

UDDEHOLM TYRAX® ESR

Compared to **Mold Quality S7** for Plastic Molds

For aggressive plastic materials, Uddeholm Tyrax ESR combines best in class corrosion and wear resistance. This matrix-based microstructure achieves a high gloss surface by only a few steps, all while maintaining high hardness.

TYPICAL CHEMICAL COMPOSITION %

STEEL GRADE	C	Si	Mn	Cr	Mo	V	N
Uddeholm Tyrax ESR	0.4	0.2	0.5	12	2.3	0.5	+
AISI S7	0.5	0.5	0.3	3.2	1.5	0.35 max	

STEEL GRADE	Surface finish	Polishability	Hardness/wear	Corrosion resistance	Cracking resistance	Hardenability
Uddeholm Tyrax ESR						
AISI S7						

WEAR RESISTANCE

Similar or better wear resistance due the presence of chromium carbides

- Gate areas & parting lines have improved surface retention
- Improved surface integrity with glass filled plastics or thermoset resins
- Achievable hardness up to 60 HRC if needed

TOUGHNESS & COMPRESSIVE STRENGTH

- Toughness of Uddeholm Tyrax ESR at 56-58 HRC exceeds that of the typical S7 at 54-56 HRC
- Grain direction variance will be less due to use of Protective Atmosphere Electro-Slag Remelting (P-ESR)
- Compressive strength will be higher with Tyrax at higher hardness; increasing parting line durability

CORROSION

- Meets your stainless needs when corrosion is not an option

POLISHING & TEXTURING

- Higher hardness means it is easier to polish, **less time = less cost**
- Unprecedented polishability; achieve an A1 finish in fewer steps
- Cleanliness (P-ESR) provides more consistent and higher surface finish

HEAT TREATMENT

- Tempering temperature for Uddeholm Tyrax is above 980°F/525°C which permits wide range of PVD coatings
- Higher tempering temperature provides better dimensional stability for the life of the tool
- Post processing of welds & EDM can be done at higher temperatures for more stress relieving
- Better hardenability for larger cross sections

WELDING

- Uddeholm Tyrax ESR has matching filler rod for excellent color matching; TIG and MIG weld rod available

This document is intended to provide a general guideline on material selection. For optimal performance, please consult with an Uddeholm representative.

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UDDEHOLM TYRAX[®] ESR

Compared to AISI 420 ESR & 440C for Plastic Molds

TYPICAL CHEMICAL COMPOSITION %

STEEL GRADE	C	Si	Mn	Cr	Mo	V	N
Uddeholm Tyrax ESR	0.4	0.2	0.5	12	2.3	0.5	+
AISI 420 ESR	0.15 min	1.00 max	1.00 max	12-14			
AISI 440 C	0.95-1.20	1.00 max	1.00 max	16-18	0.75 max		

STEEL GRADE	Surface finish	Polishability	Hardness/wear	Corrosion resistance	Cracking resistance	Hardenability
Uddeholm Tyrax ESR						
AISI 440 C						
AISI 420 ESR						

- Addition of Nitrogen in the matrix to increase strength and hardness, while adding improved stainless properties.
- Addition of Molybdenum and Vanadium - These, combined with Carbon to make carbides, will allow for more chromium to be available for corrosion resistance.

WEAR RESISTANCE

- Uddeholm Tyrax ESR has higher carbon content & achievable hardness (55-58 HRC) which equals better abrasive wear resistance compared to AISI 420 ESR at 50-52HRC
 - Gate areas & parting lines have improved surface retention
 - Improved surface integrity with glass filled plastics or thermoset resins
- Compared to 440C, Uddeholm Tyrax has lower abrasive wear resistance at typical working hardnesses

CRACKING RESISTANCE

- Will be higher with Uddeholm Tyrax ESR compared to 420 ESR & 440 C
- Due to higher ductility, Uddeholm Tyrax is safer in larger cross-sections

CORROSION

- Improved corrosion resistance over 440C & 420 ESR with similar tempering procedure
- With improved corrosion, you will have less maintenance for your tool

POLISHING & TEXTURING

- Higher hardness means it is easier to polish, **less time = less cost**
- Unprecedented polishability; achieve an A1 finish in fewer steps
- Cleanliness (P-ESR) provides more consistent and higher surface finish

HEAT TREATMENT

- Uddeholm Tyrax ESR has a tempering temperature above 980°F/525°C
 - Permits wide range of PVD coatings & nitriding treatments
- Higher tempering temperature gives you better dimensional stability for the life of the tool

This document is intended to provide a general guideline on material selection. For optimal performance, please consult with an Uddeholm representative.

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