



# VAN VOORDEN *foundry*

an **ANDUS** group company

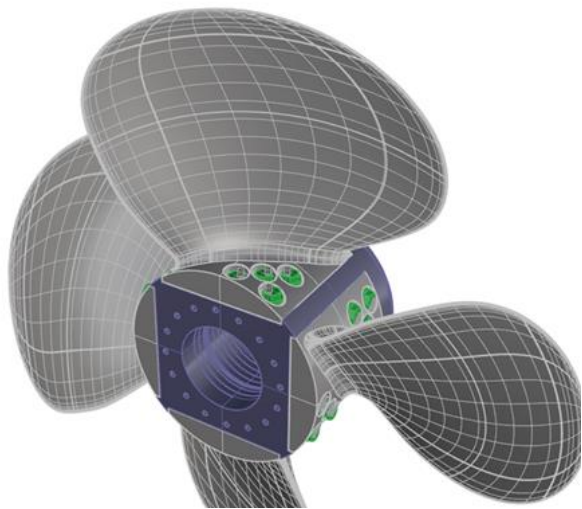
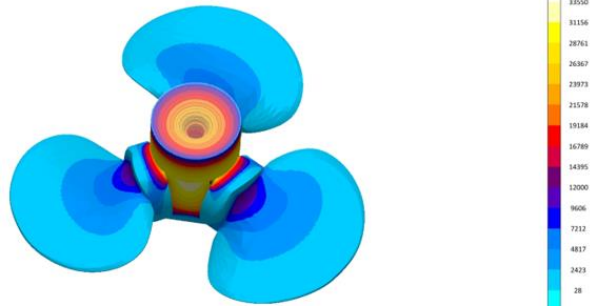
## Focus on high quality propellers



Van Voorden Foundry is a modern, Dutch foundry with over one hundred years of experience in the production of high-quality propellers. Besides Fixed Pitch Propellers in GX4CrNi13-4 or Cu3 with a diameter of up to 4600mm, Van Voorden Foundry also supplies propeller blades and build-up systems with a maximum casting weight of 32 tons per segment.

## Choice of materials

Due to its corrosion resistance, Nickel-Aluminium-Bronze is a commonly used type of material. Also, Martensitic stainless-steel is a widely-used material. This material combines good corrosion resistance with high mechanical values. Martensitic stainless-steel is mainly used in an arctic environment. We also manufacture propellers in Austenitic stainless-steel and DUPLEX.



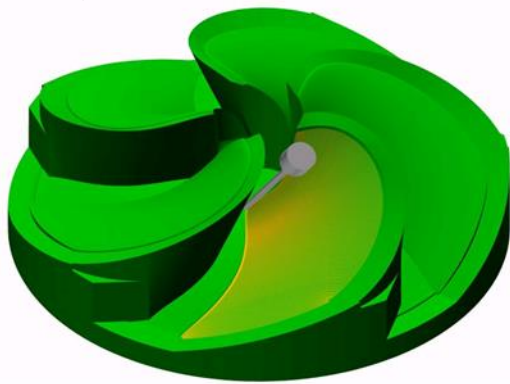
## Simulation software and 3D Modelling

Van Voorden Foundry uses the professional casting simulation software Magmasoft. This allows the ideal filling, coagulation and design to be determined from a 3D drawing. The software also enables the casting system to be optimized in such a way as to ensure a turbulence-free mold filling and to prevent rust formation. The size and location of any residual stresses in the casting can also be mapped out. All this results in a casting with the desired microstructure and mechanical properties. The data obtained is used later in the process to achieve optimum heat treatment, so that the "First time-right" principle is guaranteed.

Grade	Mechanical properties						
	Obtained from separately cast test samples						
	0.2 Proof stress min Mpa	Tensile strenght min Mpa	Elongation min %	Impact values			Hardness value guide
Type				Temp °C	Min J		
Austenitic stainless steel							
GX5CrNiMo 19-11-2 (316)	185	440	30	ISO-V	+ 20	60	140 HB
GX2CrNiMo 19-11-2 (316L)	195	440	30	ISO-V	+ 20	80	140 HB
Martensitic stainless steel							
GX7CrNiMo12-1	440	590	15	ISO-V	+ 20	27	180 HB
GX4CrNi13-4	550	760	15	ISO-V	+ 20	50	250 HB
GX4CrNiMo16-5-1	540	760	15	ISO-V	+ 20	60	250 HB
Duplex / Superduplex							
GX2CrNiMoN 22-5-3	420	600	20	ISO-V	+ 20	30	180 HB
GX2CrNiMoN 26-7-4	480	650	22	ISO-V	+ 20	50	200 HB
Nickel-Aluminium-Bronze							
CuAl10Fe5Ni5-C	250	600	20			N.A.	140 HB

## 5-axis Sand milling as an alternative for the casting pattern

In order to cast a propeller, a casting system is required. The molding system is made of furan resin bonded sand and ceramic tubing. The 5-axis sand milling machine can also be used to make the casting mold. The advantage is that it does not require a physically casting pattern. A CAD/CAM/CAE control of the 5-axis milling machine is written based on a 3D model. The casting mold is then milled from a solid block of furan resin bonded sand. Especially for single parts or small series, sand milling can be an interesting alternative.



The advantages of sand milling for the customer are:

- No casting pattern costs
- Shorter lead time and faster delivery time
- More freedom of design
- High precision
- Lower overall cost price



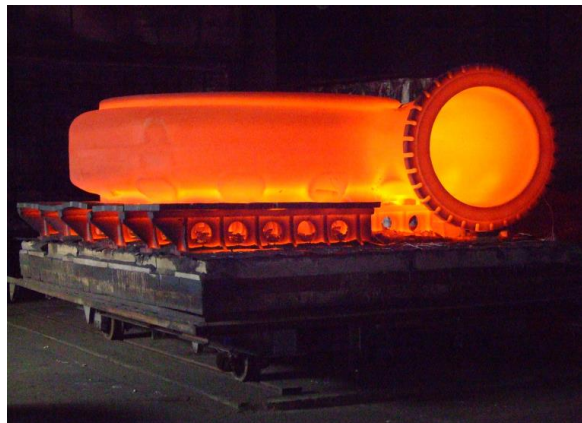
## Casting

Van Voorden Foundry has 6 induction furnaces with a total capacity of 32 tons per casting.

All aspects in the process of melting and casting are controlled by Van Voorden Foundry. Thanks to the application of high-quality raw materials, we are able to meet the required material standards. The induction furnaces can be programmed in such a way that they are always cast at the optimal temperature. Thanks to the wide range of casting ladles, the most suitable type of casting ladle can be used for each casting.

## Heat treatment

In a computer-controlled heat treatment furnace, also called an annealing furnace, the annealing process is carried out fully automatically. Heating and cooling take place in the same furnace. With a work area of 20 m<sup>2</sup>, several castings can go through the heat treatment at the same time. The temperature progression in the furnace is controlled using different thermocouples, and a uniform temperature distribution is achieved. An excellent material composition in combination with the appropriate heat treatment ensures that the required mechanical properties are met.



## Machining

The production of high-quality propellers has always been a craft. Today, thanks to modern machinery, 3D casting molds and CAD-CAM technology, and with the use of a 5-axis milling machine, the perfect profile can be applied according to the designer's specifications. Van Voorden Foundry has its own extensive machinery equipment and also works closely with reliable partners for the finishing of the propellers.



### Optimal performance of the propeller

The combination of hand grinding and machining ensures a perfect and constant result. Therefore, we always supply the top-class propeller in all possible variations. Thanks to the appropriate choice of material, Van Voorden Foundry manufactures the high-end propeller that meets the most current demands such as performance, efficiency, comfort and durability. With more than 100 years' experience, Van Voorden Foundry has acquired a great deal of expertise in the manufacture of sustainable propellers with optimal efficiency. As a result, fuel consumption remains limited and a low level of noise and vibration ensures optimal comfort and the prevention of cavitation. In this way, an optimal lifespan of the propellers, rudders and Kort nozzles is achieved.



### Certification

Van Voorden Foundry holds various certificates for the production of high-quality castings, including:

*TÜV Nederland NEN-EN-ISO 9001:2015*  
Manufacturing and machining of industrial castings in ferrous and non-ferrous alloys.

*Lloyd's Register Certificate No : MD00/1621/0009/2*  
Castings in carbon, carbon-manganese, alloy, austenitic stainless and martensitic stainless steel.

*Lloyd's Register Certificate No : MD00/1621/0009/5*  
Castings in Spheroidal Graphite Iron.

*Lloyd's Register Certificate No : MD00/1621/0009/7a*  
Copper Alloy Castings for Propellers in grades Cu1, Cu2 and Cu3.

*RMRS Certificate No: 18.20052.271*  
Steel castings and copper-base alloys for Fixed Pitch Propellers and Controllable Pitch Propellers.



### Quality and finishing

Finishing in accordance with:  
ISO 484/1-2015 Class I, II and S  
ISO 484/2-2015 Class I, II and S

### Control

Van Voorden Foundry can perform the following checks and tests in-house:

- Penetrant testing (PT)
- Magnetic testing (MT)
- Ultrasonic testing (UT)
- 3D-Scanning

### Van Voorden Foundry BV

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