Processing instructions

# Flame straightening

**DI-MC**

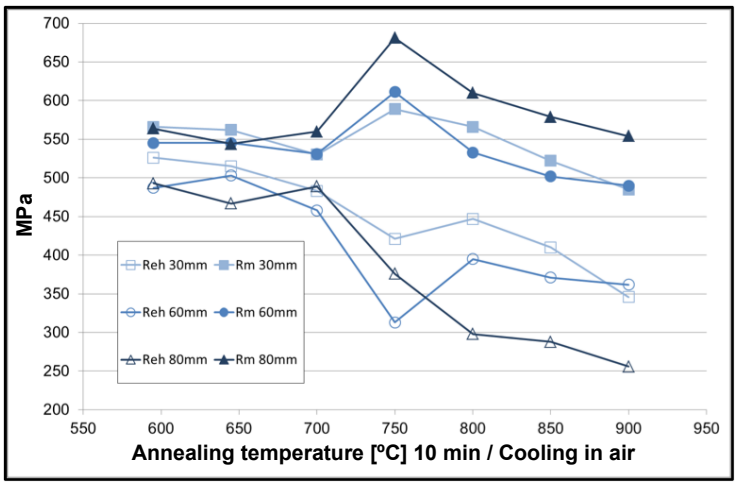
The flame straightening of plates is a procedure frequently applied in steel construction practice for the forming of complex components and the attainment of flat cross sections. DI-MC steels can be flame straightened without difficulty. As in the processing of conventional steels, it is, however, also necessary here to adhere to certain boundary conditions (e.g. maximum component temperature during flame straightening = maximum flame straightening temperature). It is also necessary to differentiate between flame straightening using heat lines, heat spots or heat wedges.

## Flame straightening using heat lines

In straightening using heat lines, only a zone of the component immediately below the surface is heated, with the result that the heated area cools down again quickly when the flame is removed. Operational tests and research projects (OPTISTRAIGHT) have demonstrated that, up to a flame straightening temperature of 900 °C, similarly to normalized steels, this procedure does not cause any loss of mechanical properties in DI-MC steels. This applies irrespective of the mode of cooling (in air or – below 600 °C – using water) and irrespective of the number of heat lines routed across the same point on the plate.

## Flame straightening using heat spots and heat wedges

Here, unlike flame straightening using heat lines, the entire cross section of the plate is heated. Longer holding times at peak temperature and longer cooling times are the result. DI-MC steels react to flame straightening temperatures of above 700 °C with a reduction in yield strength, but tensile strength is less affected. One example of this are the results of laboratory annealing tests on DI-MC 460 plates of various thicknesses.




***Plot of mechanical strength data for DI-MC 460 after laboratory annealing tests at various temperatures and 10 min. holding time***

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The potential loss of toughness caused by flame straightening depends a lot on the carbon content of the steel. It is therefore lower in thermomechanically rolled steels, whose carbon contents are generally significantly lower than in steels with other delivery conditions. Guidelines for flame straightening of structural steels are provided in the CEN/TR 10347 report. The table below summarizes the maximum temperatures suggested there for flame straightening of various steel grades.

## Guideline for flame straightening temperatures for structural steels (source: CEN/TR 10347)

| Delivery condition | Recommended maximum flame straightening temperature | | |
|---|---|---|---|
| | Short superficial heating | Short full section heating | Full section heating with longer holding times |
| Normalized grades | ≤ 900 °C | ≤ 700 °C | ≤ 650 °C |
| Thermomechanically rolled grades up to S460M/ML | ≤ 900 °C | ≤ 700 °C | ≤ 650 °C |



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