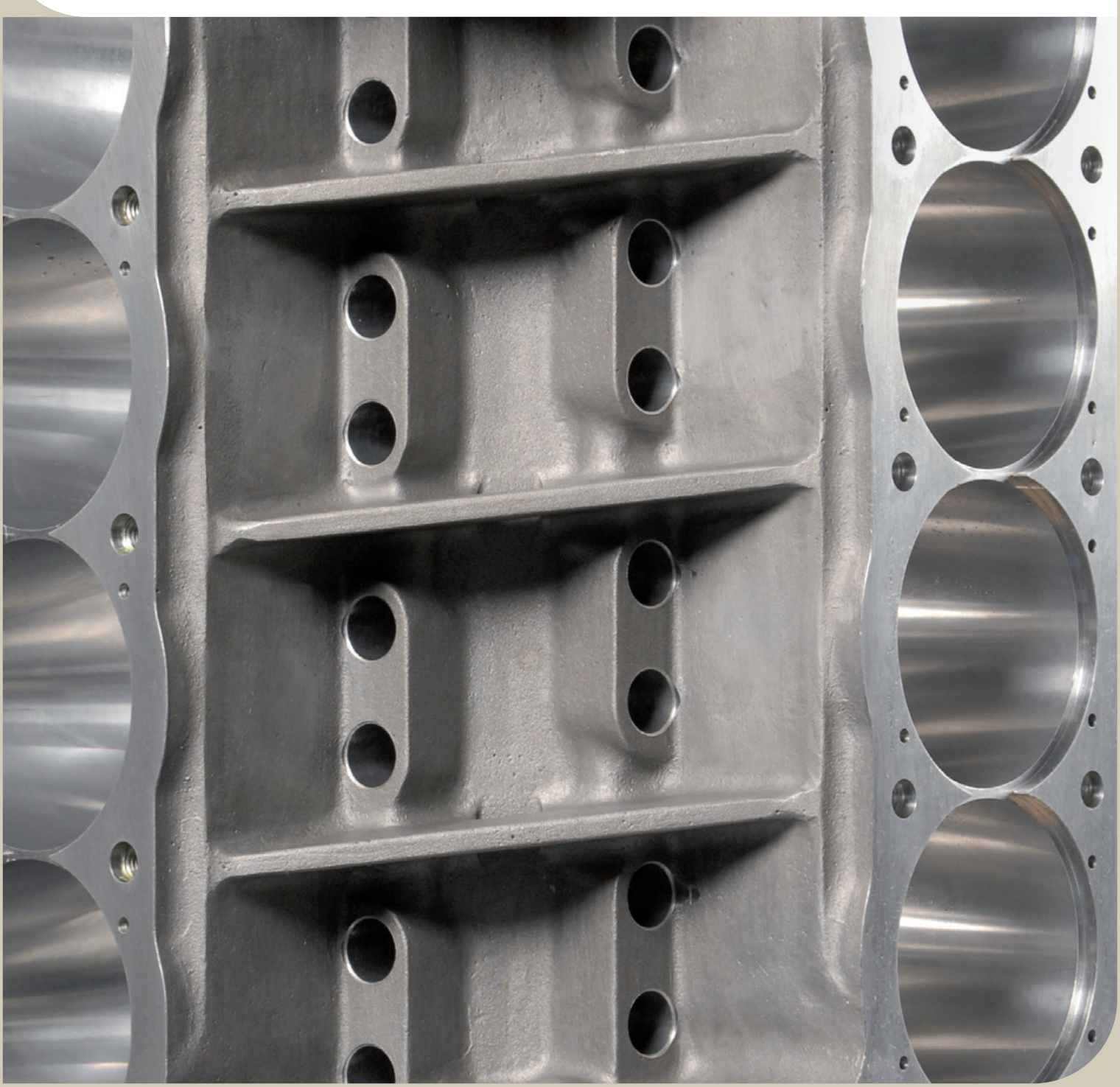
Industeel

ArcelorMittal

ISOTROP

Steel solution for die casting dies



Industeel
Special steel plates and blocks producer

Steel making

Industeel is a subsidiary of ArcelorMittal producing special steel hot rolled plates, forged blocks, ingots and formed pieces in **the world's widest dimensional range.**

Specialized in carbon, low alloys, and stainless steels, Industeel offers a complete range of **high quality steel grades** designed to meet the most stringent specifications.

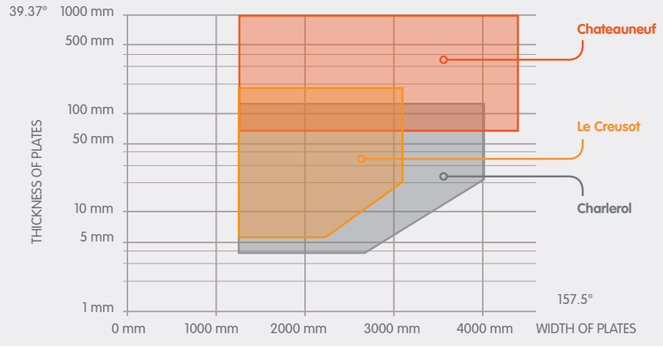
Thanks to its **3 integrated mills** located in Belgium and France, Industeel meets all customer requirements providing the widest dimensional range.

Tailor-made solutions adapted to your projects thanks to a rich metallurgical know-how.

Hot rolling

Rolled product

The widest dimensional range of plates



Our expertise

First class producer of high quality hot work tool steel

Careful selection of raw materials to produce **high purity steel** melt by electric arc furnace

Fine tuned secondary metallurgy, vacuum and special degassing processes **for high cleanliness steels** (AOD, VOD).

Bottom poured ingots forget, based on monitored forging program and **lasted know-how techniques**

Automatic quenching devices and high precision tempering furnaces create **homogeneous hardness and microstructure** through the cross section

100% inspection of internal soundness by UT examination and hardness control

Electric arc furnace

Forging press for thick blocks

Rolling mill

Hardness control

ISOTROP
Our high quality and cost effective solution for die casting

Die casting industry is very cautious in the selection of hot work tool steels to manufacture die casting dies.

In the production of long series, die life time is the first requirement, and tool steel quality / properties will always prevails on its cost, which does not mean that there is no need for cost saving in the die manufacture.

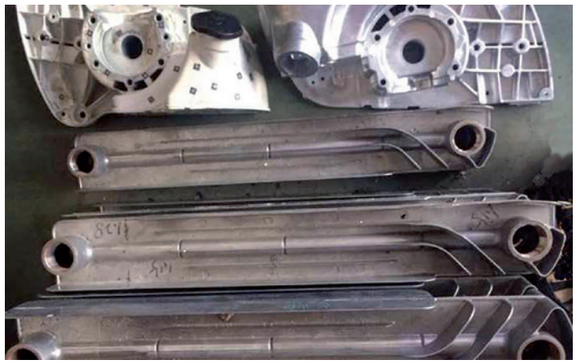
All steel properties, structure, cleanliness toughness, governing die life are well known and listed by international standards such as NADCA, SEP...

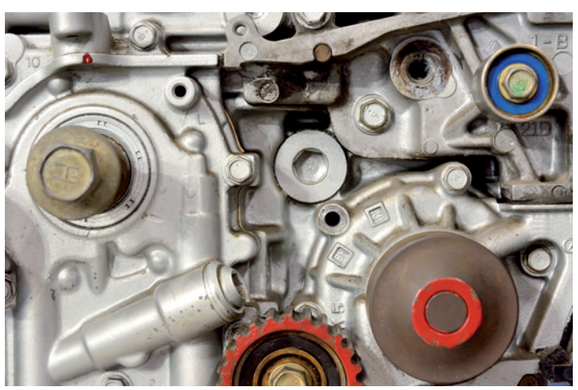
ISOTROP is a high quality hot work tool steel (W1.2343 / W1.2344 / H11 /H13 modified) obtained thanks to a special solidification process.

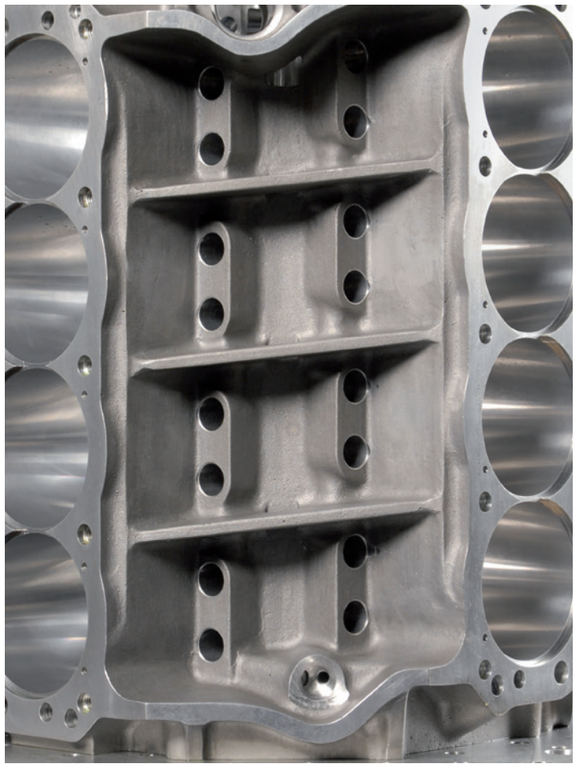
Improved chemistry

Special steel making process

Optimized heat treatment







ADVANTAGES OF ISOTROP

Similar quality as **ESR** die casting die steel thanks to an **unique solidification process** (different from ESR/VAR) achieving homogeneous structure and properties **throughout the whole master block**.

Optimized chemical analysis aim particularly to improve toughness to a high level.

Better properties than standard / EFS products
W1.2343 / H11
or W1.2344 / H13 grades

Toughness properties

- **homogeneous** in all positions, and in all directions
- similar to the one of W1.2343 ESR typically 300 / 350 joules (unnotched specimen)

Good thermal fatigue behavior

Good softening resistance

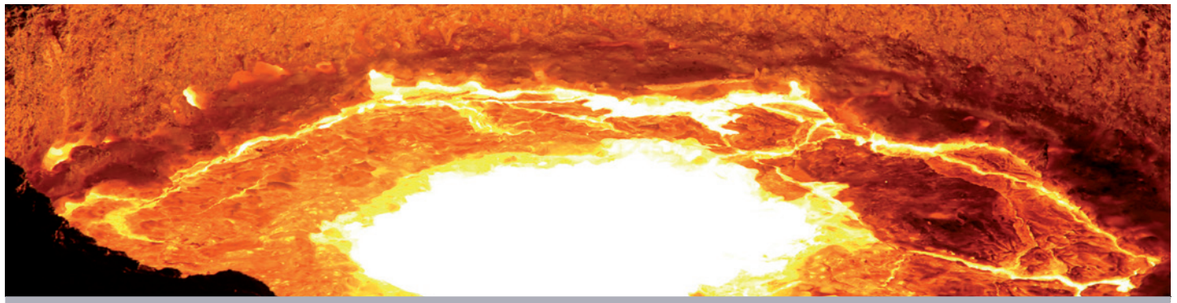
Meet the most stringent international specifications:
NADCA #207-2015, SEP 1614, VDGM82

Dimensional range

	THICKNESS	WIDTH
ISOTROP	60 to 360mm (2.36 to 14.1")	Up to 2000mm (78")

ISOTROP
Our solution for die casting

ISOTROP is a W1.2343 / H11 and W1.2344 / H13 modified with an improved chemistry

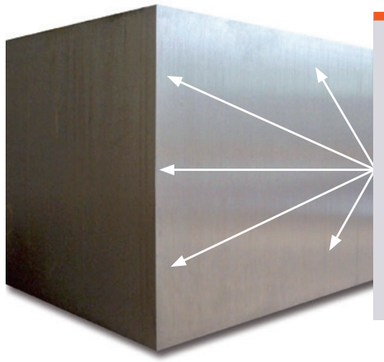


	C	S	P	Si	Mn	Cr	Mo	V
W1.2343	0.33/0.41	< 0.020	< 0.030	0.80/1.20	0.25/0.50	4.80/5.50	1.10/1.50	0.30/0.50
W1.2344	0.35/0.42	< 0.020	< 0.030	0.80/1.20	0.25/0.50	4.80/5.50	1.20/1.50	0.85/1.15
ISOTROP	0.36	0.0006	0.006	0.30	0.40	5.1	1.40	0.35

ISOTROP cleanliness meets requirement of NADCA #207-2011

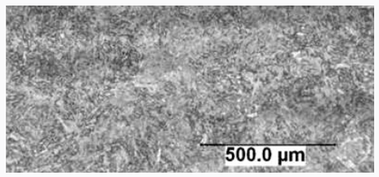
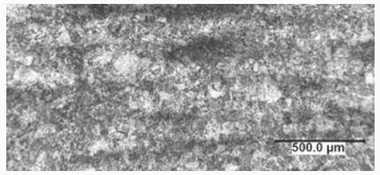
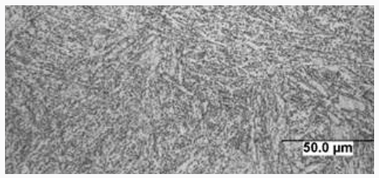
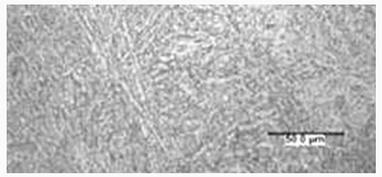
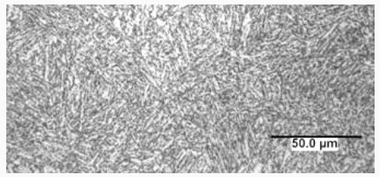
	NADCA REQUIREMENTS PREMIUM GRADES		NADCA REQUIREMENTS SUPERIOR GRADES		ISOTROP Typical values	
inclusion type	Thin	Heavy	Thin	Heavy	Thin	Heavy
A (suifide)	1.0	0.5	0.5	0.5	0/0.5	
B (aluminate)	1.5	1.0	1.5	1.0	0.5/1.5	0.5/1.0
C (silicate)	1.0	1.0	0.5	0.5	0	
D (globular oxydes)	2.0	1.0	1.5	1.0	0/0.5	

ISOTROP is homogeneous in all positions



ISOTROP guarantees better homogeneity in top/bottom/ surface/ mid thickness compared to Standard & EFS products

Whatever the thickness, ISOTROP meets the microstructural requirements of international standards

T = 120 MM (MID WIDTH)	T = 250 MM (MID WIDTH)	T = 350 MM (MID WIDTH)
 SA3 (SEP) Acceptable (NADCA)	 SB2 / SC3 (SEP) Acceptable (NADCA)	 SC3 (SEP) Acceptable (NADCA)
 SA3 (SEP) Acceptable (NADCA)	 SB2 / SC3 (SEP) Acceptable (NADCA)	 SC3 (SEP) Acceptable (NADCA)

ISOTROP
Excellent properties for die life

Toughness properties

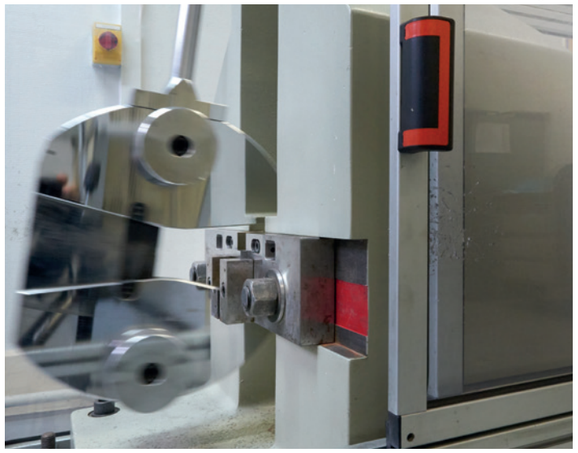
High toughness is necessary to avoid premature failure / gross cracking (complex shapes) and it also participates to heat checking cracks appearance

Toughness of ISOTROP is homogeneous in all positions, and in all directions

Toughness of ISOTROP is similar to the one of W1.2343 ESR typically 300 / 350 joules unnotched specimen

ISOTROP meets requirements of NADCA #207-2015 and VDG M82

Mechanical testing



Typical impact properties

Toughness measurement at room temperature on samples prehardened at 45 HRC

		Typical Values (average of 3 specimen)	NADCA #207-2015 (E & F)	VDG M82
Charpy V Notch (*)	ft.lb J	15 to 21 20 to 28	≥14 ≥19	
Charpy Unnotched (**) (standard)	J	275 to 385		≥200J
			NADCA requirements	NADCA requirements

(*) through thickness direction at mid thickness of the blocks
(**) length and transverse direction

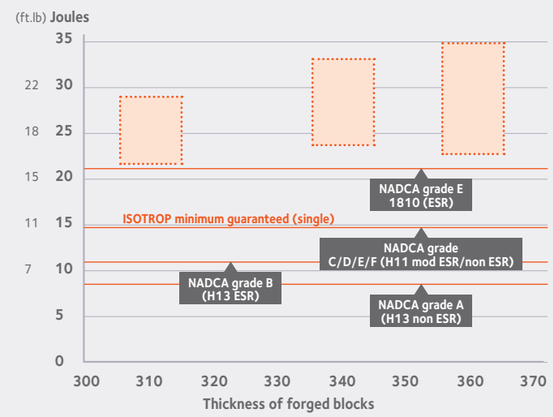
Impact tests : Charpy V notch specimens

(according to NADCA # 207-2011)

Individual values / Short transverse direction

Toughness of ISOTROP is consistent whatever the thickness

Toughness of ISOTROP meets NADCA requirements of premium and superior grades

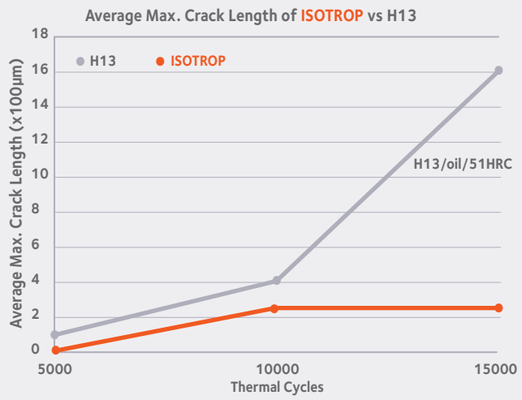


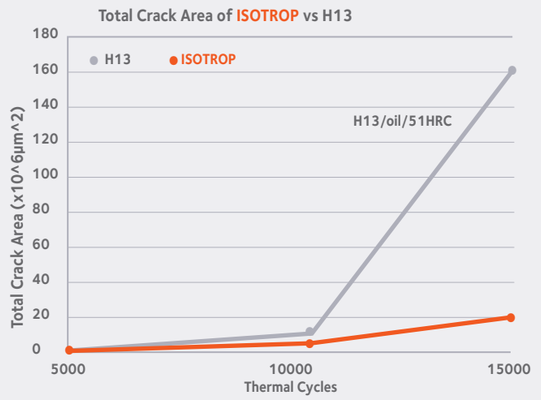
Thermal fatigue behavior

Thermal fatigue illustrates the ability of a material to withstand repetitive thermal cycle and to delay heat checking crack appearance

Test sample dunked in molten aluminum

Dunker test performed on ISOTROP (specimen hardened to 45 HRC) by Case Western Reserve University / Cleveland Ohio

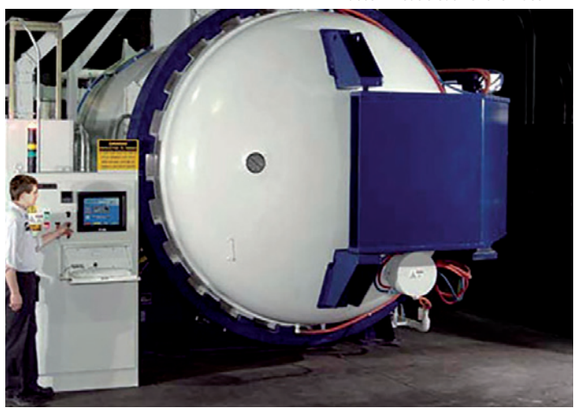




Temper resistance

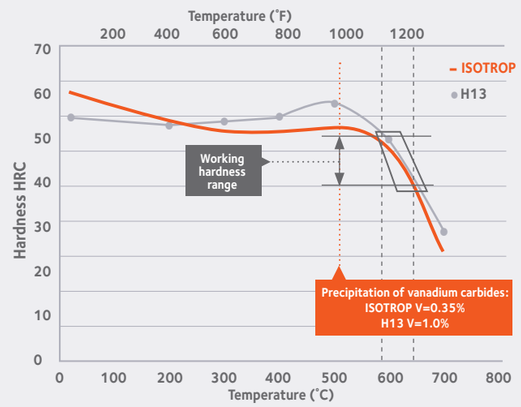
Temper resistance is the ability of a material to maintain good mechanical properties in hot conditions after a long exposure to the heat

Vaccum heat treatment furnace



Similar heat treatment process can be applied to both ISOTROP and H13

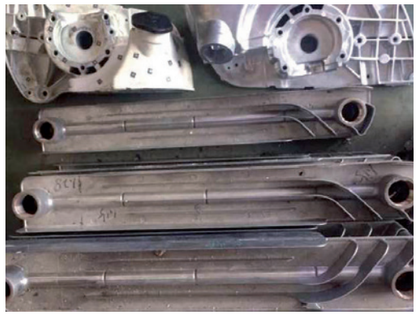
(more technical details are available in the ISOTROP datasheets)



New product with a wide range of applications

ISOTROP can be used to manufacture aluminum, magnesium die casting dies as a cost efficient substitute to ESR steel grades

Aluminium casted piedes



ISOTROP can be used for forging dies in substitution to W1.2343 / H11 and W1.2344 / H13

- Its improved toughness over standard grades reinforce the resistance of forging dies to failure

Forged golf club

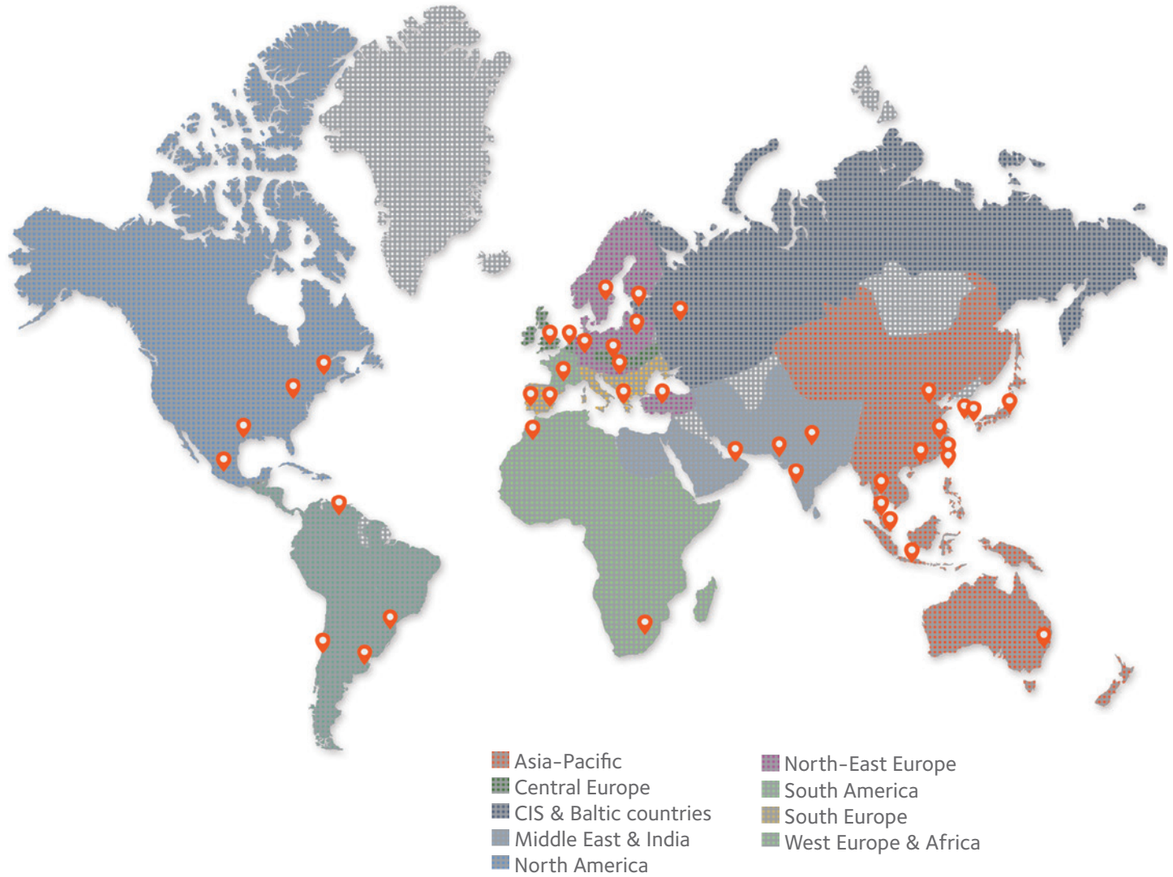
ISOTROP can be used for plastic injection molds (abrasive compounds, long series...)

- Its optimized chemistry and high hardness ensure high wear resistance.
- Because of its lower segregation rate, ISOTROP benefits from a better polishability than standard or EFS W1.2343 / H11, W1.2344 / H13 grades (it is not suitable for lens quality polishing)
- Composite parts

Electronic devices

Aerospace industry

Where to find our steels



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