

## Determination of the purity level of steels according to EN 10247

The purity of steel is defined as the content of non-metallic inclusions. Non-metallic inclusions are oxidic or sulphidic compounds that get into the material through the melting process. These unwanted impurities have a great influence on the mechanical properties of the material. The European standard EN 10247 for the determination of the content of non-metallic inclusions in steels exists since 2007. This standard should replace the DIN 50602 one. Back then, the standard committee decided on a transition period of two years. Since 2010, the DIN 50602 standard has been officially immobilised. Basically, we still can make determinations according to the invalid DIN 50602 in due consideration of a written agreement. However, in the event of damage, this can result in legal consequences. A significant benefit of the EN 10247 is that the inclusions can be specified in a physical dimension (surface / sq mm, length / sq mm or as in DIN 50602 number / sq mm). This provides a better comparability of the results.

**Does the determination of the purity level according to EN 10247 represent an issue for you? If yes, it will be our pleasure to answer your question relative to EN 10247, and we offer you consultation and assistance in the implementation of the evaluation in your company.**

According to EN 10247, one distinguishes inclusions primarily according to their shape, arrangement and size. The chemical composition can be considered, but is secondary (gradations in the grey scale values).

### What is different?

The investigation method (specimen preparation and light microscopy) and the evaluation procedure (comparison with the standard series of the standard) remain the same. In a standard enlargement of 100:1, the surface to be tested should be at least of

200 sq mm and, as far as there are no other agreements with the customer, the investigation should be made on 6 specimens from one lot. The size of the measuring field is of 0.71 x 0.71 mm or 0.5 sq mm (as far as identical to ISO 4967, ASTM E45 and DIN 50602).

Together, particles, lines and line agglomerates can form an inclusion. There are distinct definitions as to which group an inclusion

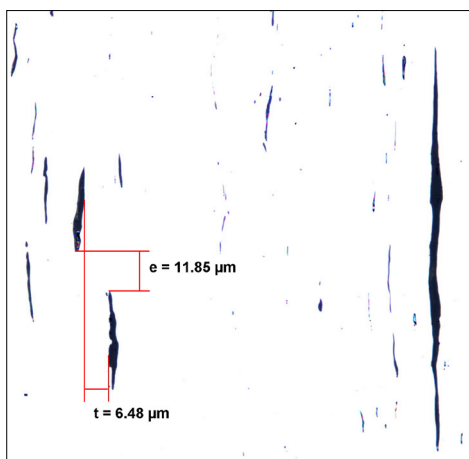


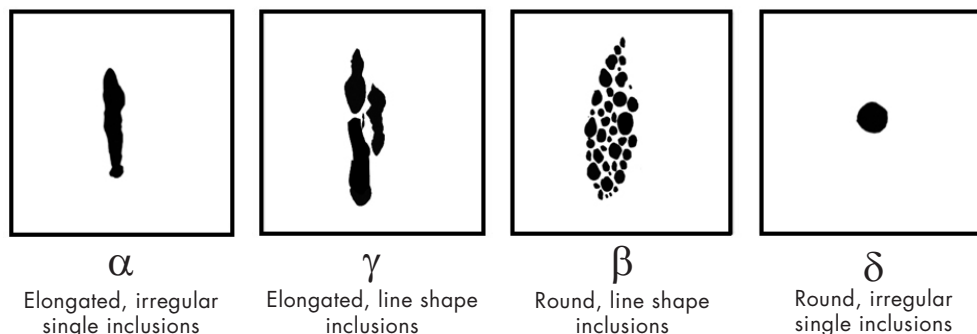
Figure 2: Distance rule:  $t \leq 10 \mu\text{m}$  and  $e \leq 40 \mu\text{m}$  equals one inclusion

belongs, and rules, which particles have to be combined to a single inclusion. The most important rule is the so-called neighbourhood condition. Two particles must be combined to a single inclusion when the distance ( $t$ ) of the two particles is  $\leq 10 \mu\text{m}$  and the distance  $e \leq 40 \mu\text{m}$ .

### References

1. DIN EN 10247: Micrographic examination of the non-metallic inclusion content of steels using standard pictures
2. Lecture / Lecture documents Damian Moll, AG der Dillinger Hüttenwerke
3. DIN Mitteilungen: Für die Bestimmung nichtmetallischer Einschlüsse in Stählen mit Richtreihenbildern gilt jetzt DIN EN 10247:2007-07, Dipl.-Ing. Damian Moll, Dr. Sc. Techn. Alois Wehrstedt, März 2009

Figure 1: Types of inclusions



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### Our services

- Test of non-metallic inclusions in steels and evaluation according to the ISO 4967, and ASTM E45 standards as well as the EN 10247 one. On demand, we can provide the results according to several standards, e.g. to EN 10247 and the drawn back DIN 50602. The evaluation processes according to EN 10247 can take place as follows:
  - Procedure P: Identification of the largest inclusions (length / diameter, surface) of each group
  - Procedure M (worst case): Identification of the measuring field with the largest inclusions (length / diameter, surface) of each group
  - Procedure K (quantitative): Determination of the mean inclusion content (number and length / diameter per sq mm, number and surface per sq mm)
- Consultation and assistance in implementing the evaluation in your company.

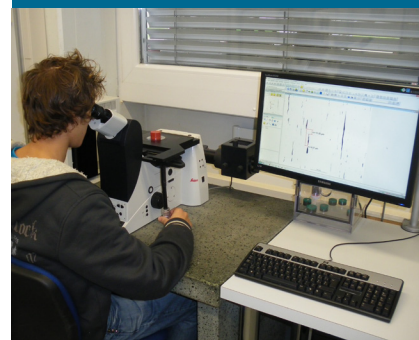


Figure 3: Microscopic analysis

**Please discuss your questions with us! We will be happy to advise you.**

**Or ask for our service catalogue. You will find this and other information on our website as well.**

The RMS Foundation has been certified according to ISO 9001:2008. Selected services have been accredited according to ISO/IEC 17025.