



ATT 2085 MOD

SIMILAR STANDARDS

ATT 2085 MOD is non-standardized steel grade, aims to substitute AISI 420 grades such as DIN X33CrS16 (W.Nr. 1.2085), UNS S42020 (AISI 420F), AFNOR Z35CD16+S, and EN X33CrS16.

GENERAL INFORMATION

ATT 2085 MOD is a low carbon martensitic stainless steel with excellent machinability designed for hot runners, mold holders and refrigeration plates. Due the special metallurgical process applied in ATT 2085 MOD production, including VOD, the properties of this steel meets most of needs required by mold makers and end users.

ATT 2085 MOD is applied in substitution of grades like AISI 420F with superior machinability, improved dimensional stability and surface finishes.

CHEMICAL COMPOSITION

Typical Analysis (Weight Percent)

C	Si	Mn	Cr	S
0.05	0.40	2.50	12.30	0.10

STANDARD PRODUCTION RANGE

Production Route	Production Range	Finishing
Rolled Products	Thickness between 12.7 to 100 mm with width between 38.10 to 330 mm Round 12.70-152.40 mm	Centerless ground Peeled Turned
Forged Products	Thickness between 100 to 330 mm with width between 500 to 1100 mm	Milled

*Other dimensions and conditions are available upon inquiry.

DELIVERY CONDITION

ATT 2085 MOD is supplied in the hardened and tempered condition with hardness between 30-34HRC ready to be processed and applied in the final applications. Others hardness are available upon request.

MAIN CHARACTERISTICS

ATT 2085 MOD presents a martensitic matrix with low amount of carbides that is intended to provide high mechanical properties in combination with corrosion resistance. The high chromium content assures its application as a plastic mold steel to chlorinated plastics and also it can be applied in hot runners and storages. Due to the low amount of hard particles, this steel presents an excellent machinability. The low amount of carbon and silicon assures a high weldability of this product.

HEAT TREATMENT

Stress Relief

In case of high removal during machining, a stress relief heat treatment shall be applied in order to avoid distortions during quenching and tempering heat treatments. As ATT 2085 MOD is already supplied in the hardened and tempered condition, the recommended procedure is slow heating to 500°C, holding until complete homogenization, and cooling inside the furnace at least down to 100 °C.

Important Note

Since ATT 2085 MOD is supplied in the hardened and tempered condition intended for use in prehardened condition, no further heat treatment is generally required.

Hardening

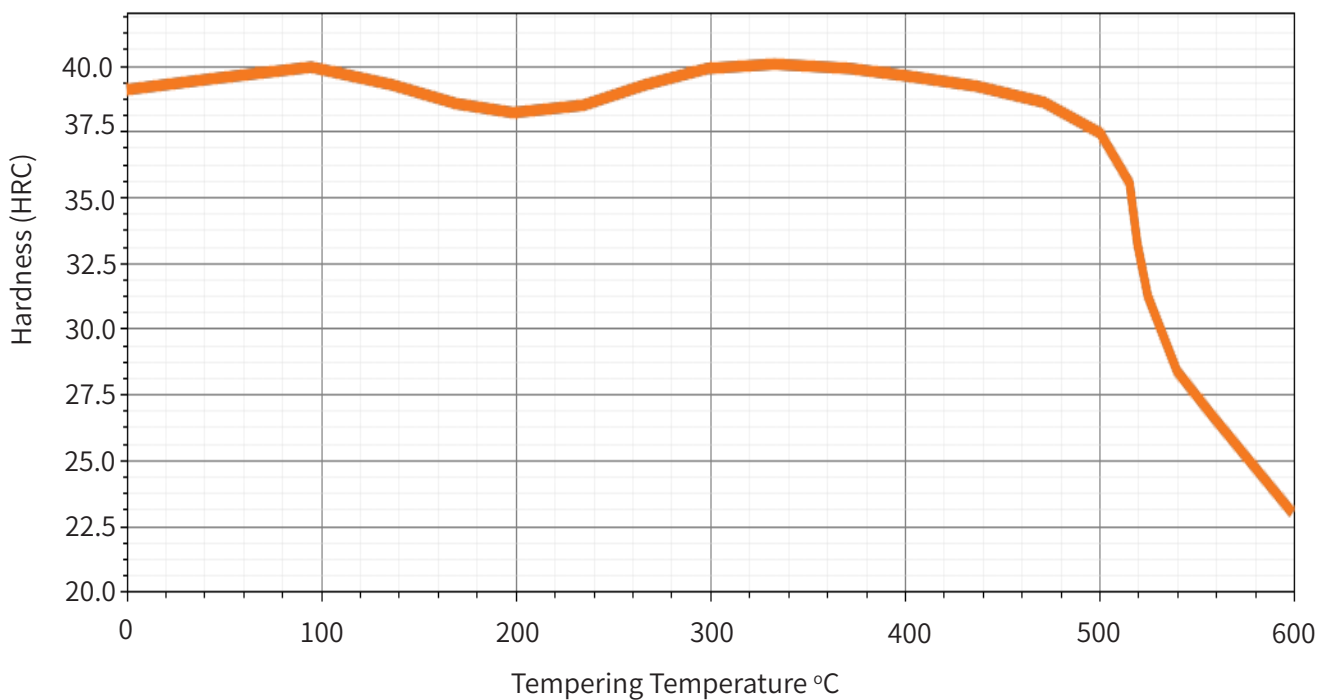
ATT 2085 MOD is already supplied in pre-benefited condition and heat treatment of quench and temper is not required. When necessary, preheat the part to 400-650°C in two steps, until the temperature from center to surface is equal in each step. The austenitizing temperature should be between 890 and 910°C holding the temperature until complete homogenization of the part.

Surface decarburization cause decrease in hardness and may cause polishing problems named “overpolishing”. Therefore, the use of protective atmosphere (or vacuum) is important during heating to hardening. After austenitization, the quenching can be performed in warm and agitated oil, 30-70°C until the part temperature reaches 100°C, followed by air cooling until 60-70°C. The maximum expected hardness will be up to 40 HRC.

Tempering

After quenching, the parts shall be tempered immediately and as soon as reaches 60°C. It is necessary at least double tempering. After each tempering, parts shall be slowly cooled to room temperature.

Tempering temperatures are generally between 500-600°C, depending upon the desired hardness. The time of each tempering cycle shall be at least 1 hour for each 25.4 mm of thickness after temperature equalization between surface and core.



Tempering curve of ATT 2085 MOD after hardening at 900°C. Tempering time: 2 hours
Curve obtained from specimens with cross section of 20 mm x 20 mm.

MAIN APPLICATIONS

The properties of excellent machinability and weldability combined with good corrosion resistance and mechanical strength make possible to use ATT 2085 MOD in the following applications:

- ⇒ Hot runners
- ⇒ Mold holders
- ⇒ Refrigeration plates
- ⇒ Non-chlorinated thermoplastic injection molds with low demand in polishing

WELDING

It is not recommended to perform welding operations on ATT 2085 MOD steel. Welding operations will produce Heat Affected Zones (HAZ), which will reduce the performance of the steel in the application. HAZ produced during arc welding operation are harder and brittle, with risk of cracking unless great care is exercised. In exceptional cases and always considering that, the welding would be a temporary solution ATT 2085 MOD might be welded using special procedures to minimize the HAZ.

ATT 2085 MOD has lower carbon content than usual AISI 420 series, which gives better weldability and results in lower hardness after welding. The process for welding ATT 2085 MOD steel consist in the following sequence: (a) preheat; (b) weld with appropriate filler metal; (c) stress relief heat treatment and (d) grind to dimensions. The qualification of a specific welding procedure is the key point to obtain the desired quality. The skill and experience of the welder is also a vital factor to obtaining satisfactory results.

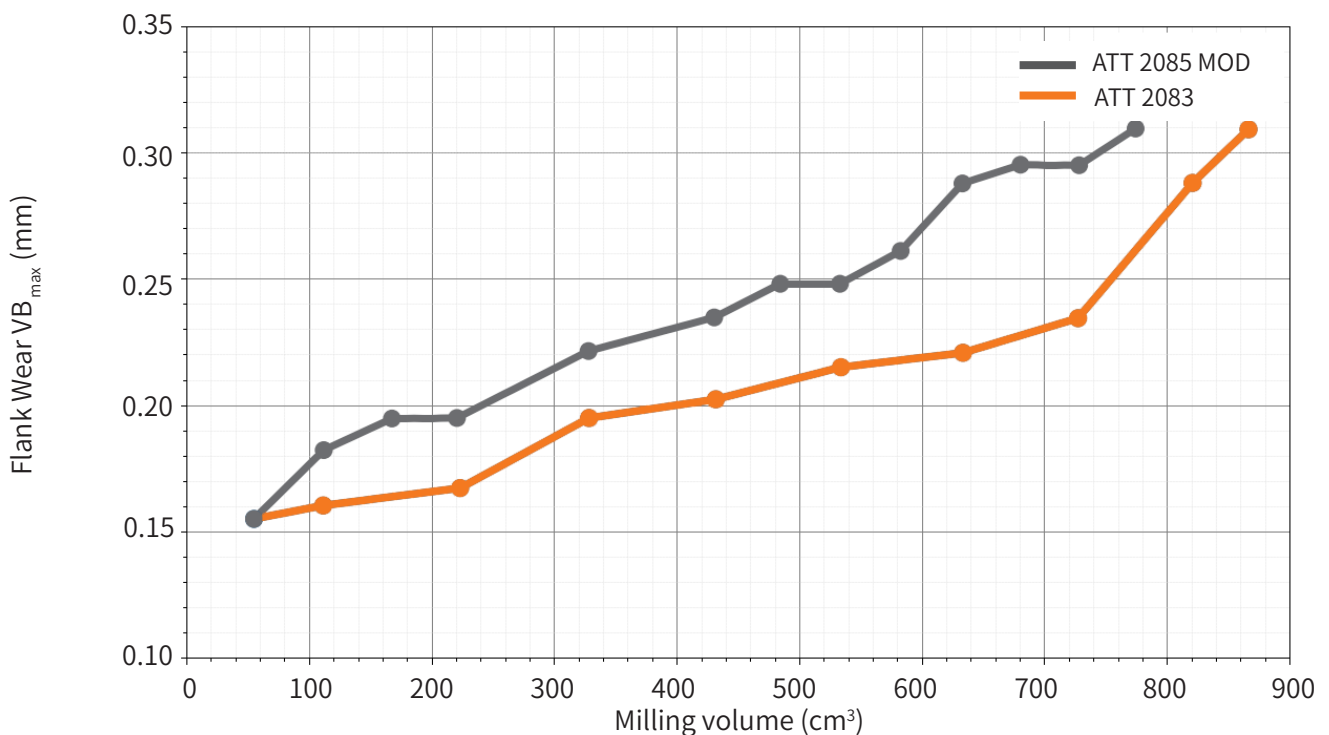
MACHINABILITY

ATT 2085 MOD can be conventionally machined in the hardened and tempered condition. Care need to be taken in the selection of the tool and the speed in order to allow a good machinability.

ATT 2085 MOD has an excellent machining performance specially in deep drilling. A good machinability property can be evaluated by tests of cutting tool end like in milling operation. Considering a flank wear of 0.25mm, cutting tool end life. The milling volume of ATT 2085 MOD was 36% higher than ATT 2083.

Electro-erosion process can be employed in heat treated dies or molds. After electro-erosion machining it is recommended to remove the superficial layer through fine grinding wheel. The white layer in ATT 2085 MOD is not as hard as in AISI P20 grades, due to the lower carbon content. After electro-erosion process and removal of the white layer, it is also recommended a stress relief treatment at 400°C.

Comparison of ATT 2085 MOD with ATT 2083



Toroidal Tool

R300-25T12-10M

Diameter = 25 mm

Number of teeth = 3

Insert

Hard metal with covered surface

R300-1032M-PH 4230

Insert Radius: 5 mm

Milling Parameters

Consistent Cut

Cutting Speed = 200 m/min

Advance = 0.12 mm/tooth

Depth of axial cut = 0.5 mm

Depth of radial cut = 10 mm

MECHANICAL PROPERTIES

ATT 2085 MOD is usually produced as blocks and which were hardened by conventional quenching and tempering treatments. The high cooling rate in quenching process of traditional steels leads to natural heterogeneity in microstructure and hardness. However, due to ATT 2085 MOD specific metallurgical features, it is possible to reach the target properties with low cooling rates, and consequently good dimensional stability and homogeneous hardness profile.

PHYSICAL PROPERTIES

Hardness	Tensile Strength		Yield Strength		Elongation in 4D	Reduction of Area
HBW	MPa	ksi	MPa	ksi	%	%
320	1125	163	967	140	14	60

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Advanced Tooling Tek (Shanghai) Co. Ltd. (ATT), established in 2001, is a trusted supplier of premium mold steel for China's manufacturing sector. With more than two decades of industry experience, ATT has built a strong reputation for reliability, technical expertise and customer-focused service.

Serving a wide range of industries, including automotive, electronics, home appliances and packaging, ATT offers a comprehensive portfolio of premium tool steels, including hot work tool steel, cold work tool steel and primarily plastic mold steel. To meet diverse customer requirements, ATT provide processing services such as sawing, milling, grinding, and heat treatment, ensuring efficient turnaround and consistent quality.

To further enhance its product range and technical strength, ATT collaborates closely with its group mill, Villares Metals. Headquartered in Sumaré, São Paulo, Brazil, Villares Metals has been a leader in specialty steels and alloys since 1944, supplying high-performance solutions to industries such as automotive, railway, energy, medical, oil and gas, aerospace and agriculture across the Americas and globally.

Through this collaboration, ATT offers customers access to world-class materials, international metallurgical expertise and innovative steel technologies. From mold manufacturers to component users and end product producers, ATT supports every stage of the value chain with dependable products, technical guidance and responsive service.

ATT is dedicated to being your preferred partner for high-performance tool steel solutions.

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