Precision cast products

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Company profile

The Wieland Group with headquarters in Ulm, Germany, is one of the world's leading manufacturers of semi-finished and special products in copper and copper alloys, such as strip, sheet, tube, rod, wire and sections as well as slide bearings, finned tubes and heat exchangers.

Wieland's history dates back to the early 19th century. The founder Philipp Jakob Wieland took over his uncle's art and bell foundry in Ulm in 1820 and by 1828 he was producing brass sheet and wire. In 1865 the Vöhringen plant started production. Over the years further branches were opened in Germany and abroad.

The Wieland Group has today several manufacturing companies, slitting centres and trading subsidiaries in many European countries as well as in USA, South Africa, Singapore and China.

Material know-how

Wieland supplies more than 100 different copper alloys to customers in numerous branches. The starting point for the production is our plant in Vöhringen, Germany, Europe's largest foundry for copper alloys.

Precision cast products

Wieland's fully continuous casting process, which is constantly being developed further, enables the production of a wide range of standard cast products such as tubes and rods.

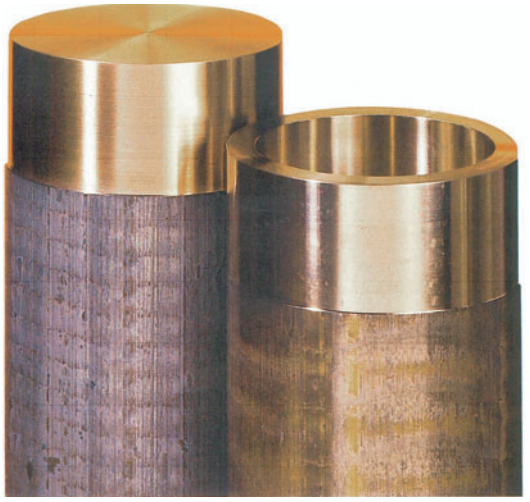
Furthermore, Wieland specialises in the manufacture of geometrically complex shaped rods and sections. The necessary moulds are manufactured in-house according to customer drawings on state-of-the-art erosion and CNC machines. Modifications or specific customer requirements can thus be met with speed and flexibility.

Advantages

Compared to conventional casting processes, Wieland's precision casting offers a number of remarkable advantages in terms of material properties:

- much lower susceptibility to pinholes, shrinkage porosity and segregations
- better surface, tight dimensional tolerances
- smaller machining allowances required, similar to drawn material; hence low material loss, short machining times and low costs
- very good processing properties
- long tool life, as there is no typical hard casting skin

The fine and homogeneous microstructure, particularly the lead distribution, is highly favourable and ensures excellent sliding and emergency running properties. Continuous casting gives better mechanical properties than other casting methods such as sand or mould casting. In many cases the tin content can be lowered whilst achieving the same properties.

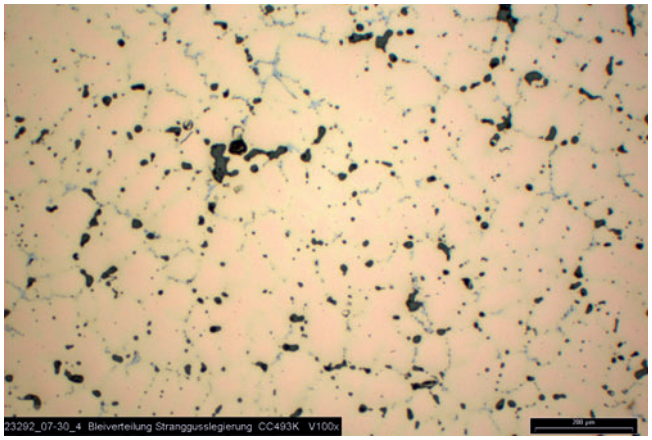


Applications

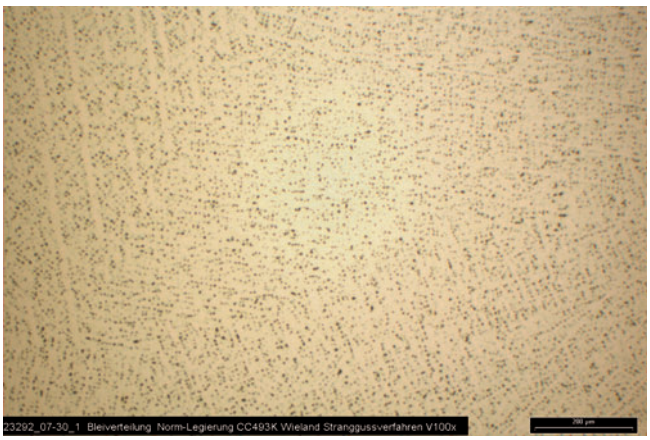
Wieland precision cast semi-finished products have proven their worth as high-quality, cost-saving material in machine and apparatus construction, vehicle manufacture as well as in the sanitary industry. They are used, for example, to manufacture bushings, bearing shells, gear and worm wheels as well as components for special applications such as yaw bearings in wind turbines (wind power stations) or turbochargers for high-performance engines

Material supply

Worldwide metal purchasing and long-term contracts with renowned suppliers of raw materials ensure a constant supply of metal and form the basis for a very reliable delivery service.



Lead distribution of a conventional continuous cast alloy (with 100x magnification; alloy CC493K)



Lead distribution of the same standardised alloy CC493K, however, manufactured using the Wieland continuous casting process (with 100x magnification, Wieland-G07)

Main casting alloys				
Designation	**Copper-tin-zinc**	**Copper-tin-zinc**	**Copper-tin**	**Copper-tin-lead**
Wieland	G07	GD1	G12	G22
DIN EN	1982	1982	1982	1982
Material No.	CC493K	CC499K	CC483K	CC496K
Symbol	CuSn7Zn4Pb7-C-GC	CuSn5Zn5Pb2-C-GC	CuSn12-C-GC	CuSn7Pb15-C-GC
Mechanical properties (reference values)				
Strength Rm N/mm²	330	275	350	260
Yield strength $Rp_{0.2}$ N/mm²	190	130	230	160
Elongation A %	14	35	15	15
Brinell hardness HB	95	85	105	75
Physical properties				
Density at 20 °C g/cm³	8.9	8.7	8.9	9.2
Coefficient of thermal expansion 20-300 °C 10^{-6}/K	18.5	18.3	18.5	18.8
Thermal conductivity at 20 °C W/m · K	63	80	55	59
Electrical conductivity at 20 °C m/Ω·mm²	7.7	11.5	6.3	7.0
Modulus of elasticity at 20 °C kN/mm²	93	100	95	82

Material			Material		
	EN designation			EN designation	
Wieland	**Symbol**	**Number**	**Wieland**	**Symbol**	**Number**
G05	CuSn5Zn5Pb5-C-GC	CC491K	GA9	CuSn5Pb20-C-GC	CC497K
G10	CuSn10-C-GC	CC480K	GB1	CuSn12Ni2-C-GC	CC484K
G21	CuSn10Pb10-C-GC	CC495K	GB3	CuSn3Zn8Pb5-C-GC	not standardised
G91	CuSn11Pb2-C-GC	CC482K	GB9	CuSn3Zn8Pb5-C-GC	not standardised
GA1	CuSn11P-C-GC	CC481K	GC9	CuSn6Pb16C-GC	not standardised
GA7	CuSn10Zn-C-GC	not standardised			

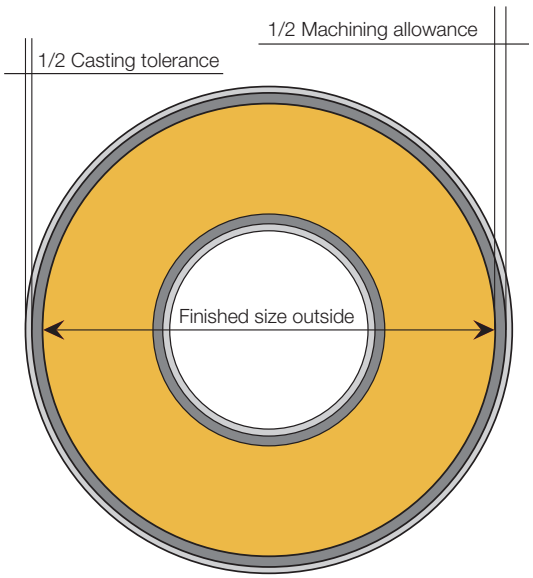
Machining allowances

Solid rods		
Finished dimension OD mm	**Allowance mm**	**Casting tolerance* mm**
13 - 119	+ 1.0	+ 0.6
120 - 140	+ 1.5	+ 0.6

Solid rods manufactured by wire casting (G05, G07, GD1)		
Finished dimension OD mm	**Allowance mm**	**Casting tolerance* mm**
13 - 25	+ 1.0	+ 0.2

Tubes				
Finished dimension OD mm	**Allowance**		**Casting tolerance**	
	outside	**inside**	**OD**	**ID**
17 - 51	+ 1.0	- 1.0	+ 0.4	- 0.6
52 - 119	+ 1.0	- 1.0	+ 0.6	- 1.2
120 - 140	+ 1.5	- 1.0	+ 0.6	- 1.2

* A closer tolerance can be agreed in some instances for the machining on automatic lathes.



Alloys

Wieland's product range includes more than 30 cast materials. Additionally Wieland supplies, for example, special alloys in accordance with customer requirements oriented to their applications or to foreign standards. For certain semi-finished products minimum quantities per size may apply.

Copper-tin-zinc (red brass)

Examples: Wieland-GD1 and -G07
GD1 meets the requirements of drinking water standard DIN 50930-6 due to its low nickel and lead content. This alloy is, therefore, mainly used in the fittings industry and for tube connectors.

G07 is characterised by very good sliding and emergency running properties as well as high wear resistance and is therefore suitable for all medium-load slide bearings used in the machine-building industry. G07 can often be used successfully as low-cost substitute especially in tin bronze sand cast parts.

Typical applications are bearings for hoisting equipment and machine tools, piston bushings, valve seat rings, slide valves, guide bushings, hydraulic cylinders, slip rings, bearings of electric motors and bearings for machine and apparatus construction. The use of normal (unhardened) shaft material is allowed.

Copper-tin (tin bronze)

Example: Wieland-G12
G12 belongs to the group of copper-tin casting alloys. This material has very good sliding properties and a high resistance to wear. G12 is harder than G07 due to its high tin content and this should be taken into consideration when choosing shaft materials. Amongst the copper-tin casting alloys Wieland-G12 is the standard alloy. Hard shafts are recommended for slide bearings but edge pressure is to be avoided, especially if the admissible high stresses and sliding speeds are to be fully utilised.

Typical applications: high-precision main-spindle bearings of machine tools, grinding machines and gears, piston pin bushings, press bearings, high-stress spindle nuts, fast rotating worm wheels and rims as well as bearings in wind power stations.

Copper-tin-lead (lead bronze)

Example: Wieland-G22
G22 has excellent emergency running properties and is largely insensitive to edge pressure. It is often used for main spindles in machine tools as surface-hardened spindles are not used for this purpose.

Typical applications: textile machinery and pump construction. G22 is particularly suitable for the manufacture of pumps with "water lubrication".

Production programme

Continuous cast tubes
Outside diameter 17 to 140 mm finished dimension.
Inside diameter ≥ 9 mm, depending on the outside diameter.
Smallest wall thickness 4 mm (however, min. 9 % of the outside diameter).

Continuous cast rods
From 13 to 140 mm diameter finished dimension.
Special production on wire casting machine: 13 to 25 mm finished dimension possible for G05, G07 and GD1.

Continuous cast sections
Rectangular bars, hexagonal rods with round hole, solid hexagonal rods and other sections on request.

Lengths supplied
Standard length 3,000 +100 mm
Special lengths up to max. 4,000 mm and special tolerances on request.

Straightness
Outside diameter up to 60 mm = 1.5 mm/m
Outside diameter from 61 to 140 mm = 2.0 mm/m

Stock items and large dimensions

Precision cast products ex stock and small requirements are available from our subsidiary CARO-PROMETA. They also supply standard cross-sections in large dimensions up to and more than 400 mm. The current stock sizes can be viewed at www.caro-prometa.de.

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