

EDRO SPECIALTY STEELS

TOP PERFORMING MATERIALS FOR PVC EXTRUSION TOOLING

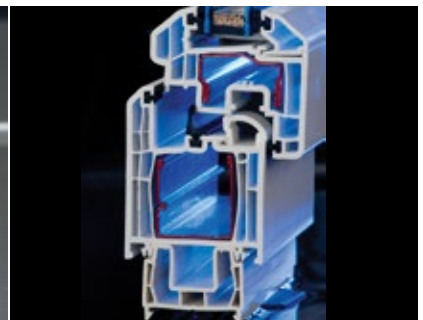
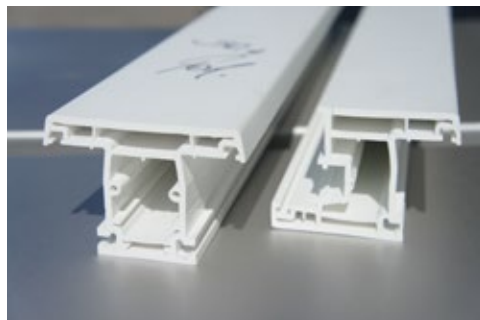


EDRO PRODUCT PORTFOLIO

EDRO/ Bohler Carries a Wide Variety of Materials to Solve the Most Demanding Tooling Failure

| Grade | Description |
|--|---|
| RoyAlloy | Prehard 400 series 35 HRC stainless. Designed for excellent machinability and dimensional stability. |
| UltraChem | Prehard modified 15-5 PH 40 HRC Stainless. Excellent corrosion resistance and machinability. |
| BÖHLER M303 EXTRA <small>HIGH HARD</small> | Prehard 400 series 40 HRC stainless. Excellent corrosion resistance and machinability. Ideal for EDMing die and adaptor plates. |
| 420 Annealed | Industry Standard. Baseline stainless with low hardness/wear resistance and standard corrosion resistance. |
| BÖHLER M310 ISOPLAST | 420 stainless ESR, an all rounder for extrusion tooling. |
| BÖHLER M340 ISOPLAST | 440B Mod, very high corrosion resistance combined with high wear resistance. (ex PVC-C or glass fiber resins) |
| BÖHLER M390 MICROCLEAR | Powder Metallurgical stainless grade. Extremely high wear resistance with good corrosion resistance. Ideal for the most demanding wear issues in calibrator plates and special dies. (ex PVC-C or glass fiber resins) |

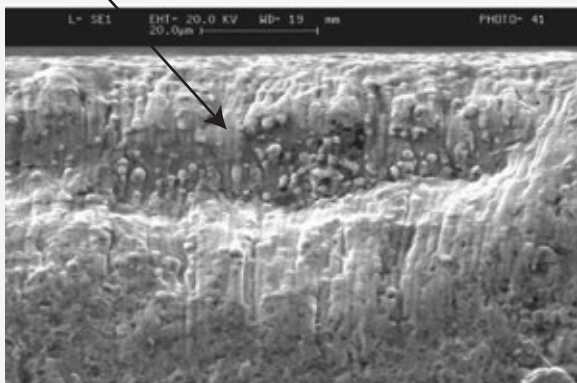
| Grade | Description | Hardness (HRC) | Corrosion Resistance | Wear Resistance | Machinability | EDMing Ability |
|--|-------------------------|----------------|----------------------|-----------------|---------------|----------------|
| RoyAlloy® | Prehard 400 SS | 30-35 | ★★★★ | ★★☆ | ★★★★★ | ★★★★ |
| UltraChem® | Prehard 15-5 PH | 38-40 | ★★★★★ | ★★ | ★★★★ | ★★★★ |
| BÖHLER M303 EXTRA <small>HIGH HARD</small> | Prehard Stainless | 38-40 | ★★★★ | ★★★☆☆ | ★★★★ | ★★★★★ |
| 420 Annealed | Soft Annealed Stainless | ~22 HRC | ★★★★ | ☆☆ | ★★★★ | ★★★★ |
| BÖHLER M310 ISOPLAST | 420 ESR | 50-52 | ★★★★ | ★★★★ | ★★★★ | ★★★★★ |
| BÖHLER M340 ISOPLAST | 440B Mod | 50-58 | ★★★★ | ★★★★ | ★★ | ★★★★★ |
| BÖHLER M390 MICROCLEAN | PM Stainless | 58-62 | ★★ | ★★★★★ | ★★ | ★★★★ |



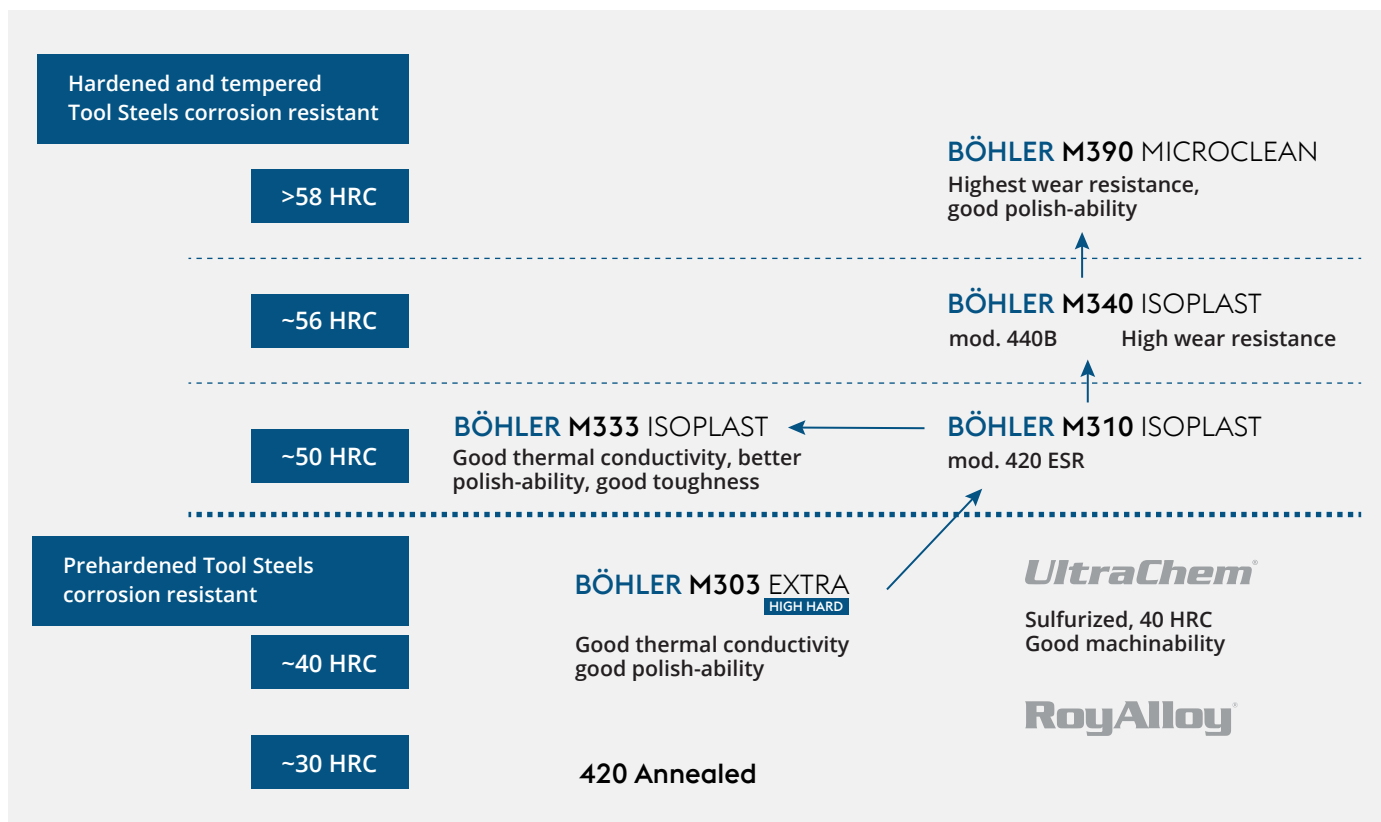
PVC-C parts as well as fiber reinforced resins are becoming more common in PVC extrusion. Demands on tooling performance and higher tool life are becoming more crucial than ever. EDRO-Bohler tool steels provides the best combination of wear and corrosion resistance for

Common Failure Modes in Extrusion Tooling:

Erosion of the Matrix

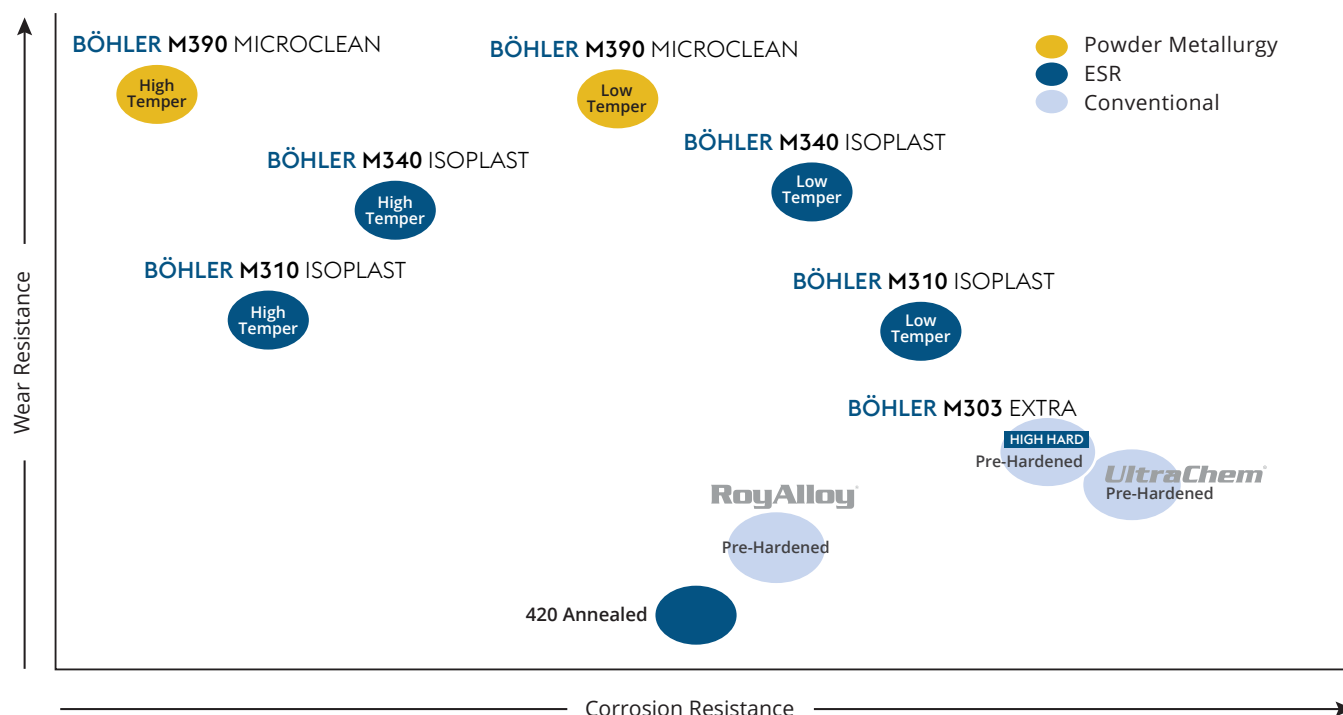


- » **Wear**
 - Triological
 - Erosion
- » **Corrosion**
 - Pitting
 - Oxidation
- » **Cracking**
 - Finer/thin sections



EDRO/ Bohler Carries a Wide Variety of Materials to Solve the Most Demanding Tooling Failure

PROPERTY PROFILES OF BÖHLER AND EDRO TOOL STEELS FOR EXTRUSION APPLICATIONS



420 PVC EXTRUSTION WEAR DATA

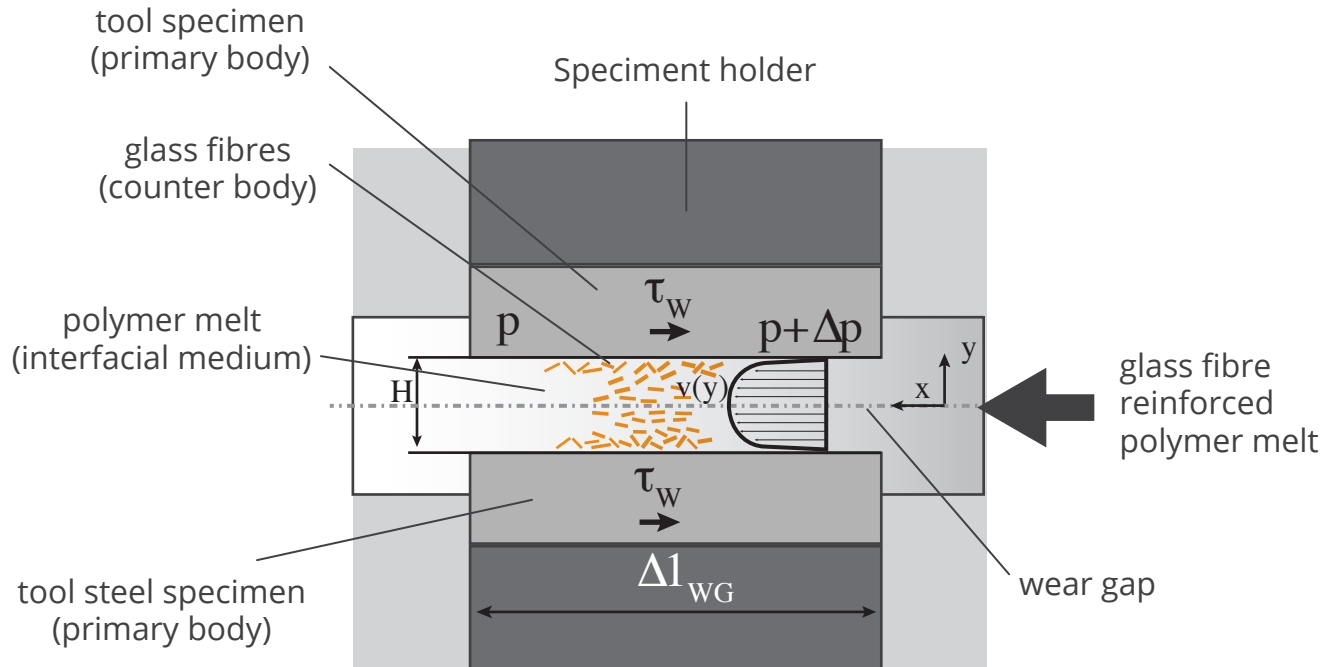
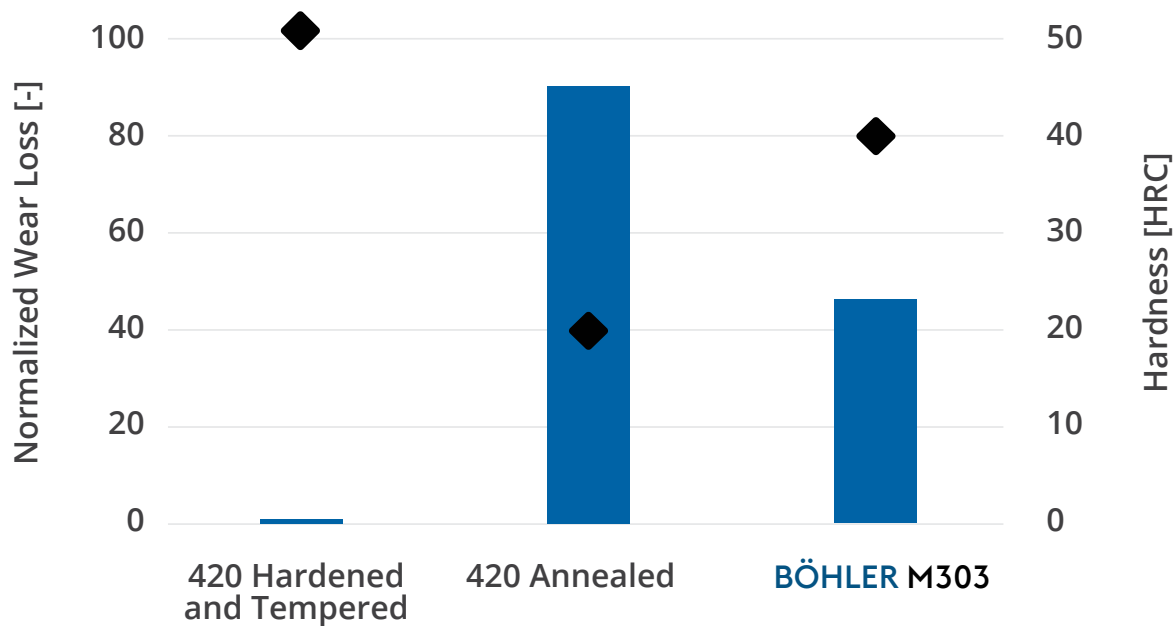


PLATE WEAR TEST, NORMALIZED WEAR LOSS

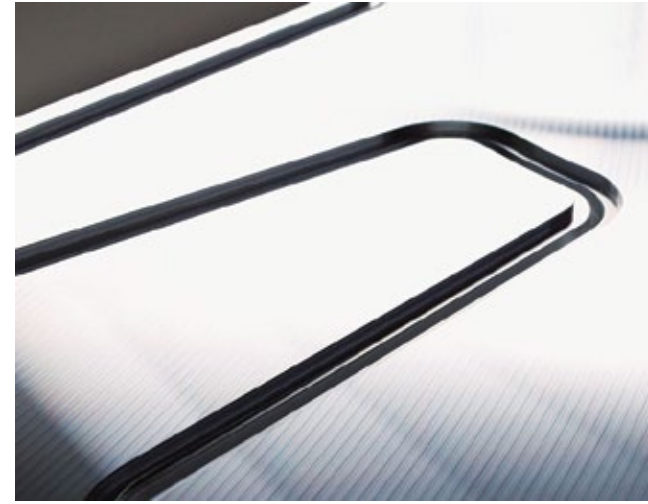


OTHER PRODUCTS & SERVICES

Aluminum Plate- 5083 (Typically used for tank plates), 6061, 7075, QC-10

ACP 5080R & ACP 5080P

Fine grain structure, low porosity and excellent machining characteristics all define the cost saving and value added attributes of every block and plate of ACP 5080R. Outstanding industry leading material dimensional stability along with good mechanical and physical properties and an extraordinary range of sizes allow users of ACP 5080R to utilize Alimex's material and knowledge expertise at its finest. Being an industry innovator and leader, Alimex was the first to introduce aluminum cast plate (ACP 5080R) manufactured to AA 5083 alloy specifications. 5083 is a optimal choice for tank plates since it exhibits a good combination of wear and corrosion properties



Additive Manufacturing - EDRO can provide 3D printing services and tool design through our voestalpine vAMC center.

Additive Build and Post Processing

We offer a variety of build technologies such as direct metal laser sintering and direct metal deposition.

Capability to print a variety of steels and super alloys, from producing single prototypes to serial production.

Post processing capabilities such as machining, grinding, polishing, heat treatment as well as coatings.



PRODUCT SPOTLIGHT

BÖHLER M789 AMPO

Patent pending alloy that combines the ease of printability of a maraging steel with the added corrosion resistance of a 17-4 PH grade alloy. M789 AMPO can be aged up to 52 HRC for added wear resistance.

M789 AMPO provides extremely high corrosion resistance, toughness, and wear properties to printed parts ideal for PVC extrusion tooling performance. Very complex geometries can be printed for dies or inserts pieces



OTHER PRODUCTS & SERVICES

PVD/DLC Coatings- EDRO has a wider variety of PVD/DLC coatings through the eifeler group.

PVD / DLC COATINGS

Known as a global leader in Physical Vapor Deposition (PVD) and surface technology, voestalpine eifeler Coatings has partnered with sister company EDRO Engineering to house the latest PVD, DLC and Duplex Treatment technology in California.

- + High quality thin film coatings
- + Enhance performance, durability, and appearance
- + State-of-the-art ultrasonic cleaning line
- + In house media blasting and polishing



PRODUCT SPOTLIGHT

CARBON-X® SUCASLIDE®

DLC coatings can be applied to calibrator plates to increase wear resistance, reduce friction, and reduce sticking.

| | CARBON-X® | SUCASLIDE® |
|--|---|--|
| Coating Material | Chrome Base Carbon Coating/DLC | Chrome Base Carbon Coating/DLC |
| Microhardness HV _{0.05} | 2,400 ± 400 | 1,800 2,000 |
| Friction Coefficient Against Steel (Dry) | 0.05 - 0.15 | 0.05 - 0.1 |
| Coating Thickness ¹⁾ | 1.5 – 2.5 µm | 1.5 – 2.5 µm |
| Thermal Threshold | 325°C / 617°F | 400°C / 732°F |
| Color of the Coating | dark grey | black |
| Key Characteristics | high wear resistance due to high hardness, very low friction, reduce sticking and top performance under tough condition | good adhesive strength, very hard, low friction coefficient, biocompatible |



EDRO SPECIALTY STEELS, LLC

310 Wayne Ave.
Ellwood City, PA 16117

(888) 368-3376

(724) 758-4475

(724) 758-2076

info@edro.com

FOR TECHNICAL SUPPORT CONTACT



Rob Curran

SENIOR METALLURGIST-
SEGMENT MANAGER PVC EXTRUSION

(610) 675-6371

robert.curran@edro.com

FOLLOW US ON LINKEDIN FOR
THE LATEST NEWS AND UPDATES:

[https://www.linkedin.com/
company/edro-engineering-inc/](https://www.linkedin.com/company/edro-engineering-inc/)

