

# MISSION: UNLIMITED

Sophisticated tool-making in the plastics industry requires uncompromising materials. The new **M368 MICROCLEAR** material from **BÖHLER** boosts performance in plastics processing.

## BÖHLER M368 MICROCLEAR – a new high-end steel for the plastics processing industry

The plastics industry demands a wide range of tool steels with very specific properties for processing.

Many applications require corrosion-resistant steels due to chemically aggressive plastic melts or additives, as well as corrosive cooling water, which strain the often highly complex tools. In addition, the tools must meet high requirements regarding hardness and wear resistance since plastics are often reinforced with hard and abrasive filler materials such as glass or carbon fibres. For efficient large-scale production and the use of complex moulds, toughness is a decisive material property enhancing operational reliability. The best choices to meet these requirements are martensitic chromium steels. This group of materials combine good corrosion resistance with high strength and high wear resistance.

A modern example in this group is the M340 ISOPLAST tool steel developed by BÖHLER Edelstahl. Alongside applications in the plastics industry, where it is used for mould inserts, extrusion tools and cylinders, this steel is used for the processing of chemically aggressive pastes as well as in the food industry. BÖHLER Edelstahl has now expanded their product portfolio with the M368 MICROCLEAR, a powder metallurgical version of the M340 ISOPLAST.

### TOOL STEEL RESPONDS TO NEW CHALLENGES

The main goals of technological progress and trends in the plastics industry are to gain higher performance of processing machines and increase the use of high-performance plastics. Modern injection moulding machines achieve ever increasing operating pressures and speeds, allowing reduced cycle times in production. However, this also imposes higher requirements on moulds and materials. More frequent use of abrasive fillers such as glass, carbon fibres or ceramic fillers, as well as increasing part- and tool sizes, continuously confront material developers with new challenges. At BÖHLER Edelstahl, these rising requirements led to the development of the new M368 MICROCLEAR powder metallurgical steel for plastic moulds. Due to its alloy concept based on the proven M340 ISOPLAST steel and its specific manufacturing method, this material offers the ideal

combination of the required characteristics and is therefore a superior basis for further performance improvements in the plastics processing industry.

### OUTSTANDING CHARACTERISTICS THANKS TO POWDER METALLURGY

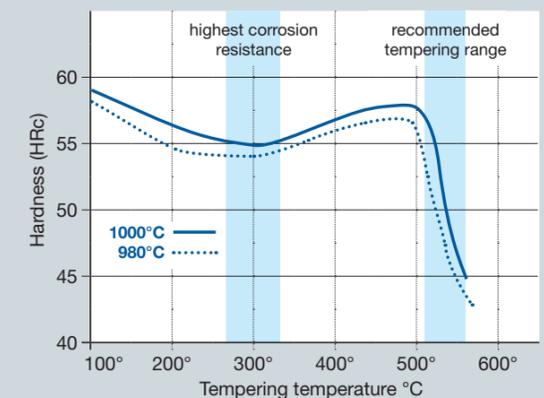
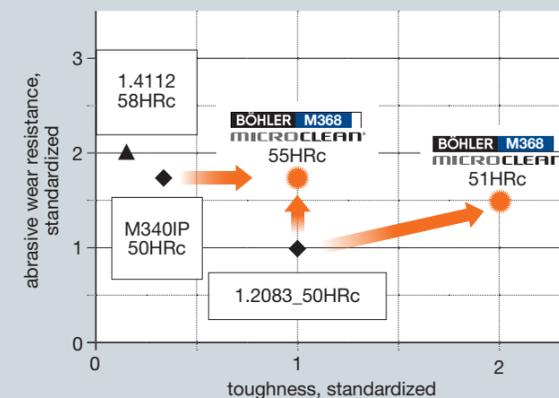
A defining characteristic of powder metallurgical steels is their uniformly fine microstructure, resulting in improved properties compared to conventionally manufactured materials. To produce these high performance steels, BÖHLER Edelstahl has installed a third-generation powder metallurgy plant in Kapfenberg. In this manufacturing process, the steel melt is atomised into a fine powder.

The resulting rapid solidification atomisation process gives the steel particles an extremely homogeneous and fine microstructure. The steel powder is filled in a capsule and subjected to high temperature and pressure to form a solid, non-porous material. The fine microstructure and the associated advantages are retained during this process and the subsequent forming process. The M368 MICROCLEAR takes full advantage of the powder metallurgy technology to ensure a broad spectrum of characteristics at the highest level.

### PREMIUM GRADE M368 MICROCLEAR

The advantages of this powder metallurgically processed material truly excels when its properties are compared to those of standard grades such as 1.2083 or 1.4112.

Regarding toughness, corrosion resistance, polishing capability and machinability, the M368 MICROCLEAR clearly surpasses competitive materials while wear resistance at least matches the same level. This is achieved by the homogeneous microstructure, which also improves the machinability and polishing capability of the material. The test results are confirmed in practical applications such as dies for plastic extrusion and mould inserts for the plastics industry as well as flanging rolls in the food industry. When it comes to large parts the advantages of the product's microstructure over the entire cross-section become outstandingly clear.



This enables industrial users to employ larger moulds and provides a competitive edge in plant productivity.

### THE RIGHT HEAT TREATMENT IS THE KEY TO SUCCESS

The material is supplied in the soft annealed state with a maximum hardness of 280 HB, which is ideal for machining. The properties of the material can be adjusted according to individual tool requirements via heat treatment, which consists of a hardening procedure followed by several tempering steps. Depending on the size of a workpiece, a temperature of 980 to 1000°C is recommended for hardening. The optimal combination of toughness, wear resistance and corrosion resistance is achieved by subsequent repeated tempering at temperatures of at least 520°C. A tempering temperature of 300°C should be applied for the use in extreme corrosive environments. After heat treatment the hardness of the steel ranges between 48 and 55 HRc. Careful hardening and tempering by a qualified heat treatment shop is recommended to achieve the steels maximum performance.

- BÖHLER M368 MICROCLEAR  
OUTSTANDING  
CHARACTERISTICS**
- High wear resistance
  - High toughness
  - High corrosion resistance
  - Good machinability
  - Very good grinding capability
  - Good polishing capability
  - High dimensional stability

### M368 MICROCLEAR – ONE STEP AHEAD

M368 MICROCLEAR from BÖHLER Edelstahl is a new high-performance steel for plastics processing, showing extremely high wear- and corrosion resistance in the hardness range up to 55 HRc. In addition, this material is suitable for relatively large parts due to its powder-metallurgy microstructure. For more detailed information about this material, please consult the product brochure available in the download centre at [www.boehler-edelstahl.com](http://www.boehler-edelstahl.com).



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