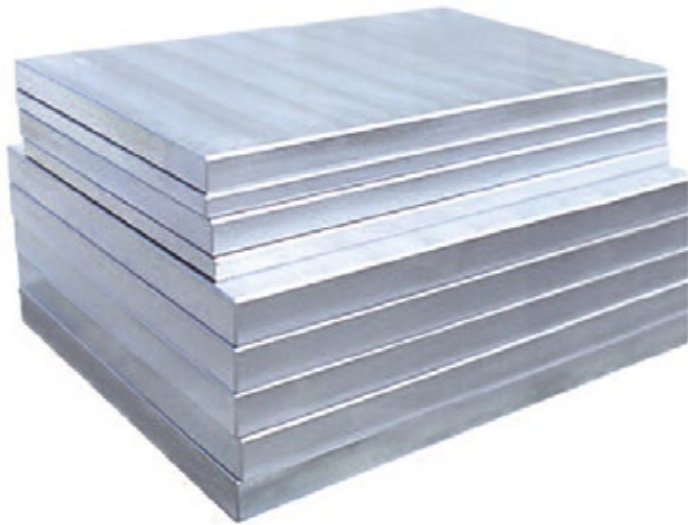




## LOW-CARBON PREHARDENED MOLD QUALITY MARTENSITIC STAINLESS STEEL



### APPLICATIONS

- Plastic injection mold inserts / cavities
- Extrusion tooling
- Rubber molds
- Components
- Constructional parts
- High polishability applications

EDRO400<sup>®</sup> is a remelted 400 series martensitic stainless steel supplied prehardened to approximately 40 HRC (375 HB).

EDRO400 is characterized by:

- EXCELLENT POLISHABILITY
- SUPERIOR CORROSION RESISTANCE
- HIGH LEVEL OF DIMENSIONAL STABILITY
- ENHANCED MACHINABILITY
- GOOD DUCTILITY AND TOUGHNESS
- UNIFORM AND CONSISTENT HARDNESS
- GOOD THERMAL CONDUCTIVITY
- GOOD RESISTANCE TO INDENTATION (COMPRESSIVE STRENGTH)
- SMOOTH AS ROLLED PLATE SURFACES
- EXCELLENT WELDABILITY

### PROPERTIES

#### PHYSICAL DATA

Prehardened to 387 HB. Data at room and elevated temperatures.

Temperature	68°F (20°C)	390°F (200°C)
Density kg/m <sup>3</sup> lbs/in <sup>3</sup>	7,800 .284	7,750 .282
Modulus of elasticity N/mm <sup>2</sup> (Mpa) psi	200 x 10 <sup>3</sup> 29.0 x 10 <sup>6</sup>	190 x 10 <sup>3</sup> 27.6 x 10 <sup>6</sup>
Coefficient of thermal expansion per °F from 68°F per °C from 20°C		6.1 x 10 <sup>-6</sup> 11.0 x 10 <sup>-6</sup>
Thermal conductivity Btu /ft <sup>2</sup> h°F W/m <sup>2</sup> K		195.6 28.2

#### TENSILE STRENGTH

Longitudinal Tests from 6.3" (160mm) plate at 387 HB

Testing temperature	68°F (20°C)	390°F (200°C)
Ultimate tensile strength psi N/mm <sup>2</sup>	189,000 1,303	TBD
Yield strength @ .2% offset psi N/mm <sup>2</sup>	146,000 1,007	TBD
% Elongation in 2"	13	TBD
% Reduction in area	33	TBD

#### IMPACT STRENGTH

Average Charpy V-notch from 6.3" (160mm) plate at 387 HB

Testing temperature	68°F (20°C)	390°F (200°C)
Ft-lbs	9	TBD
Joules	12	TBD

## General

EDRO400® was developed as an improved stainless grade providing excellent polishability combined with good corrosion resistance, consistent hardness, enhanced machinability, superior dimensional stability, and good ductility and toughness within a prehardened range of 38 – 42 HRC.

## Polishing

EDRO400 demonstrates excellent polishability in the as-supplied prehardened condition, due to superior microcleanliness with very low nonmetallic inclusion levels. An SPI A2 or better rating can be achieved when polishing EDRO400 using standard lapping and handpolishing techniques with diamond compounds.

## Corrosion Resistance

Tooling made from EDRO400 will have excellent resistance to attack caused by corrosive plastic elements and humid working / storage conditions, which may be encountered under normal molding production conditions.

## Stability

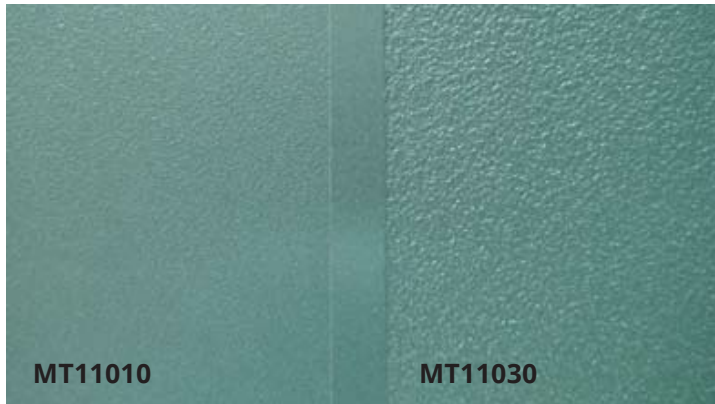
Due to its unique microstructure and special production processes applied during its manufacture, EDRO400 demonstrates superior dimensional stability during mold manufacture and during the life of the tool.

## Size Availability

EDRO400 is currently available in flat sizes up to 8.5" (216 mm) thick, and up to 90" wide (2286 mm).

## Texturing and Photo Etching

EDRO400 is suitable for texturing and photoetching.



Sample using standard process (MT11010, MT11030) formula

## Welding

EDRO400 is readily welded without pre or post heating, and provides excellent visual matching throughout the welded area and base metal. EDRO400 will not develop an overhardened heat affected zone (HAZ) surrounding the weld deposit, eliminating the risk of weld induced cracking during repairs or in future service.

## Heat Treatment and Hardness

EDRO400 is supplied prehardened to a range of 38 - 42 HRC, eliminating the need for costly and time consuming heat treatment during mold manufacture.

Due to its' unique composition and special thermal treatments applied during production, EDRO400 demonstrates very uniform and consistent through hardness.

## Nitriding

EDRO400 can be nitrided to achieve a surface hardness in excess of 1000 HV. Nitriding temperatures applied to EDRO400 should not exceed 475°C.

## MACHINING RECOMMENDATIONS

The cutting data below are to be considered as guidelines and may require adjustments based on equipment, selection of cutting tools, etc.

Condition: prehardened approx. 363 HB coolant recommended

### TURNING

Cutting data parameter	Turning with carbide		Turning with HSS*
	Rough Turning	Fine Turning	Fine Turning
<b>Cutting speed (<math>v_c</math>)</b>			
m/min	91-133	133-175	18-20
f.p.m.	430-620	620-820	80-90
<b>Feed (f)</b>			
mm/r	0.1-0.2	0.025-0.1	0.025-0.15
i.p.r	0.004-0.0008	0.001-0.004	0.001-0.005
<b>Depth of cut (<math>a_p</math>)</b>			
mm	2-4	0.5-2	0.5-3
inch	0.08-0.16	0.02-0.08	0.02-0.1
<b>Carbide designation</b>			
ISO	P20-P30	P10-P20	-
US	C6-C5 Coated carbide	C7-C6 Coated carbide or cement	-

\*HSS = High Speed Steel

### MILLING

#### FACE AND SQUARE SHOULDER MILLING

Cutting data parameter	Milling with carbide	
	Rough milling	Fine milling
<b>Cutting speed (<math>v_c</math>)</b>		
m/min	91-133	190-250
f.p.m.	301-434	434-574
<b>Feed (<math>f_z</math>)</b>		
mm/tooth	0.1-0.2	0.05-0.1
in/tooth	0.004-0.008	0.002-0.004
<b>Depth of cut (<math>a_p</math>)</b>		
mm	2-5	≤2
inch	0.08-0.2	≤0.08
<b>Carbide designation</b>		
ISO	P20-P40	P10-P20
US	C6-C5 Coated carbide	C7-C6 Coated carbide or cement

### END MILLING

Cutting data parameter	Type of end mill		
	Solid carbide	Carbide indexable insert	HSS
<b>Cutting speed (<math>v_c</math>)</b>			
m/min	56-84	190-250	25-28
f.p.m.	182-273	620-820	80-90
<b>Feed (<math>f_z</math>)</b>			
mm/tooth	0.003-0.50 <sup>2)</sup>	0.03-0.10 <sup>2)</sup>	0.05-0.175 <sup>2)</sup>
in/tooth	.0001-.008 <sup>2)</sup>	0.001-0.004 <sup>2)</sup>	.0002-.0007 <sup>2)</sup>
<b>Carbide designation</b>			
ISO	-	P15-P40	-
US	-	C6-C5	-

<sup>1)</sup> For coated HSS end mill  $v_c = 60-66$  m/min (197-217 f.p.m.)

<sup>2)</sup> Depending on radial depth of cut and cutter diameter

### DRILLING

#### HIGH SPEED STEEL TWIST DRILLS

Drill diameter		Cutting speed ( $v_c$ )		Feed (f)	
mm	inch	m/min	f.p.m.	mm/r	i.p.r
-5	-3/16	12-14*	40-44*	0.003-0.05	0.001-0.002
5-10	3/16-3/8	12-14*	40-44*	0.05-0.10	0.002-0.004
10-15	3/8-5/8	12-14*	40-44*	0.10-0.13	0.004-0.005
15-20	5/8-3/4	12-14*	40-44*	0.13-0.15	0.005-0.007

\*For coated HSS drill  $v_c = 20-22$  m/min (67-71 f.p.m.)

#### CARBIDE DRILLING

Cutting data parameter	Type of drill		
	Indexable insert	Solid carbide	Carbide tip <sup>1)</sup>
<b>Cutting speed (<math>v_c</math>)</b>			
m/min	151-168	77-91	49-77
f.p.m.	500-553	252-299	161-252
<b>Feed (<math>f_z</math>)</b>			
mm/r	0.025-0.075 <sup>2)</sup>	0.05-0.125 <sup>3)</sup>	0.075-0.125 <sup>4)</sup>
i.p.r	0.001-0.003 <sup>2)</sup>	0.002-0.005 <sup>3)</sup>	0.015-0.005 <sup>3)</sup>

<sup>1)</sup> Drill with replaceable or brazed carbide tip

<sup>2)</sup> Feed rate for drill diameter 10-20 mm (0.4"-0.8")

<sup>3)</sup> Feed rate for drill diameter 2.5-10 mm (0.1"-0.4")

<sup>4)</sup> Feed rate for drill diameter 5-10 mm (0.2"-0.4")

### GRINDING

A general grinding wheel recommendation is given below. More information can be found in the Uddeholm publication "Grinding of tool steel".

Type of grinding	Delivery condition
Face grinding straight wheel	A 46 HV
Face grinding segments	A 36 GV
Cylindrical grinding	A 60 KV
Internal grinding	A 60 JV
Profile grinding	A 120 JV