) and structures in the ground like former bomb craters are measured.

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After the evaluation, the suspicious areas are also uncovered and, if confirmed, salvaged.

The **INN technique** is an isotope process (neutrons) which can be used independently of soil types, water content or contamination such as scrap or slag as well as installations such as sheet piling and reinforcement.

After the measurement of anomalies in the SAM, the arithmetical evaluation for explosive ordnance is carried out in parallel according to

1. detection of metallic bodies (combat agent cover),
2. detection of explosive indicators (Nitrogen N in TNT).

It's on:
+1 + 2 = suspected explosive ordnance
+1 - 2 = no suspected of explosive ordnance
-1 + 2 = no suspected explosive ordnance

If both features in an object are positive (+), the anomaly is addressed in the evaluation as explosive ordnance.

Double evaluation reduces the number of suspected cases. The time, blocking and costs for the uncovering and, if confirmed, the recovery are minimized.

The requirements of occupational health and safety must be observed.