CLIFFS

FERRITIC AUTOMOTIVE TRIM

430, 435 MOD AND 436 STAINLESS STEEL

- **Beltline Trim**
- **Pillar Post Trim**
- **Wheel Covers**
- **Window Bezels**

FERRITIC STAINLESS STEEL AUTOMOTIVE TRIM provides corrosion resistance, functionality, and beauty. Type 430, Type 436, and Cleveland-Cliffs 435 Mod are suitable for many roll-formed and stamped automotive trim applications. Note that Type 434 is no longer available, having been replaced by Type 436 and Type 435 Mod.

Type 430 is one of the most widely used of the non-hardenable ferritic stainless steels. It combines good corrosion resistance with heat and oxidation resistance up to 1500 °F (816 °C) while maintaining good mechanical properties. Type 436 is a modification of Type 430, with a molybdenum (Mo) addition to increase corrosion resistance and make it less susceptible to attack from many deicing chemicals. Type 436 also has a small stabilizing niobium (Nb) addition, recommended for applications involving welding. Cleveland-Cliffs 435 Mod is a higher-chromium (Cr), molybdenum-free trim alloy with lower carbon for improved weldability and formability.

Restriction of Hazardous Substances note: Chromium is added to ferritic automotive trim steels, but our manufacturing process prevents the formation of a chromium+6 phase in the final product. These stainless steel products do not require any additional surface treatments for use in their intended applications.

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Product Description

AVAILABLE FORMS

Cleveland-Cliffs produces ferritic automotive trim grades in thickness of 0.010 –0.040 in. (0.25 – 1.02 mm) and in widths up to 36 in. (914 mm). Heavier gauges are available for non-critical finishes only.

Cleveland-Cliffs 435 Mod and Type 436 can all be considered modifications of Type 430. A reference to chemical composition or a specification is required to determine the correct grade. Cleveland-Cliffs 435 Mod, in particular, is known by a number of aliases, including UNS S44500, SUS430MT and SUS430J1L.

FINISH AND APPEARANCE

Cleveland-Cliffs offers three choices of surface finish for automotive trim applications: bright annealed, GREYSTONE® Satin, and GREYSTONE® Silver. The traditional bright annealed finish offers a highly reflective and glossy surface appearance. Bright annealed trim material has a long history in decorative trim applications.

GREYSTONE Satin and GREYSTONE Silver finishes are proprietary, non-directional, rolled-on finishes that provide a less reflective alternative to the traditional Bright Anneal. GREYSTONE Satin exhibits a muted reflectivity while adding a brighter, whiter background when compared to the bright annealed finish. GREYSTONE Silver maintains the same background brightness that GREYSTONE Satin offers yet also has the increased reflectivity similar to bright annealed products. These finishes are offered on both 435 Mod and 436 stainless steel grades.

Luster standards used by Cleveland-Cliffs to evaluate finish appearance of stainless steel grades (Type 430, Type 436 and Cleveland-Cliffs 435 Mod) for suitability in bright automotive trim molding and decorative trim applications were developed over time, with customer input. For more information on luster standards, inquire.

Interleaving is recommended on all grades to prevent marring of the surface. Both paper and PVC interleaving are available.

Bright Anneal

GREYSTONE® Satin

GREYSTONE® Silver

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Values shown in this bulletin were established in U.S. customary units. The metric equivalents may be approximate.

TABLE 1 – CHEMICAL COMPOSITION

	Type 430 (UNS S4300)	Type 434* (UNS S43400)	Cleveland-Cliffs 435 Mod (UNS44500)	Type 436 (UNS43600)
Carbon (C)	0.12 max.	0.12 max.	0.02 max.	0.12 max.
Manganese (Mn)	1.00 max.	1.00 max.	1.00 max.	1.00 max.
Phosphorus (P)	0.04 max.	0.04 max.	0.04 max.	0.04 max.
Sulfur (S)	0.03 max.	0.03 max.	0.012 max.	0.03 max.
Silicon (Si)	1.00 max.	1.00 max.	1.00 max.	1.00 max.
Chromium (Cr)	16.00 – 18.00	16.00 – 18.00	19.00 – 21.00	16.00 – 18.00
Nickel (Ni)	0.75 max.	—	0.60 max.	—
Molybdenum (Mo)	—	0.75 – 1.25	—	0.75 – 1.25
Nitrogen (N)	—	—	0.04 max.	—
Others	—	—	Cu 0.30 – 0.60, Nb = 10(C+N) min, 0.80 max.	Nb = 5xC min, 0.80 max.

Type 434 is no longer available, but is included for reference purposes.

Mechanical Properties

TABLE 2 – TYPICAL ROOM TEMPERATURE MECHANICAL PROPERTIES

Product	UTS, ksi. (MPa)	0.2% YS, ksi. (MPa)	Elongation % in 2 in. (50.8 mm)	Rockwell Hardness, B
Type 430	70 (483)	45 (310)	28	75
Type 434*	80 (552)	50 (345)	28	75
Cleveland-Cliffs 435 Mod	75 (517)	45 (310)	28	75
Type 436	75 (517)	45 (310)	28	75

Type 434 is no longer available, but is included for reference purposes.

TABLE 3 – PHYSICAL PROPERTIES

	Type 430	Type 434*	435 Mod	Type 436
Density, lbs/in^3. (g/cm^3)	0.28 (7.70)	0.28 (7.72)	0.28 (7.69)	0.28 (7.72)
Mean Coefficient of Thermal Expansion, in./in./°F (μm/m•K)				
32 – 212 °F (0 – 100 °C)	5.6 (10.1)	5.6 (10.1)	5.5 (9.8)	5.6 (10.0)
32 – 1200 °F (0 – 649 °C)	6.6 (12.0)	6.6 (11.9)	6.5 (11.7)	6.6 (11.8)
Modulus of Elasticity, ksi. (MPa)	29.0 x 10^3 (200 x 10^3)	29.0 x 10^3 (200 x 10^3	29.0 x 10^3 (200 x 10^3	29.0 x 10^3 (200 x 10^3
Specific Heat, BTU/lbs./°F (kJ/kg•K)				
32 – 212 °F (0 – 100 °C	0.11 (0.46)	0.11 (0.46)	0.11 (0.46)	0.11 (0.46)

Type 434 is no longer available, but is included for reference purposes.

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CORROSION RESISTANCE

Type 430 bright anneal is the entry-level 17% chromium ferritic that provides acceptable corrosion resistance to mild conditions and is primarily used for interior or fully encapsulated products. When added corrosion protection from deicing salts is needed, the more corrosion resistant Type 436 grades are typically required. The molybdenum-added 17% chromium ferritics are suitable for applications above the belt line, such as window bezels and roof trim. Cleveland-Cliffs offers a molybdenum-free, 19% chromium ferritic, Cleveland-Cliffs 435 Mod, that shows similar corrosion resistance to deicing salts as Type 436. With proper care, these bright anneal products will provide good overall resistance to chloride corrosion.

When welding operations are involved in fabrication, the fully-stabilized Type 436 and Cleveland-Cliffs 435 Mod are recommended. These niobium-stabilized grades will reduce the risk of preferential corrosion due to intergranular attack.

FORMABILITY

The ferritic auto trim grades are all readily drawn and formed. Their drawing characteristics are similar to those of low-carbon steel, although stronger in the annealed condition, and will require stronger tooling and increased power. Type 430 product can "rope" during forming, where wavy lines form on the surface. Cleveland-Cliffs 435 Mod and Type 436 are stabilized grades with a small niobium addition, and, as such the roping tendency would be expected to be lower than Type 430.

Parts manufactured from strip meeting the minimum luster standard are not necessarily guaranteed to meet any specific luster. Deformation of the metal can degrade the luster appearance. Customers are encouraged to closely evaluate the impact of the manufacturing process on the incoming strip luster to insure that minimum luster strip will provide parts of suitable appearance.

WELDABILITY

The ferritic class of stainless steels is generally considered to be weldable by common fusion and resistance techniques. Special consideration is required to avoid brittle weld fractures during fabrication by minimizing discontinuities, maintaining low weld heat input, and occasionally warming the part somewhat before forming. This particular alloy is generally considered to have poorer weldability than the most common alloy of the stainless class, Type 409. Major differences are the higher carbon content and the lack of stabilizing elements for this alloy, which require post weld annealing to restore optimum corrosion and forming characteristics. When a weld filler is needed, AWS E/ER 308L and Type 430 are most often specified. Type 430 is well-known in reference literature, and more information can be obtained this way.

About Cleveland-Cliffs Inc.

Cleveland-Cliffs is the largest flat-rolled steel producer in North America. Founded in 1847 as a mine operator, Cliffs also is the largest manufacturer of iron ore pellets in North America. The Company is vertically integrated from mined raw materials, direct reduced iron, and ferrous scrap to primary steelmaking and downstream finishing, stamping, tooling, and tubing. The Company serves a diverse range of markets due to its comprehensive offering of flat-rolled steel products and is the largest supplier of steel to the automotive industry in North America. The Company is headquartered in Cleveland, Ohio with mining, steel and downstream manufacturing operations located across the United States and in Canada. For more information, visit www.clevelandcliffs.com.

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