HSI BLOW BAR

Material Selection & Engineering Guide

Comprehensive Alloy Comparison for Optimal Performance

Document Purpose: This guide provides detailed metallurgical specifications, application recommendations, and selection criteria for ATF's complete range of HSI blow bar alloys. Use this document to identify the optimal material for your specific crushing application, feed characteristics, and operational requirements.

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1. QUICK SELECTION MATRIX

Use this matrix for rapid alloy selection based on your primary application. For detailed specifications, refer to individual alloy sections.

Application	Primary Choice	Alternative	Avoid
Primary Crushing (Variable Feed)	Manganese (Mn18Cr2)	Mn + TiC	High Chrome
Concrete Recycling (With Rebar)	Martensitic	Mn18Cr2	HC + Ceramic
Asphalt Recycling (Clean)	Martensitic + Ceramic	High Chrome + Ceramic	Manganese
Limestone Secondary (Clean Feed)	High Chrome + Ceramic	HC + Ceramic Plus	Manganese
Manufactured Sand (Ultra-Abrasive)	HC + Ceramic Plus	High Chrome + Ceramic	Martensitic
Mixed Demolition (Variable)	Martensitic	Manganese	High Chrome
Quarry Secondary (Some Impact)	HC (Low Hardness)	Martensitic	HC Standard

2. ALLOY FAMILIES OVERVIEW

ATF manufactures HSI blow bars in three primary metallurgical families, each engineered for specific wear mechanisms:

MANGANESE FAMILY — Austenitic manganese steels (ASTM A128 equivalent) that work-harden under impact. Ideal for high-impact, variable feed applications where toughness is paramount.

MARTENSITIC FAMILY — Quenched and tempered low-alloy steels (DIN 1.2704 equivalent) offering balanced hardness and toughness. Optimal for recycling applications with moderate rebar exposure.

HIGH CHROME FAMILY — White iron castings (ASTM A532 Class III equivalent) with exceptional abrasion resistance. Best for clean, controlled secondary/tertiary crushing with zero tramp metal.

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3. MANGANESE STEEL (Mn18Cr2)

Property	Specification
Hardness (As-Cast)	HB 200-240
Hardness (Work-Hardened)	HB 500-550+
Chemistry	C: 1.1-1.4%, Mn: 17-19%, Cr: 1.7-2.3%
Standard Equivalent	ASTM A128 Grade C
Impact Strength	>300 J/cm² (Very High)
Typical Service Life	600-1,200 hours / 80,000-160,000 tons

Best Applications:

• Primary crushing with variable/unknown feed materials
• Heavy demolition with high tramp metal (rebar) risk
• Concrete recycling where steel contamination is unavoidable
• Any application requiring maximum impact tolerance

Avoid If:

Ultra-clean, highly abrasive secondary/tertiary crushing without significant impact — high-chrome alloys will significantly outperform manganese in pure abrasion environments.

Engineering Rationale:

The higher manganese content (18% vs. standard 13%) dramatically increases work-hardening capacity. Under repeated impact, the surface transforms from soft austenite to extremely hard martensite while maintaining a tough, shock-absorbing core. This dual-phase behavior provides exceptional resistance to both impact fracture and surface wear in aggressive primary crushing environments.

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4. MANGANESE + TITANIUM CARBIDE (TiC) COMPOSITE

Property	Specification
Base Hardness	HB 200-240 (work-hardens to 550+ HB)
TiC Insert Hardness	HV 3200
Chemistry	Mn base: C 1.1-1.4%, Mn 17-19%
Standard Equivalent	ASTM A128 Grade C + TiC MMC
Impact Strength	>300 J/cm² (base matrix)
Typical Service Life	800-1,400 hours (30-50% longer than plain Mn)

Best Applications:

Primary crushing and heavy demolition where plain manganese wears too quickly. The TiC inserts provide enhanced edge retention while maintaining full impact tolerance. Ideal bridge solution between manganese toughness and ceramic performance.

5. MARTENSITIC STEEL

Property	Specification
Hardness	48-54 HRC
Chemistry	Low-alloy steel, quenched & tempered
Standard Equivalent	DIN 1.2704 / ASTM A536
Impact Strength	100-300 J/cm² (Medium-High)
Typical Service Life	400-700 hours in concrete recycling

Best Applications:

Concrete recycling, mixed demolition, asphalt reclamation, and medium-abrasiveness applications. Effectively handles occasional rebar strikes without catastrophic failure. Optimal balance of hardness and toughness for recycling operations.

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6. MARTENSITIC + CERAMIC (MMC)

Property	Specification
Matrix Hardness	48-54 HRC
Ceramic Insert Hardness	HV 1600
Impact Strength	50-150 J/cm² (Medium)
Typical Service Life	800-1,600 hrs concrete / 1,000-1,800 hrs asphalt
Life Extension	2-4× vs. mono-alloy martensitic

Best Applications:

High-abrasion concrete and asphalt recycling with controlled feed and minimized tramp metal. Delivers significant wear life increase when tramp metal risk is managed. Most popular choice for professional recycling contractors.

Critical Warning:

■ ***AVOID*** *if high tramp metal risk exists or very large primary feed material is present. Ceramic inserts WILL spall or delaminate under extreme uncrushable impacts, leading to premature blow bar failure and potential rotor damage.*

7. HIGH CHROME WHITE IRON

Property	Specification
Hardness	60-64 HRC
Chemistry	C: 2.5-3.5%, Cr: 24-28%
Standard Equivalent	ASTM A532 Class III Type A
Impact Strength	~10 J/cm² (Very Low)
Typical Service Life	800-1,500 hrs limestone / 600-1,200 hrs aggregates

Best Applications: Clean, high-abrasion secondary/tertiary crushing of limestone, basalt, and clean gravel with meticulously controlled feed size and ZERO tramp metal.

Critical Limitation: *Inherently brittle. ANY rebar, tramp metal, or heavy primary shocks WILL cause catastrophic fracture. Not suitable for recycling applications.*

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8. HIGH CHROME + CERAMIC (MMC)

Property	Specification
Matrix Hardness	60-64 HRC
Ceramic Insert Hardness	HV 1600
Impact Strength	~10 J/cm² (Very Low)
Typical Service Life	1,200-2,400 hrs asphalt / 1,500-2,500 hrs limestone

Best Applications: Ultra-clean secondary stone, gravel, manufactured sand, and asphalt recycling when steel is FULLY removed. Maximum edge retention for highly abrasive, low-impact applications.

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9. HIGH CHROME + CERAMIC PLUS

Property	Specification
Matrix Hardness	60-64 HRC
Ceramic Coverage	Extended depth up to 60mm
Typical Service Life	1,500-3,000 hrs limestone / up to 2,400 hrs M-sand

Best Applications: Very abrasive, ultra-clean secondary crushing — limestone, basalt, manufactured sand with exceptionally tight feed control. Delivers the longest edge retention in highly controlled, low-impact duties. ATF's most advanced abrasion-resistant option.

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10. HIGH CHROME (LOW HARDNESS / TEMPERED)

Property	Specification
Hardness	55-58 HRC (vs. 60-64 standard)
Chemistry	C: 2.5-3.5%, Cr: 24-28%, heat-treated
Standard Equivalent	ASTM A532 Class III Type B
Impact Strength	20-50 J/cm² (Low-Medium)
Typical Service Life	1,000-1,800 hrs in mixed aggregates

Best Applications: Medium-to-abrasive feeds with occasional impact shocks; variable quarry conditions where standard high-chrome would be too brittle. Bridges the gap between high-chrome abrasion resistance and martensitic toughness.

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11. APPLICATION DECISION GUIDE

Step 1: Assess Tramp Metal Risk
HIGH RISK (rebar, steel, unknowns) → Manganese or Martensitic families ONLY
LOW RISK (pre-screened, controlled) → Consider High Chrome families
ZERO RISK (virgin material, washed) → High Chrome + Ceramic optimal

Step 2: Evaluate Impact vs. Abrasion Balance
HIGH IMPACT / LOW ABRASION → Manganese (Mn18Cr2)
BALANCED → Martensitic or HC (Low Hardness)
LOW IMPACT / HIGH ABRASION → High Chrome + Ceramic

Step 3: Consider Feed Material
Variable/Unknown → Manganese family
Concrete/Demolition → Martensitic family
Clean Limestone/Basalt → High Chrome family
Manufactured Sand → HC + Ceramic Plus

Step 4: Optimize for Cost-Per-Ton
Calculate: (Blow Bar Cost + Labor + Downtime) ÷ Total Tonnage Processed
Higher-cost ceramic composites often deliver lowest cost-per-ton in suitable applications.

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12. TECHNICAL SPECIFICATIONS SUMMARY

Alloy	Hardness	Impact J/cm²	Abrasion Resist.	Tramp Tolerance
Manganese (Mn18Cr2)	HB 200→550+	>300 Very High	Low-Med	HIGH
Mn + TiC	HB 200→550+ + HV 3200	>300 Very High	Medium	HIGH
Martensitic	48-54 HRC	100-300 Med-High	Med-High	MEDIUM
Mart + Ceramic	48-54 HRC + HV 1600	50-150 Medium	High	LOW-MED
High Chrome	60-64 HRC	~10 Very Low	Very High	NONE
HC + Ceramic	60-64 HRC + HV 1600	~10 Very Low	Extreme	NONE
HC + Cer Plus	60-64 HRC + Extended	~10 Very Low	Maximum	NONE
HC (Tempered)	55-58 HRC	20-50 Low-Med	High	LOW

Need Application-Specific Guidance? *Contact ATF's application engineering team with your crusher model, feed material characteristics, and current wear life for a customized recommendation.*

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