

IMPAX Hi Hard

Prehardened mould steel

COLD WORK

PLASTIC MOULDING

HOT WORK

HIGH PERFORMANCE STEEL



This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose.

General

Impax Hi Hard is a prehardened mould steel with a higher hardness, 360–400 HB, than well-known Impax Supreme. The higher hardness gives an increased resistance to wear and indentations which means enhanced mould life.

The chemical composition and way of manufacture is the same as for Impax Supreme which means that Impax Hi Hard has the same very good polishability and etchability that is characteristic for Impax Supreme.

Impax Hi Hard is manufactured to consistently high quality standards with a very low sulphur content, giving a steel with the following characteristics:

- Good polishing and photo-etching properties
- High purity and good homogeneity
- Uniform hardness.

Note: Impax Hi Hard is 100% ultrasonic tested.

Approx. analysis %	C 0,37	Si 0,3	Mn 1,4	Cr 2,0	Ni 1,0	Mo 0,2	S <0,010
Standard spec.	AISI P20 modified						
Delivery condition	Hardened and tempered to 360–400 HB						
Colour code	Brown						

Applications

Impax Hi Hard is used for the same applications as Impax Supreme, but mainly when demands on strength and wear resistance are somewhat higher:

- Injection moulds for thermoplastics
- Extrusion dies for thermoplastics
- Blow moulds
- Structural components, shafts.

Properties

PHYSICAL DATA

Delivery condition.

Temperature	20°C (68°F)	200°C (390°F)
Density, kg/m ³ lbs/in ³	7 800 0,282	7 750 0,280
Coefficient of thermal expansion per °C from 20° per °F from 68°F	– –	12,7 x 10 ⁻⁶ 7,0 x 10 ⁻⁶
Thermal conductivity W/m °C Btu in/ft ² h °F	29,0 202	30,0 205
Modulus of elasticity N/mm ² psi	205 000 29,7 x 10 ⁶	200 000 29,0 x 10 ⁶
Specific heat capacity J/kg °C Btu/lb °F	460 0,110	– –

MECHANICAL PROPERTIES

Tensile strength

Approx. values. Hardness: 370 HB.

Testing temperature	20°C (68°F)
Ultimate tensile strength, R _m N/mm ²	1180
Yield strength, R _{p0,2} N/mm ²	1090

Compressive strength

Compressive yield strength, R _{c0,2} N/mm ²	~1150
---	-------

Welding

Good results when welding tool steel can be achieved if proper precautions are taken during welding (elevated working temperature, joint preparation, choice of consumables and welding procedure). If welding is performed with Impax Weld or TIG-Weld a lower hardness will be achieved on weld compared with the high hard base material (see table below).

Welding method	TIG	MMA (SMAW)
Working temperature	200–250°C (390–480°F)	200–250°C (390–480°F)
Consumables	IMPAX TIG-WELD	IMPAX WELD
Hardness after welding	320–350 HB	320–350 HB

Further information is given in the Uddeholm brochure "Welding of Tool Steel".

General machining recommendations for Impax Hi Hard

The cutting data below are to be considered as guiding values which must be adapted to existing local conditions.

Condition: hardened and tempered to 360–400 HB

TURNING

Cutting data parameters	Turning with carbide	
	Rough turning	Fine turning
Cutting speed, (v_c) m/min. f.p.m.	100–150 328–492	150–200 492–656
Feed (f) mm/rev i.p.r.	0,2–0,4 0,008–0,016	0,05–0,2 0,002–0,008
Depth of cut, (a_p) mm inch	2–4 0,08–0,16	–2 –0,08
Carbide designation ISO US	P20–P30 C6–C5 Coated carbide	P10 C7 Coated carbide or cermet

DRILLING

High speed steel twist drill*

Drill diameter		Cutting speed (v_c)		Feed (f)	
mm	inch	m/min	f.p.m.	mm/r	i.p.r.
–5	–3/16	14	46	0,05–0,15	0,002–0,006
5–10	3/16–3/8	14	46	0,15–0,25	0,006–0,010
10–15	3/8–5/8	14	46	0,25–0,30	0,010–0,012
15–20	5/8–3/4	14	46	0,30–0,35	0,012–0,014

* Coated HSS, uncoated HSS drill is not recommended

Carbide drill

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Brazed carbide ¹⁾
Cutting speed, (v_c) m/min. f.p.m.	140–160 459–525	90–120 295–394	50–70 164–230
Feed (f) mm/r i.p.r.	0,03–0,12 ²⁾ 0,001–0,005 ²⁾	0,05–0,20 ²⁾ 0,002–0,008 ²⁾	0,10–0,20 ²⁾ 0,004–0,008 ²⁾

¹⁾ Drill with internal cooling channels and brazed tip.

²⁾ Depending on drill diameter.

MILLING

Face and square shoulder milling

Cutting data parameters	Milling with carbide	
	Rough milling	Fine milling
Cutting speed, (v_c) m/min. f.p.m.	80–100 262–328	100–130 328–426
Feed (f_z) mm/tooth inch/tooth	0,2–0,4 0,008–0,016	0,1–0,2 0,004–0,008
Depth of cut, (a_p) mm inch	2–5 0,08–0,20	–2 –0,08
Carbide designation ISO US	P20–P40 C6–C5 Coated carbide	P10 C7 Coated carbide or cermet

End milling

Cutting data parameters	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed, (v_c) m/min. f.p.m.	50–90 164–295	50–90 164–295	15–20 ¹⁾ 49–66 ¹⁾
Feed (f_z) mm/tooth inch/tooth	0,006–0,20 ²⁾ 0,0002–0,008 ²⁾	0,06–0,20 ²⁾ 0,002–0,008 ²⁾	0,01–0,35 ²⁾ 0,0004–0,014 ²⁾
Carbide designation ISO US	K10, P40 C3, C5	P20–P30 C6–C5	– –

¹⁾ Coated HSS, uncoated HSS is not recommended

²⁾ Depending on radial depth of cut and cutter diameter.

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	Wheel recommendation
Surface grinding straight wheel	A 46 HV
Surface grinding segments	A 36 GV
Cylindrical grinding	A 60 KV
Internal grinding	A 60 IV
Profile grinding	A 120 JV

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty for fitness for a particular purpose.

UDDEHOLM EUROPE**AUSTRIA**

UDDEHOLM
Hansaallee 321
D-40549 Düsseldorf
Telephone: +49 211 535 10
Telefax: +49 211 535 12 80

BELGIUM

UDDEHOLM
Europark Oost 7
B-9100 Sint-Niklaas
Telephone: +32 3 780 56 20
Telefax: +32 3 780 56 29

CROATIA

BOHLER UDDEHOLM Zagreb
d.o.o za trgovinu
Zitnjak b.b
10000 Zagreb
Telephone: +385 1 2459 301
Telefax: +385 1 2406 790

CZECHIA

BOHLER UDDEHOLM CZ s.r.o.
Division Uddeholm
U silnice 949
161 00 Praha 6 Ruzyně
Czech Republic
Telephone: +420 233 029 850.8
Telefax: +420 233 029 859

DENMARK

UDDEHOLM A/S
Kokmose 8, Bramdrupdam
DK-6000 Kolding
Telephone: +45 75 51 70 66
Telefax: +45 75 51 70 44

ESTONIA

UDDEHOLM TOOLING ESTI OÜ
Silikatsiidi 7
EE-11216 Tallinn
Telephone: +372 655 9180
Telefax: +372 655 9181

FINLAND

OY UDDEHOLM AB
Ritakuja 1, PL 57,
FIN-01741 VANTAA
Telephone: +358 9 290 490
Telefax: +358 9 2904 9249

FRANCE

UDDEHOLM S.A.
12 Rue Mercier, Z.I. de Mitry-Compan
F-77297 Mitry Mory Cedex
Telephone: +33 (0)1 60 93 80 10
Telefax: +33 (0)1 60 93 80 01

Branch office

UDDEHOLM S.A.
77bis, rue de Vesoul
La Nef aux Métiers
F-25000 Besançon
Telephone: +33 381 53 12 19
Telefax: +33 381 53 13 20

GERMANY

UDDEHOLM
Hansaallee 321
D-40549 Düsseldorf
Telephone: +49 211 535 10
Telefax: +49 211 535 12 80

Branch offices

UDDEHOLM
Falkenstraße 21
D-65812 Bad Soden/TS.
Telephone: +49 6196 659 60
Telefax: +49 6196 659 625

UDDEHOLM

Albstraße 10
D-73765 Neuhausen
Telephone: +49 715 898 65-0
Telefax: +49 715 898 65-25

GREAT BRITAIN, IRELAND

UDDEHOLM UK LIMITED
European Business Park
Taylors Lane, Oldbury
West Midlands B69 2BN
Telephone: +44 121 552 55 11
Telefax: +44 121 544 29 11
Dublin Telephone: +353 1 45 14 01

GREECE

UDDEHOLM STEEL TRADING
COMPANY
20, Athinon Street
G-Piraeus 18540
Telephone: +30 2 10 41 72 109/41 29 820
Telefax: +30 2 10 41 72 767

Agency

SKLERO S.A.
Heat Treatment and Trading of Steel
Uddeholm Tool Steels
Industrial Area of Thessaloniki
P.O. Box 1123
G-57022 Sindos, Thessaloniki
Telephone: +30 23 10 79 76 46
Telefax: +30 23 10 79 76 78

HUNGARY

UDDEHOLM TOOLING/BOK
Dunaharaszti, Jedlik Ányos út 25
H-2331 Dunaharaszti 1.Pf. 110
Telephone/Telefax: +36 24 492 690

ITALY

UDDEHOLM div. della Bohler
Uddeholm Italia S.p.A.
Via Palizzi, 90
I-20157 Milano
Telephone: +39 02 35 79 41
Telefax: +39 02 390 024 82

LATVIA

UDDEHOLM TOOLING AB
Piedrujas street 7
LV-1073 Riga
Telephone: +371 7 702 133
Telefax: +371 7 185 079

LITHUANIA

UDDEHOLM TOOLING AB
BE PLIENAS IR METALAI
T. Masiulio 18b
LT-52459 Kaunas
Telephone: +370 37 370613, -669
Telefax: +370 37 370300

THE NETHERLANDS

UDDEHOLM B.V.
Isolatorweg 30
NL-1014 AS Amsterdam
Telephone: +31 20 581 71 11
Telefax: +31 20 684 86 13

NORWAY

UDDEHOLM A/S
Jernkroken 18
Postboks 85, Kalbakken
N-0902 Oslo
Telephone: +47 22 91 80 00
Telefax: +47 22 91 80 01

POLAND

INTER STAL CENTRUM
Sp. z o.o./Co. Ltd.
ul. Kolejowa 291, Dziekanów Polski
PL-05-092 Lomianki
Telephone: +48 22 429 2260
Telefax: +48 22 429 2266

PORTUGAL

F RAMADA Aços e Industrias S.A.
P.O. Box 10
P-3881 Ovar Codex
Telephone: +351 256 580 580
Telefax: +351 256 580 500/410

ROMANIA

BÖHLER Romania SRL
Uddeholm Branch
Atomistilor Str. No 96-102
077125 - com. Magurele, Jud. Ilfov.
Telephone: +40 214 575007
Telefax: +40 214 574212

RUSSIA

UDDEHOLM TOOLING CIS
25 A Bolshoy pr PS
197198 St. Petersburg
Telephone: +7 812 233 9683
Telefax: +7 812 232 4679

SLOVAKIA

Bohler-Uddeholm Slovakia s.r.o.
divizia UDDEHOLM
Čsl. Armády 5/5622
036 01 Martin, Slovakia
Telephone: +421 842 4 300 823
Telefax: +421 842 4 224 028

SLOVENIA

UDDEHOLM div. della Bohler
Uddeholm Italia S.p.A.
Via Palizzi, 90
I-20157 Milano
Telephone: +39 02 35 79 41
Telefax: +39 02 390 024 82

SPAIN

UDDEHOLM
Guifré 690-692
E-08918 Badalona, Barcelona
Telephone: +34 93 460 1227
Telefax: +34 93 460 0558

Branch office

UDDEHOLM
Barrio San Martin de Arteaga, 132
Pol.Ind. Torrelarragoiti
E-48170 Zamudio
(Bizkaia)
Telephone: +34 94 452 13 03
Telefax: +34 94 452 13 58

SWEDEN

UDDEHOLM TOOLING
SVENSKA AB
Aminogatan 25
SE-431 53 Mölndal
Telephone: +46 31 67 98 50
Telefax: +46 31 27 02 94

SWITZERLAND

HERTSCH & CIE AG
General Wille Strasse 19
CH-8027 Zürich
Telephone: +41 44 208 16 66
Telefax: +41 44 201 46 15

**UDDEHOLM
NORTH AMERICA****USA**

UDDEHOLM
4902 Tollview Drive
Rolling Meadows, IL 60008
Sales Phone: +1 800 638 2520
Sales Fax: +1 630 350 0880

Region East Warehouse
UDDEHOLM - Shrewsbury, MA

Region Central Warehouse
UDDEHOLM - Wood Dale, IL

Region West Warehouse
UDDEHOLM - Santa Fe Springs, CA

CANADA

UDDEHOLM
2595 Meadowvale Blvd.
Mississauga, ON L5N 7Y3
Telephone: +1 905 812 9440
Telefax: +1 905 812 8658

Branch Warehouses

UDDEHOLM - St. Laurent, QC
UDDEHOLM - New Westminster, BC

Heat Treating

THERMO-TECH - Mississauga, ON

MEXICO

ACEROS BOHLER UDDEHOLM,
S.A. de C.V.
Calle 8 No 2, Letra "C"
Fraccionamiento Industrial Alce Blanco
C.P. 52787 Naulcapan de Juarez
Estado de Mexico
Telephone: +52 55 9172 0242
Telefax: +52 55 5576 6837

UDDEHOLM

Lerdo de Tejada No.542
Colonia Las Villas
66420 San Nicolas de Los Garza, N.L.
Telephone: +52 8-352 5239
Telefax: +52 8-352 5356

**UDDEHOLM
SOUTH AMERICA****ARGENTINA**

UDDEHOLM S.A
Mozart 40
1619-Centro Industrial Garin
Garin-Prov. Buenos Aires
Telephone: +54 332 744 4440
Telefax: +54 332 745 3222

BRAZIL

UDDEHOLM ACOS ESPECIAIS Ltda.
Estrada Yae Massumoto, 353
CEP 09842-160
Sao Bernardo do Campo - SP Brazil
Telephone: +55 11 4393 4560, -4554
Telefax: +55 11 4393 4561

**UDDEHOLM
SOUTH AFRICA**

UDDEHOLM Africa (Pty) Ltd.
P.O. Box 539
ZA-1600 Isando/Johannesburg
Telephone: +27 11-974 2781
Telefax: +27 11-392 2486

UDDEHOLM**AUSTRALIA**

BOHLER-UDDEHOLM Australia
129-135 McCredie Road
Guildford NSW 2161
Private Bag 14
Telephone: +61 2 9681 3100
Telefax: +61 2 9632 6161

Branch offices

Sydney, Melbourne, Adelaide,
Brisbane, Perth, Newcastle,
Launceston, Albury, Townsville

ASSAB**ASSAB INTERNATIONAL**

Skytteholmsvägen 2
P O Box 42
SE-171 11 Solna
Sweden
Telephone: +46 8 564 616 70
Telefax: +46 8 25 02 37

Subsidiaries

India, Iran, Turkey, United Arab
Emirates, Saudi Arabia

Distributors in

Africa, Latin America, Middle East

ASSAB PACIFIC

ASSAB Pacific Pte. Ltd
171, Chin Swee Road
No. 07-02, San Centre
Singapore 169877
Telephone: +65 534 56 00
Telefax: +65 534 06 55

Subsidiaries

China, Hong Kong, Indonesia, Japan,
Korea, Malaysia, Philippine Islands,
Singapore, Taiwan, Thailand

When the first idea pops into your head, throughout the development process to the release of the new product, we'll be your partner. As the world's leading supplier of tooling materials and related services, we can be trusted. Meet us under the Uddeholm and ASSAB brands, wherever in the world you have your business.

