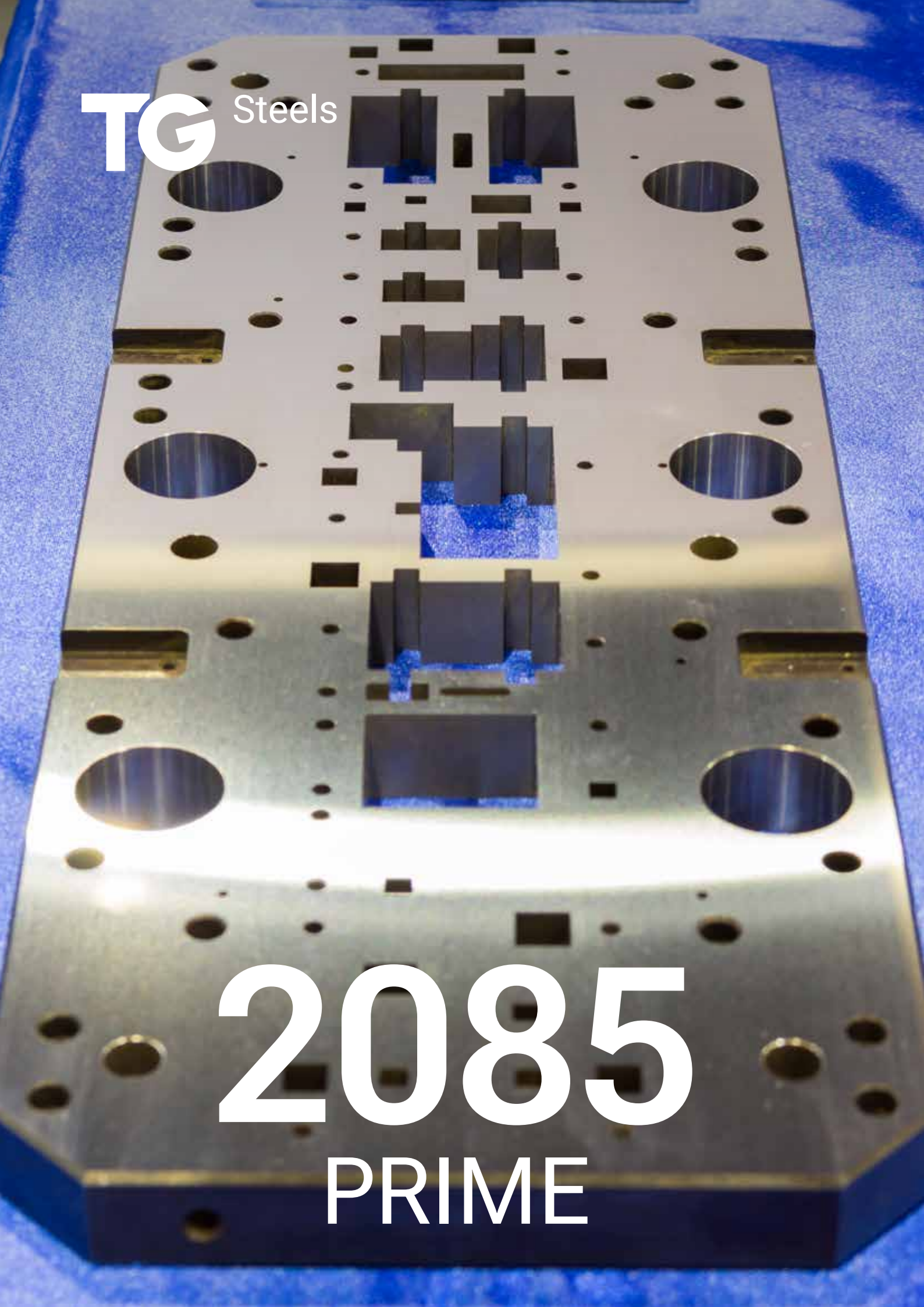
TG Steels



2085
PRIME

Stainless mold steel for either good corrosion resistance and high machinability

2085 PRIME is stainless steel, which can be used for making small and medium-sized plastic injection molds where good corrosion resistance and high machinability is required. It is delivered in hardened condition, ready to be used without any additional heat treatment, at a hardness of 300 HB. 2085 PRIME is suitable for food and medical applications.

Applications

2085 PRIME has both good corrosion resistance and excellent machinability.

2085 PRIME can be used for injection molds for corrosive plastic, molds for food, medical and measuring equipment.

2085 PRIME is delivered in the annealed condition and in use it should be treated to a hardness of 52 HRC.

Main properties

- Good corrosion resistance
- Excellent machinability
- Good wear resistance
- Delivered in heat treated conditions at 300 HB

Chemical composition *(typical)*

C	Mn	Si	P	S	Cr	Mo	Ni
0.30	< 1.40	< 1.00	< 0.025	< 0.060	16.0	0.20	< 1.00

Designation

Werkstoff Nr	ISO	China GB	JIS Japan	UK	AISI USA	Russia Gost	AFNOR	Other / Special
1.2085	X30Cr16+S	-	-	420S45	420F mod	-	Z30C16+S	-

Structure

The structure of the 2085 PRIME is fine and homogeneous without precipitation or alignments of carbides.

Corrosion resistance

2085 PRIME is specially resistant to corrosion by condensation and cooling circuit water and it can be used successfully for tools operating in marine or tropical environments.

As for all stainless steels and for improving the corrosion resistance, it is always preferable to have a surface roughness as low as possible.

2085 PRIME is heat treated under optimal conditions to improve its corrosion resistance but because of its high sulfur content it is not suitable for use in highly aggressive environments. In case of highly aggressive environment we recommend to use the 2316 PRIME and eventually the Cromis PRIME or Cromis ESR.

Hardness at the time of delivery

Hardened for 280 - 325 HB

Typical mechanical properties in hardened conditions *(results from internal tests not indicated on the certificates)*

TS MPa	YS 0.2% MPa	Elongation %	KU J à 20°C
1000	910	10	≥ 15

Physical properties

Temperature	20°C	100°C	200°C	300°C
Volumic mass kg/m^3	7720	7700	7660	7650
Young Modulus N/mm²	205000	202000	197000	192000
Thermal conductivity W/m.K	23	23.5	24	24.1
Coefficient of linear expansion 10^{-6}/K		11	11.2	11.7

Heat treatment

2085 PRIME is delivered heat treated for a hardness of 280 to 325 HB. There is no need for extra heat treatment.

In the case of the necessity for the heat treatment of 2316 PRIME *(e.g.: need for higher hardness, material damaged by thermal processing...)*

the data below could be used:

SOFT ANNEALING

Temperature: 780 - 820°C, duration 1h + 1h for 25 mm thickness. slow cooling in the furnace *(10 to 20°C/h).* The atmosphere in the furnace must be reducing to avoid decarburization of the steel.

STRESS RELIEVING

After machining, it is recommended to perform stress relieving at a temperature over 550°C and at 20°C *(minimum)* under the last tempering temperature for a minimum of 2 hours, followed by slow cooling in the furnace to 450°C.

AUSTENITIZATION

In order to avoid any risk of cracking it is recommended to preheat in 2 steps.

- 1st preheating step: temperature: 600°C time: 30 s/mm of thickness
- 2nd preheating step: temperature: 850°C time: 30 s/mm of thickness

Recommended austenitizing temperature: 1000 - 1050°C. The holding time should not be too long to avoid a risk of grain coarsening and a loss of toughness. It is recommended to keep the room for 30 minutes at the austenitizing temperature, as soon as the core of the room has reached the austenitizing temperature.

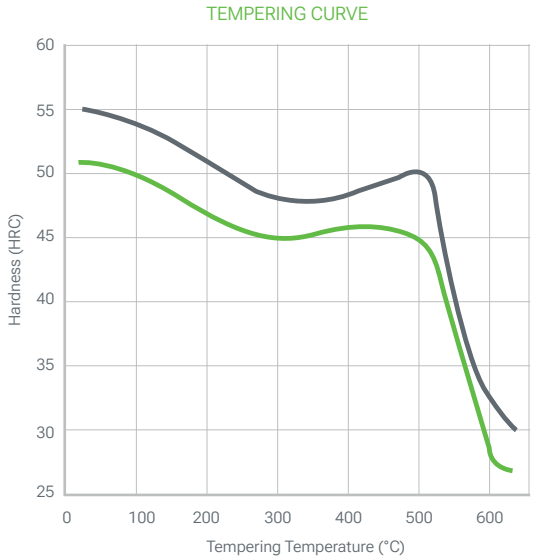
QUENCHING MEDIUM

Oil at 80°C, vacuum *(pressure >6 bars)*, salt bath 500-550°C.
To ensure good toughness, treatment with oil or salt bath is preferable.

TEMPERING

To ensure a minimum residual austenite rate as well as greater tool stability, it is essential to perform a double tempering. Each tempering is followed by a cooling under 100°C. Each tempering time must be at least equal to 1h + 1h for 25 mm of thickness of the treated part *(equivalent thermal thickness).*

Tempering temperature and corrosion resistance:
In order to avoid a better corrosion resistance it is highly recommended to avoid tempering temperatures in the range 400 to 550°C since at these temperatures there is a precipitation of chromium carbides at the grain boundaries leading to an increase of the local corrosion at these locations. For the higher hardness *(better wear resistance)* tempering temperatures lower than 400°C are recommended and for lower hardness *(better toughness)* tempering temperatures over 550°C are recommended.



Surface treatment

NITRIDING

2085 PRIME can be nitrided at temperatures less than or equal to 20°C below tempering temperatures without risk of deterioration of the mechanical characteristics. Nitriding at a temperature over 550°C is recommended to avoid any risk of carbide precipitation at the grain boundaries.

PVD, CVD

2085 PRIME is suitable for all kind of PVD and CVD treatment as soon as the treatment temperature is 30°C lower than the last tempering temperature and less than 400°C or over 550°C.

Polishing

2085 PRIME is suitable for polishing in the heat treated condition and it can be used for applications requiring a good polished level *(Rt ≤ 50 µm, CNOMO level 3, Rugotest N9)* as used for parts requiring a correct aspect. Optimal polishing is achieved by performing consecutive steps with similar roughness and stopping each step as soon as the last scratch from the previous step disappears.

Texturing

2085 PRIME is NOT suitable for chemical or laser texturing because of its high sulfur content.

Machining

Compared to the 2316 PRIME, at a constant cutting speed, by using the 2085 PRIME the service life of cutting tools is increased by 500%, the drilling speed by 300% with high-speed steel tools, and the milling speed by 30% with tools with carbide inserts.

The machining parameters below are given for information only and must be adapted according to the equipment and usual machining conditions.

TURNING

	Carbide tool		HSS tool
	Rough machining	Finishing	Finishing
Cutting speed m/min	180 - 210	230 - 270	22 - 25
Feed mm/r	0.2 - 0.4	0.1 - 0.2	0.1 - 0.3
Depth of cut mm	2 - 4	0.5 - 2	0.5 - 2

MILLING: SURFACING

	Milling with carbide tools	Solid
	Rough machining	Finishing
Cutting speed m/min	180 - 2400	280 - 320
feed mm/r	0.2 - 0.4	0.1 - 0.2
Depth of cut mm	2 - 4	0.5 - 2
Carbide designation ISO	P20 - P40 coated carbide	P10 - P20 coated carbide or cermet

END MILLING

	Milling with carbide tools	
	Solid carbide	Carbide indexable insert
Cutting speed m/min	150 - 170	180 - 230
Feed mm/teeth	0.02 - 0.2	0.07 - 0.2
Carbide designation ISO	NA	P20 - P30

DRILLING: HSS TWIST DRILL

Drill diameter mm	Cutting speed m/min	Feed mm/t
< 5	16 - 19	0.05 - 0.15
5 - 10	16 - 19	0.15 - 0.20
10 - 15	16 - 19	0.20 - 0.25
15 - 20	16 - 19	0.25 - 0.30

DRILLING: CARBIDE DRILL

	Carbide type		
	Indexable insert	Solid carbide	Carbide tip
Cutting speed m/min	230 - 250	100 - 120	90 - 100
Feed mm/t	0.05 - 0.10	0.10 - 0.25	0.15 - 0.25

FINE GRINDING

General indications for grinding wheels to be used on 2085 PRIME in the heat treated condition. Usually, rather soft vitrified aluminum oxide grinding wheels *(grades G for plane grinding to K for cylindrical grinding)* are used.

Particular attention will be paid to effective cooling of the surface during grinding to prevent degradation of the material surface.

ELECTRO-DISCHARGE MACHINING

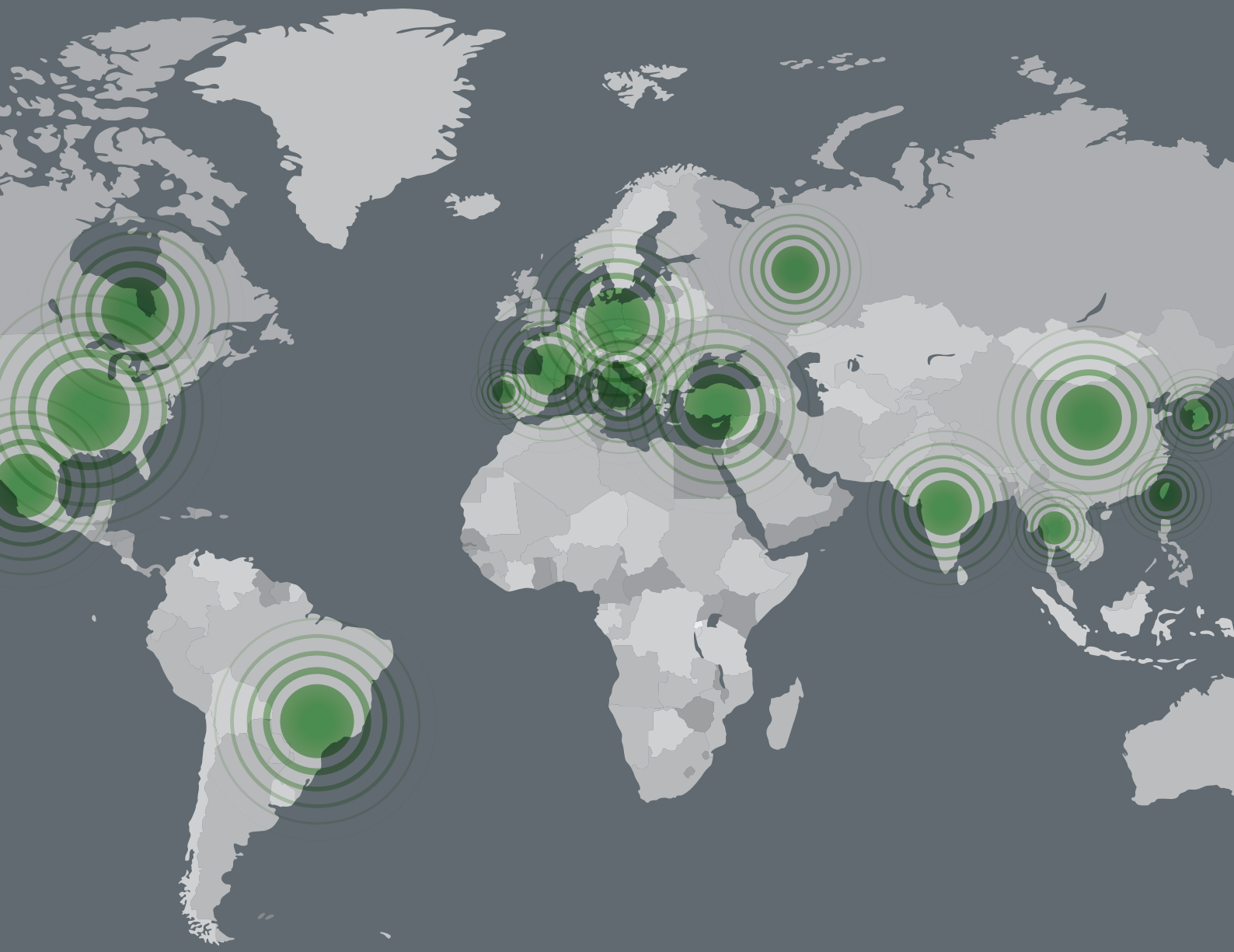
2085 PRIME is also suitable for EDM machining *(wire or electrode)*. Preferably, the machining will be carried out with a low current density and a high frequency in order to limit the thickness of the white layer as much as possible.

Then it is necessary to carry out a stress relieving at 25°C below the last tempering in order to reduce the level of residual stresses *(which could lead to a risk of cracking)* and to carry out a polishing to completely remove the white layer formed during the discharge machining process.

Welding

It is not recommended to weld the 2085 PRIME because of it high sulfur content leading to an important risk of cracks.

In case of need this is mandatory please consult us for more details on welding parameters.



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