TG Steels

TGX8

CORVI

Remelted cold working tool steel for both very good wear resistance and very high toughness

TGX8 is an 8% Cr cold working steel with a specific elaboration that achieves very high cleanliness and a very fine structure.

Applications

TGX8 has very good dimensional stability *(it can be used for measuring instruments)*, good compressive and abrasion resistance as well as good resistance to chipping, very good resistance to brittleness and tempering. It also has good machinability and suitability for grinding and processing such as gas, ionic or salt bath nitriding, as well as PVD or CVD coatings.

TGX8 can be used for: cutting tools *(punches and dies)*, cutting tools, punching and drilling tools, cold heading tools *(punches and dies)*, stamping tools, cold spinning and extrusion tools, thread rolling tools, reamers, shear blades, cold working rolls *(rolling or straightening)*.

TGX8 can also be used for mold injection cavities and thresholds for plastics and in some cases for hot work tools thanks to its high hot hardness.

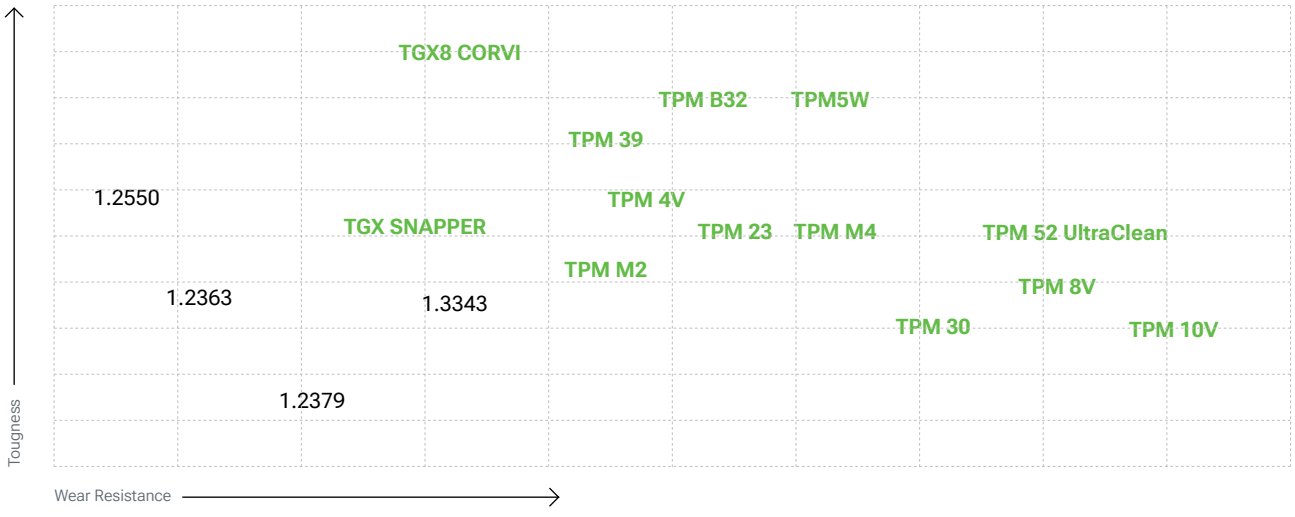
TGX8 can be considered as a steel that pushes the limits of cold-working steels at 12% chromium.

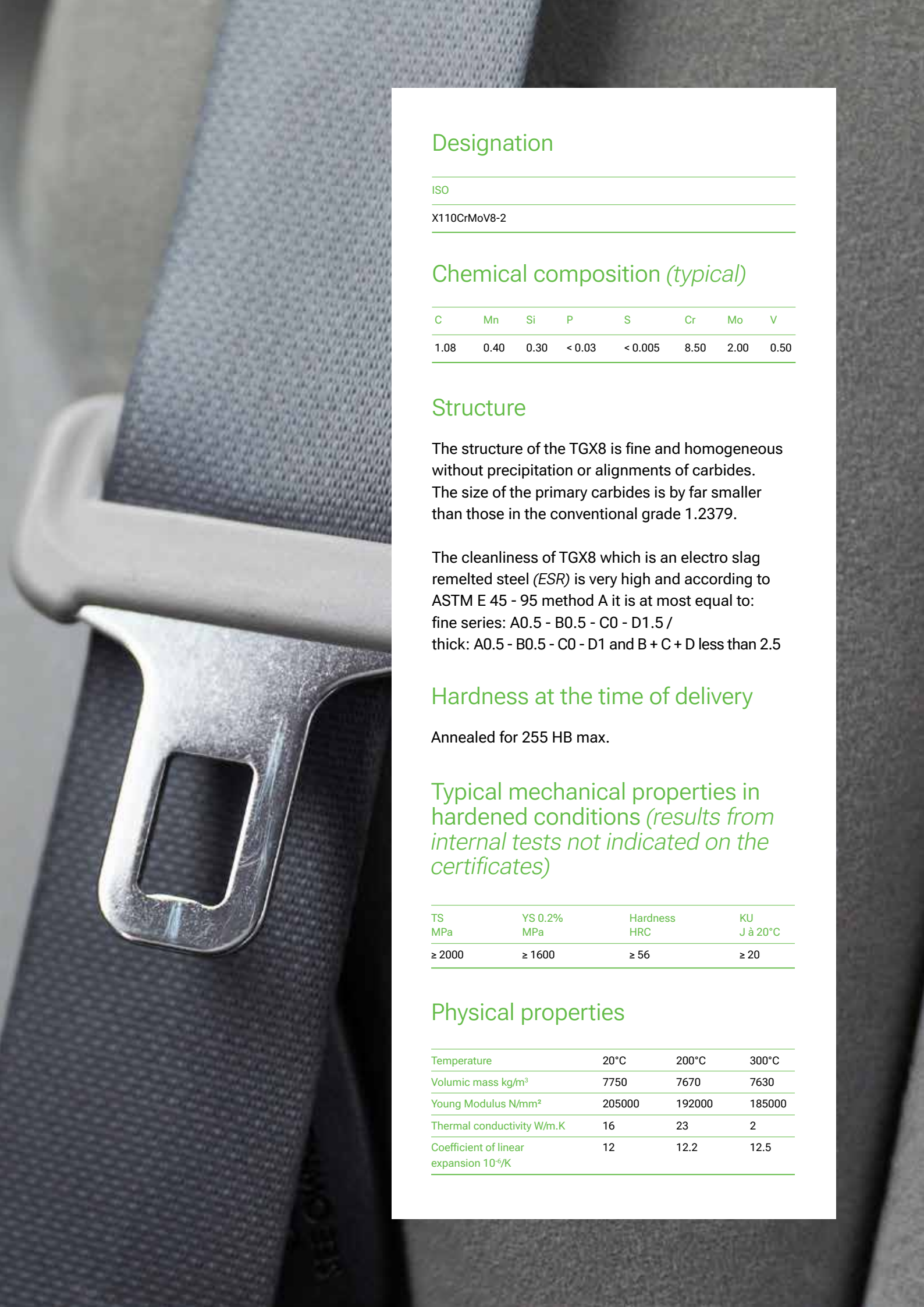
TGX8 is an excellent solution for improving the service life of tools in 1.2363, 1.2550 or 1.2842 when they reach their end of life due to wear and for tools in 1.2379 or 1.2380 when they reach their end of life due to breakage.

TGX8 is delivered in the annealed condition and in use it should be treated to a hardness of 58 to 60 HRC.

Main properties

- Very good wear resistance
- Very good toughness
- High hardenability





Designation

ISO
X110CrMoV8-2

Chemical composition *(typical)*

C	Mn	Si	P	S	Cr	Mo	V
1.08	0.40	0.30	< 0.03	< 0.005	8.50	2.00	0.50

Structure

The structure of the TGX8 is fine and homogeneous without precipitation or alignments of carbides. The size of the primary carbides is by far smaller than those in the conventional grade 1.2379.

The cleanliness of TGX8 which is an electro slag remelted steel *(ESR)* is very high and according to ASTM E 45 - 95 method A it is at most equal to:
fine series: A0.5 - B0.5 - C0 - D1.5 /
thick: A0.5 - B0.5 - C0 - D1 and B + C + D less than 2.5

Hardness at the time of delivery

Annealed for 255 HB max.

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

TS MPa	YS 0.2% MPa	Hardness HRC	KU J à 20°C
≥ 2000	≥ 1600	≥ 56	≥ 20

Physical properties

Temperature	20°C	200°C	300°C
Volumic mass kg/m³	7750	7670	7630
Young Modulus N/mm²	205000	192000	185000
Thermal conductivity W/m.K	16	23	2
Coefficient of linear expansion 10^{-6}/K	12	12.2	12.5

Heat treatment

SOFT ANNEALING

Temperature: 840 - 850°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 650°C 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: 550°C time: 30 s/mm of thickness
- 2nd preheating step: temperature: 750°C time: 30 s/mm of thickness

Recommended austenitizing temperature: 1030 - 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 part at the austenitizing temperature 30 minutes per inch of thickness as soon as the temperature of the surface reach the austenitization 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.

SUB ZERO TREATMENT

For parts that need to have high dimensional stability and to increase wear resistance without reducing toughness, it is recommended to perform a subzero treatment at a temperature between -70°C and -190°C for 1 hour for 25 mm of thickness of the part.

The temperature range from -70°C up to -120°C *(named cold treatment of steel)* leads to the complete transformation of austenite into martensite and as a consequence to better stability associated with improved hardness and better wear resistance and the temperature range from -135°C down to -190°C *(named cryotreatment of steel)* leads also to the complete transformation of austenite and also the the precipitation of ultrafine carbides improving a lot the wear resistance without modification of the toughness. This treatment is optional for common applications.

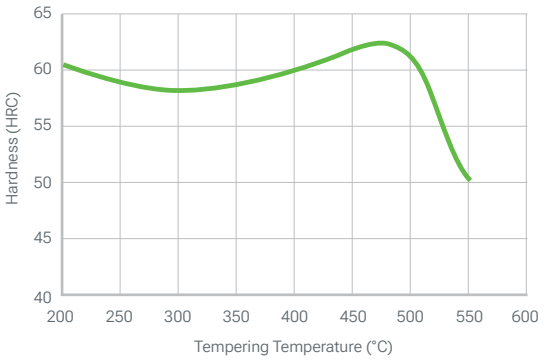
TEMPERING

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 25mm of thickness of the treated part *(equivalent thermal thickness)*.

The minimum deformations *(the deformations are negative (narrowing) ≈- 0.05%)* are obtained for tempers between 350 and 450°C and an austenitization temperature of 1030°C.

TEMPERING CURVE



Surface treatment

NITRIDING

TGX8 can be nitrided at temperatures less than or equal to 20°C below tempering temperatures without risk of deterioration of the mechanical characteristics.

PVD, CVD

TGX8 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.

Polishing

TGX8 is perfectly suitable for polishing in the heat treated condition and can be used for applications requiring a good level of polish *(total roughness Rt ≈ 4 µm, CNOMO level 1.5, roughness N5).*

Optimal polishing is achieved by performing consecutive stages of roughness that are close enough and stopping each step as soon as the last scratch from the previous step disappears.

Surface hardening

The surface of the TGX8 can be hardened by induction, laser or torch heating.

By induction it is typically possible to achieve a surface hardness of the order of 62 HRC at a depth of 2 mm *(1 mm by laser)*. This hardening must be followed by a low-temperature tempering to release the stresses induced by the treatment and to adjust the hardness.

By using an oxyacetylene torch with heating to 1000°C followed by air quenching, it is quite possible to obtain a surface hardness of 60 to 62 HRC.

Machining

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	100 - 140	160 - 210	17 - 22
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 tool
	Rough machining	Finishing
Cutting speed m/min	110 - 160	180 - 220
Feed mm/r	0.2 - 0.4	0.1 - 0.2
Depth of cut mm	2 - 4	0.5 - 2

END MILLING

	Milling with carbide tools		HSS milling tool
	Solid carbide	Carbide indexable insert	
Cutting speed m/min	100 - 120	110 - 10	12 - 19
Feed mm/teeth	0.02 - 0.2	0.07 - 0.2	0.05 - 0.3

DRILLING: HSS TWIST DRILL

Drill diameter mm	Cutting speed m/min	Feed mm/t
< 5	14 - 16	0.05 - 0.15
5 - 10	14 - 16	0.15 - 0.20
10 - 15	14 - 16	0.20 - 0.25
15 - 20	14 - 16	0.25 - 0.30

DRILLING: CARBIDE DRILL

	Carbide type		
	Indexable insert	Solid carbide	Carbide tip
Cutting speed m/min	210 - 230	80 - 100	70 - 80
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 TGX8 in the heat treated condition.

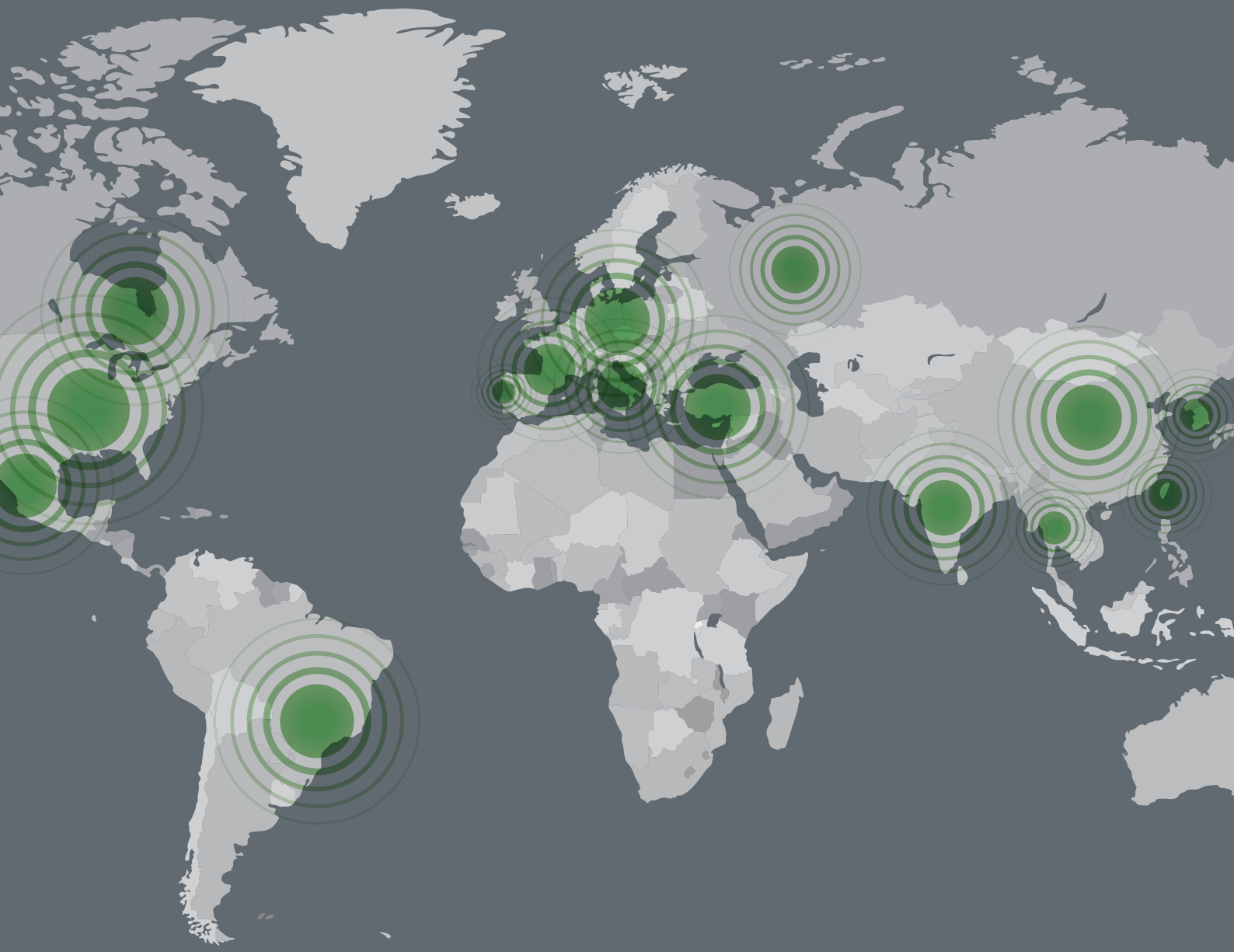
Usually, rather soft vitrified aluminum oxide grinding wheels *(grades G for plane grinding to K for cylindrical grinding)* are used.

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

ELECTRO-DISCHARGE MACHINING

TGX8 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.



TG Steels

E info@tgsteels.com **W** www.tgsteels.com

Atlas Special Steels, s.l.
Avinguda de Can Sucarrats, 88-92,
08191 Rubí, Barcelona, Spain
+34 938 233 590
info@atlassteels.eu

Atlas Special Steels Unipessoal, Lda
Rua do Antuã, nr. 64 pavilhão A e B
3720-558 Travanca – OAZ, Portugal
+351 256 245 497
info@atlassteels.eu

Five Star Special Steel Europe srl
Via Glenn Curtiss, 9, 25018
Montichiari BS, Italy
+39 030 524 3724
info@fssseurope.com

GNG Consultoria
Rua Ituporanga, 210 – Bom Retiro
Joinville – SC – 89222-430
+55 47 99669-5557
marcus@gngconsultoria.com.br

OSS Canada Special Steel Inc
2384 Speers Rd, Oakville,
ON, Canada L6L 5M2
905-827-5888
sales@oss-material.ca

OSS Special Steel Inc.
2015 Mitchell Blvd Suite C
Schaumburg, IL 60193
(618) 426 – 6158
sales@oss-material.com

TG Steels s.r.o.
Libušina 850, Dubí 272 03
Kladno, Czech Republic
info@tgsteels.com

TG Middle East
Kocaeli KOBİ OSB, Köseler Mh.,
3. Cd., No: 15 Dilovası, Kocaeli, Türkiye
+90 262 728 11 67 (pbx)
info@tgme.com.tr