GAS ATOMIZED POWDER FOR ADDITIVE MANUFACTURING

Additive manufacturing is the revolution in manufacturing technology! Especially in this promising segment, we as voestalpine BÖHLER Edelstahl can build on our extensive materials experience and expertise in the field of powder metallurgy.

Why to buy at voestalpine BÖHLER Edelstahl?

Customized alloys depending on your requirements. We atomize BÖHLER standard grades, theoretical selection of 250 grades.

voestalpine BÖHLER Edelstahl leverages the metallurgical knowledge and manufacturing options of a special steel producer for this new technology.

Powder is produced on latest atomization techniques and tested in-house.
Vacuum induction melting and atomization under inert gas ensure highest product quality.

Depending on the steel grade and customer requirements, raw materials molten under vacuum or remolten can be used. This ensures the highest quality standards and minimizes undesired impurities.

Depending on the requirements of the specific AM process used, we can provide the appropriate particle fraction in a range from 15-150µm.

Safety recommendations

See the SDS (Safety Data Sheet) in the version localized for the country where the material will be used. SDS are available from the voestalpine BÖHLER Edelstahl web site at www.voestalpine.com/bohler-edelstahl (AMPO - Safety Data Sheets).

W360 AMPO Development

Additive Manufacturing offers a multitude of advantages over conventional manufacturing methods like design freedom, shorter lead times or zero tooling costs. However, up to now there has been only a limited number of commercial alloys available for additive manufacturing. BÖHLER W360 AMPO has been developed from W360 ISOBLOC. As no other currently available powder for additive manufacturing W360 AMPO combines high hardness, superior toughness and highest wear resistance. In general the W360 AMPO has to be printed at elevated temperatures above 200°C due to the special alloy design. Recommended hardness in use 52 – 57 HRc.

BÖHLER W360
AMPO
patent pending

Chemical Composition [average %]

Element	C	Si	Mn	Cr	Mo	V	
Mass - %	0.50	0.20	0.25	4.50	3.00	0.55	**Co-free**

ACHIEVABLE MECHANICAL PROPERTIES OF PRINTED PART AFTER HEAT TREATMENT FOR TEMPERING CONDITION OF 55 – 57 HRc

Tensile strength (Rm)	Yield strength ($Rp_{0,2}$)	Elongation (%)	Hardness	Toughness (ISO V)
1970 – 2010 MPa	1500 – 1670 MPa	6.6 – 8.1	55 – 57 HRc	8 – 14 J

Samples for mechanical testing were printed in heating chamber on two different machines with pre-heating at 230°C and 400°C

PARTICLE SIZE DISTRIBUTION*

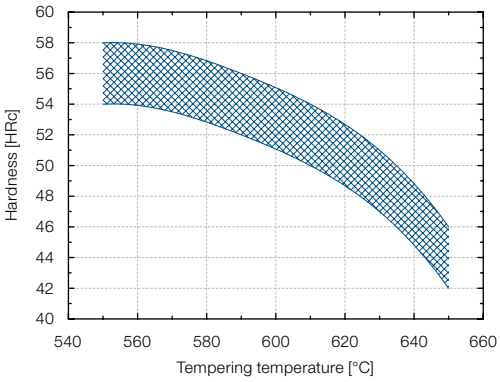
15 - 45 µm (e.g. laser powder bed fusion)		**45 - 150 µm** (e.g. direct laser deposition)	
Flowability [s]**	**Apparent density [g/cm³]****	**Flowability [s]****	**Apparent density [g/cm³]****
17	4.01	19	3.61

* Measurement of particle size distribution is based on ISO 13322-2 (Dynamic image analysis methods)
** Flowability and apparent density are based on ASTM B964 resp. ASTM B212

COMPARISON WITH TYPICAL FORGED HOT WORK TOOL STEELS AS WELL AS AMPO POWDER GRADES

BÖHLER grade	DIN No	Achievable hardness [HRc]	Hot temperature toughness	Hot temperature wear resistance
BÖHLER W300 ISOBLOC	1.2343	52	★★★★½	★★
BÖHLER W302 ISOBLOC	1.2344	52	★★★	★★★
BÖHLER W722 AMPO	1.2709	54	★★★	★½
BÖHLER W360 AMPO	patent pending	57	★★★★	★★★★★

TEMPERING CHART



HEAT TREATMENT PARAMETER

Stress relieving: 690°C in a neutral atmosphere / after through-heating, soak for 1 to 2 hours / cool slowly in furnace
Hardening: 1050°C / oil or vacuum furnace with gas quenching / Holding time at hardening temperature after through-heating: 15 to 20 minutes / Achievable hardness: see tempering chart
Tempering (according to tempering chart): at least twice. Heat slowly to tempering temperature immediately after hardening. Holding time at tempering temperature 1,5 hours per temper. A third temper is advantageous.

The achievable mechanical properties are strongly dependent on the printing process.