

FORMAX

Holder 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

Formax is a low carbon steel which can be supplied in as-hot-rolled or fine-machined condition.

Formax is characterized by:

- Good machinability
- Easy to flame-cut
- Good mechanical strength
- Can be case hardened
- Good weldability.

Typical analysis %	C 0,18	Si 0,3	Mn 1,4
Standard specification	(W.-Nr. 10050, SS 2172)		
Delivery condition	Hot rolled. Hardness approx.170 HB		
Colour code	Black		

Applications

- Bolsters
- Punch holders
- Die holders
- Backing plates
- Guide plates
- Support plates
- Jigs
- Fixtures
- Constructional parts.

Properties

TENSILE STRENGTH

Approximate values at room temperature.

Hardness 170 HB.

Tensile strength R _m	N/mm ² ksi	560 80
Yield strength R _{p0,2}	N/mm ² ksi	320 45
Reduction of area Z	%	40
Elongation A ₅	%	20

Heat treatment recommendations

Formax is intended for use in the as-delivered condition, i.e. not heat treated.

For applications where the material must be hardened to a higher hardness, the following instructions should be followed;

STRESS RELIEVING

Temperature approx. 550–650°C (1020–1200°F).

After rough machining with chip-cutting tools, stress relieving may be advisable to minimize distortion if the tool is to be hardened. Holding time: 2 hours after the entire piece has attained a temperature of approx. 650°C (1200°F). Cool in furnace to approx. 500°C (930°F), followed by cooling in air.

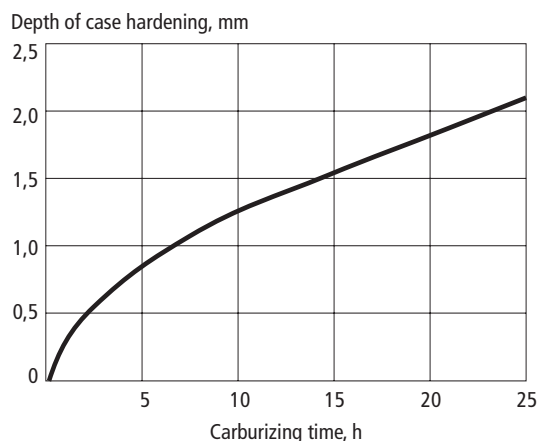
CASE HARDENING

The composition of Formax makes it highly suitable for case hardening. Case hardening can be carried out as follows:

Carburizing temperature 850–920°C (1560–1690°F).

The time and temperature must be adapted to the required depth of hardening. Quench in salt water from 800–820°C (1470–1510°F).

The following chart shows the rough relationship between the carburizing time and the depth of case at 900°C (1650°F).



TEMPERING

Tempering at 200°C (390°F) gives a surface hardness of approx. 60 HRC.

FLAME HARDENING

Formax can be flame/induction hardened to 40 ±3 HRC. Cooling in water. Case depth 1–2 mm. Temper immediately after hardening.

Cutting data recommendations

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

TURNING

Cutting data parameters	Turning with carbide		Turning with high speed steel Fine turning
	Rough turning	Fine turning	
Cutting speed (v_c) m/min f.p.m.	210–260 690–850	260–320 850–1050	28–32 90–105
Feed (f) mm/r i.p.r.	0,3–0,6 0,01–0,024	–0,3 –0,01	–0,3 –0,01
Depth of cut (a_p) mm inch	2–4 0,08–0,16	0,5–2 0,2–0,08	0,5–3 0,2–0,1
Carbide designation ISO	P20–P30 Coated carbide	P10 Coated carbide or cermet	—

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.	220–320 720–1050	320–370 1050–1210
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	2–4 0,08–0,16	0,5–2 –0,08
Carbide designation ISO	P20–P40 Coated carbide	P10–P20 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.	100–130 330–425	210–250 690–820	40–45 ¹⁾ 130–150 ¹⁾
Feed (f_z) mm/tooth inch/tooth	0,03–0,20 ²⁾ 0,001–0,008 ²⁾	0,08–0,20 ²⁾ 0,003–0,008 ²⁾	0,05–0,35 ²⁾ 0,002–0,014 ²⁾
Carbide designation ISO	K20	P20–P40	—

¹⁾ For coated HSS end mill $v_c = 60–65$ m/min. (200–215 f.p.m.).

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

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	22–25*	70–100*	0,08–0,20	0,003–0,008
5–10	3/16–3/8	22–25*	70–100*	0,20–0,30	0,008–0,012
10–15	3/8–5/8	22–25*	70–100*	0,30–0,35	0,012–0,014
15–20	5/8–3/4	22–25*	70–100*	0,35–0,40	0,014–0,016

* For coated HSS drill $v_c = 38–40$ m/min. (125–130 f.p.m.).

Carbide drill

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Brazed carbide ¹⁾
Cutting speed (v_c) m/min f.p.m.	250–270 820–885	130–160 425–525	90–110 295–360
Feed (f) mm/r i.p.r.	0,05–0,25 ²⁾ 0,002–0,01 ²⁾	0,10–0,25 ²⁾ 0,004–0,01 ²⁾	0,15–0,25 ²⁾ 0,006–0,01 ²⁾

¹⁾ Drill with internal cooling channels and brazed carbide tip.

²⁾ Depending on drill diameter.

GRINDING

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

Wheel recommendation

Type of grinding	Soft annealed condition	Hardened condition
Face grinding straight wheel	A 46 HV	A 46 HV
Face grinding segments	A 24 GV	A 36 GV
Cylindrical grinding	A 46 LV	A 60 KV
Internal grinding	A 46 JV	A 60 JV
Profile grinding	A 100 KV	A 120 JV

Flame-cutting

Formax is suitable for flame-cutting. Normally, no tempering of the cutting edge is needed before machining, since the machinability is not affected.

Welding

Formax has extremely good weldability and normally it needs no heat treatment in connection with the welding operation. However, if there is a risk of an abnormally high cooling rate, holding at 100–200°C (210–390°F) is recommended. Stress relieving, if any, is carried out at 550–600°C (1020–1200°F).

The low carbon content reduces hardness variations in the material after welding to a minimum.

Further information

Please, contact your local Uddeholm office for further information on the selection, heat treatment, application and availability of Uddeholm tool steels.



Gas cutting of Formax can be made by Uddeholm Machining, which is a company owned by Uddeholm Tooling.

UDDEHOLM EUROPE

AUSTRIA

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

BELGIUM

UDDEHOLM N.V.
Waterstraat 4
B-9160 Lokeren
Telephone: +32 9 349 11 00
Telefax: +32 9 349 11 11

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 AB
Silikatsiidi 7
EE-0012 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-Compans
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 12 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 14 011

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

SKLERO S.A.

Steel Trading Comp. and
Hardening Shop
Frixou 11/Nikif. Ouranou
G-54627 Thessaloniki
Telephone: +30 31 51 46 77
Telefax: +30 31 54 12 50

HUNGARY

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

ITALY

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
Deglava street 50
LV-1035 Riga
Telephone: +371 7 701 983, -981, -982
Telefax: +371 7 701 984

LITHUANIA

UDDEHOLM TOOLING AB
BE PLIENAS IR METALAI
T. Masiulio 18b
LT-3014 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 56 58 61 11
Telefax: +351 56 58 60 24

ROMANIA

BÖHLER Romania SRL
Uddeholm Branch
Str. Atomistilor Nr 14A
077125 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

UDDEHOLM Slovakia
Nástrojové oceľe, s.r.o
KRÁCINY 2
036 01 Martin
Telephone: +421 842 4 300 823
Telefax: +421 842 4 224 028

SLOVENIA

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 1 208 16 66
Telefax: +41 1 201 46 15

UDDEHOLM

NORTH AMERICA

USA

UDDEHOLM
4902 Tollview Drive
Rolling Meadows IL 60008
Telephone: +1 847 577 22 20
Telefax: +1 847 577 80 28

UDDEHOLM

548 Clayton Ct.,
Wood Dale IL 60191
Telephone: +1 630 350 10 00
Telefax: +1 630 350 08 80

UDDEHOLM

9331 Santa Fe Springs Road
Santa Fe Springs, CA 90670
Telephone: +1 562 946 65 03
Telefax: +1 562 946 77 21

UDDEHOLM

220 Cherry Street
Shrewbury, MA 01545
Telephone: +1 508 845 1066
Telefax: +1 508 845 3471

CANADA

UDDEHOLM LIMITED
2595 Meadowvale Blvd.
Mississauga, Ontario L5N 7Y3
Telephone: +1 905 812 9440
Telefax: +1 905 812 8659

MEXICO

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

UDDEHOLM

Letdo 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

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.

