



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.

Classified according to EU Directive 1999/45/EC

For further information see our "Material Safety Data Sheets".

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The latest revised edition of this brochure is the English version, which is always published on our web site [www.uddeholm.com](http://www.uddeholm.com)



SS-EN ISO 9001  
SS-EN ISO 14001



## UDDEHOLM NIMAX

Reliable and efficient tool steel is essential for good results. The same goes for achieving high productivity and high availability. When choosing the right steel many parameters must be considered, however by using a superior steel your productivity can be greatly improved. With excellent machinability and very good polishability you will spend less time to finish your product. This makes it much easier to meet your deadline.

Uddeholm Nimax is a new steel grade for plastic moulding which provides several unique benefits.

### SUPERIOR MACHINABILITY

This will give you the advantage of shorter machining time. In turn this means that it will be easier for you to meet your customers demands on delivery time. You will also benefit from lower cutting tool cost and increased availability of your machines.

### INSTANT WELDING

#### – NO PREHEATING OR POST HEAT TREATMENT REQUIRED

Weld repairs, maintenance and design changes can be performed quicker, thus shortening the downtime during mould manufacturing and production. You will be very flexible and your production will run smoother and faster.

### CONSISTENT TOOL PERFORMANCE

#### – LONGER TOOL LIFE

Uddeholm Nimax combines high hardness with a high toughness. This leads to a mould with good resistance to indentations and a minimum risk for unexpected failures, thereby leading to a more reliable tool and prolonged tool life.

### REDUCE YOUR POLISHING COSTS

#### – ACHIEVE A BETTER SURFACE FINISH

With good structure and a low amount of inclusions you will spend considerably less time to achieve the desired surface finish.

## General

Uddeholm Nimax is a low carbon plastic mould steel delivered at a hardness of ~ 40 HRC.

Uddeholm Nimax is characterized by the following:

- Excellent machinability
- Very good welding properties
- Good polishing and texturing properties
- Good resistance against indentations
- High impact and fracture toughness
- Consistent properties through large sections

The excellent machinability and easy weldability, no preheating or post treatment necessary, reduce the manufacturing time and make the maintenance much easier. The high hardness in combination with a high toughness results in a mould with good resistance to indentations and a minimum risk for unexpected failures, leading to a safer mould and a prolonged tool life.

Typical analysis weight-%	C 0,1	Si 0,3	Mn 2,5	Cr 3,0	Mo 0,3	Ni 1,0
Delivery condition	360–400 HB					
Colour code	Light blue/Dark blue					

## Applications

Uddeholm Nimax is suitable for many different types of applications within the plastic segment. Its excellent machinability and high toughness also makes it suitable as a holder material as well as for many engineering applications.

Examples of applications are:

- Moulds for plastic injection
  - Packaging industry
    - Containers of different types
  - Automotive industry
    - Larger interior parts
    - Reflectors
  - Appliances
    - Panels and handles
- Holder material for forging and die casting dies
- Holder material for cutting tools
- Hot runner manifolds
- Structural components

## Properties

### Physical data

Temperature	20°C (68°F)	200°C (390°F)
Density, kg/m <sup>3</sup> lbs/in <sup>3</sup>	7 900 0,285	–
Modulus of elasticity, N/mm <sup>2</sup> psi	205 000 29,7 × 10 <sup>6</sup>	–
Coefficient of thermal expansion per °C from 20°C °F from 68°F	–	12,4 × 10 <sup>-6</sup> 6,9 × 10 <sup>-6</sup>
Thermal conductivity W/m · °C Btu in/(ft <sup>2</sup> h °F)	–	26 180
Specific heat J/kg °C Btu/lb, °F	460 0,11	–

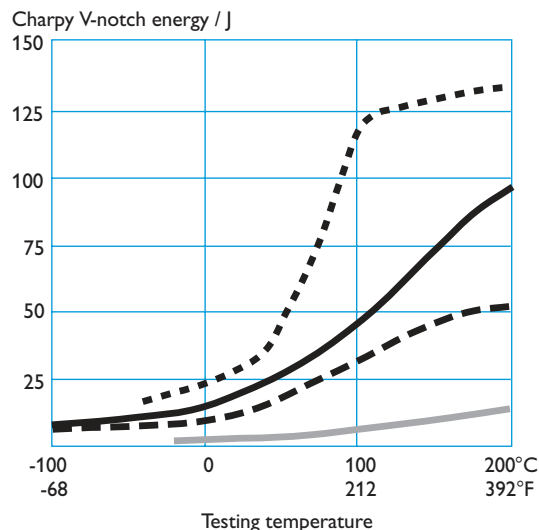
### Mechanical properties

The properties are representative of samples taken from the centre of bars with dimension 596 x 296 mm unless otherwise is indicated. Values of different mechanical properties depend on dimension of original material, position and direction of samples as well as hardness and test temperature.

#### IMPACT TOUGHNESS

Specimens type: Charpy V, short transverse direction.

— — —	Uddeholm Nimax Size: 400 x 100 mm, 373 HB
— — —	Uddeholm Nimax Size: 596 x 296 mm, 375 HB
— — —	W.-Nr. 1.2738 Size: 300 x 100 mm, 325 HB
— — —	W.-Nr. 1.2738 Size: 355 x 90 mm, 356 HB



The high impact toughness increases the safety against cracking failures.

## TENSILE STRENGTH

Hardness ~370 HB.

Yield strength, $R_{p0,2}$ MPa	785
Tensile strength, $R_m$ MPa	1265
Elongation, %	11
Area contraction, %	47

## COMPRESSIVE STRENGTH

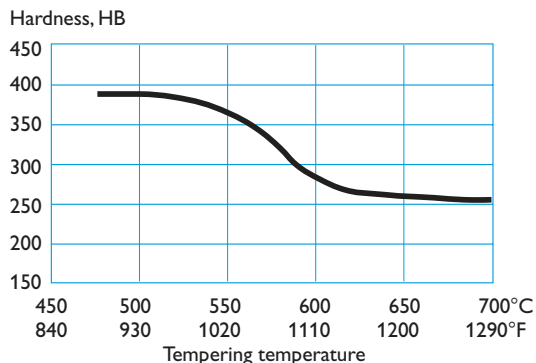
Hardness ~370 HB.

Compressive strength, $R_{c0,2}$ MPa	1000
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## Heat treatment

Uddeholm Nimax is intended to be used in the delivery condition. The hardness cannot be increased by heat treatment, but can be decreased by tempering. **However, tempering is not recommended because it significantly decreases toughness in spite of the fact that the hardness is reduced.**

The following hardness reduction can be expected after 2 h at full temperature:



If the steel has been exposed to high temperature thus reducing toughness and hardness, the following procedure can be performed in order to restore the original condition:

Heat to 850°C (1560°F), holding time 30 min.  
Cool in circulating air.



Refrigerator handle.

## Surface treatment

## Flame and induction hardening

The surface hardness of Uddeholm Nimax cannot be increased either by induction hardening or flame hardening.

## Nitriding

Nitriding increases the surface hardness and wear resistance. For best result the following steps should be followed:

1. Rough machining.
2. Stress relieving at a temperature not higher than 525°C (977°F). Heat the mould up until it is heated through and let it cool down to room temperature.
3. Grinding.
4. Nitriding.

The following approximate nitriding depths and surface hardnesses can be expected:

	Surface hardness MHV (200g)	Depth after nitriding		
		10h mm (inch)	30h mm (inch)	60h mm (inch)
Gas nitriding at 510°C (950°F)	950	0,16 <sup>1)</sup> (0,006 <sup>1)</sup> )	0,28 <sup>1)</sup> (0,011 <sup>1)</sup> )	0,39 <sup>1)</sup> (0,015 <sup>1)</sup> )
Plasma nitriding at 480°C (896°F)	1000	0,13 <sup>2)</sup> (0,005 <sup>2)</sup> )	0,25 <sup>1)</sup> (0,010 <sup>1)</sup> )	0,33 <sup>1)</sup> (0,013 <sup>1)</sup> )

<sup>1)</sup> Not recommended

<sup>2)</sup> Recommended

**Nitriding at temperatures above 500°C (930°F) and times longer than 10 h is not recommended as it will reduce toughness and hardness significantly. For more detailed information contact your local Uddeholm office.**

## Case hardening

The surface hardness can be increased by case hardening. 2h at 850°C (1560°F) and a carbon activity of 0,65 followed by tempering 1 h at 170°C (340°F) gives a surface hardness of 650 MHV and a case hardening depth of 0,3 mm (0,012”).

## Machining recommendations

The cutting data below are to be considered as guiding values which must be adapted to existing local conditions. More information can be found in the Uddeholm publication "Cutting data recommendations".

### Turning

Cutting data parameters	Turning with carbide		Turning with HSS Fine turning
	Rough turning	Fine turning	
Cutting speed ( $v_c$ ) m/min. f.p.m.	110–150 360–492	150–200 492–656	10–15 33–49
Feed (f) mm/rev. i.p.r.	0,2–0,4 0,008–0,016	–0,3 –0,012	–0,3 –0,012
Depth of cut ( $a_p$ ) mm inch	2–4 0,08–0,16	–2 –0,08	–2 –0,08
Carbide designation ISO	P20–P30 Coated carbide	P10 Coated carbide	–

### Drilling

#### HIGH SPEED STEEL TWIST DRILL

Drill diameter		Cutting speed ( $v_c$ )		Feed (f)	
mm	inch	m/min	f.p.m.	mm/rev	i.p.r.
–5	–3/16	12–14*	39–46*	0,05–0,10	0,002–0,004
5–10	3/16–3/8	12–14*	39–46*	0,10–0,20	0,004–0,008
10–15	3/8 –5/8	12–14*	39–46*	0,20–0,25	0,008–0,010
15–20	5/8 –3/4	12–14*	39–46*	0,25–0,30	0,010–0,012

\* For coated HSS drills  $v_c = 18–20$  m/min. (59–66 f.p.m.)

#### CARBIDE DRILL

Cutting data parameters	Type of drill		
	Indexable insert <sup>1)</sup>	Solid carbide <sup>1)</sup>	Carbide tipped <sup>1)</sup>
Cutting speed ( $v_c$ ) m/min. f.p.m.	150–170 492–558	100–130 328–426	90–110 296–360
Feed (f) mm/rev. i.p.r.	0,05–0,25 <sup>2)</sup> 0,002–0,010 <sup>2)</sup>	0,10–0,25 <sup>2)</sup> 0,004–0,010 <sup>2)</sup>	0,15–0,25 <sup>2)</sup> 0,006–0,010 <sup>2)</sup>

<sup>1)</sup> Preferably drills with internal cooling channels

<sup>2)</sup> 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.	80–150 262–492	150–180 492–590
Feed ( $f_z$ ) mm/tooth in/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 0,08–0,2	– 2 – 0,08
Carbide designation ISO	P20 Coated carbide	P10–P20 Coated carbide or cermet

#### END MILLING

Cutting data parameters	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel <sup>1)</sup>
Cutting speed ( $v_c$ ) m/min. f.p.m.	70–110 230–361	80–120 262–394	10–15 33–49
Feed ( $f_z$ ) mm/tooth in/tooth	0,03–0,20 <sup>2)</sup> 0,001–0,008 <sup>2)</sup>	0,08–0,20 <sup>2)</sup> 0,003–0,008 <sup>2)</sup>	0,05–0,35 <sup>2)</sup> 0,002–0,014 <sup>2)</sup>
Carbide designation ISO	–	P20–P30	–

<sup>1)</sup> For coated HSS end mill  $v_c = 25–30$  m/min. (82–98 f.p.m.)

<sup>2)</sup> 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".

#### WHEEL RECOMMENDATION

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

## Electrical discharge machining, EDM

Contrary to other steel grades, the heat affected surface layer achieved during EDM'ing will not be harder than the underlying steel. Consequently, the heat affected layer is more easily removed.

## Welding

Preheating or post heat treatment is not necessary. However if severe strain conditions could be expected a stress relieving at 450°C (840°F) for 2h is recommended after welding.

Welding method	TIG	MMA
Preheating temperature	None	None
Filler material	Impax TIG Weld Nimax TIG-Weld	Impax Weld
Max interpass temperature	300°C (570°F)	
Cooling rate	Freely in air	
Hardness as welded	Impax TIG-Weld 320–340 HB Nimax TIG-Weld 360–400 HB	330–350 HB –
Post heat treatment	None / 450°C (840°F) 2h	

## Polishing

Uddeholm Nimax has a very good polishability. The very low sulphur content and the homogenous structure ensures a good polishing result.

## Further information

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

## Photo etching

Uddeholm Nimax is very suitable for texturing by photo etching. The very low sulphur content and homogenous structure ensures an accurate and consistent pattern reproduction.



Chair support.

## Europe

### Austria

*Representative office*  
UDDEHOLM  
Albstraße 10  
DE-73765 Neuhausen  
Telephone: +49 7158 9865-0  
www.uddeholm.de

### Belgium

UDDEHOLM  
Europark Oost 7  
B-9100 Sint-Niklaas  
Telephone: +32 3 780 56 20  
www.uddeholm.be

### Croatia

BÖHLER UDDEHOLM Zagreb  
d.o.o za trgovinu  
Zitnjak b.b  
10000 Zagreb  
Telephone: +385 1 2459 301  
Telefax: +385 1 2406 790  
www.bohler-uddeholm.hr

### Czech Republic

BÖHLER UDDEHOLM CZ s.r.o.  
Division Uddeholm  
U Silnice 949  
161 00 Praha 6, Ruzyně  
Telephone: +420 233 029 850,8  
www.uddeholm.cz

### Denmark

UDDEHOLM A/S  
Kokmose 8, Bramdrupdam  
DK-6000 Kolding  
Telephone: +45 75 51 70 66  
www.uddeholm.dk

### Estonia

UDDEHOLM TOOLING AB  
Silikatsiidi 7  
EE-11216 Tallinn  
Telephone: +372 655 9180  
www.uddeholm.ee

### Finland

OY UDDEHOLM AB  
Ritakuja 1, PL 57  
FI-01741 VANTAA  
Telephone: +358 9 290 490  
www.uddeholm.fi

### France

*Head office*  
UDDEHOLM  
Z.I. de Mitry-Compans, 12 rue Mercier,  
FR-77297 Mitry Mory Cedex  
Telephone: +33 (0)1 60 93 80 10  
www.uddeholm.fr

#### *Branch offices*

UDDEHOLM S.A.  
77bis, rue de Vesoul  
La Nef aux Métiers  
FR-25000 Besançon  
Telephone: +33 (0)381 53 12 19

LE POINT ACIERS  
UDDEHOLM - Aciers à outils  
Z.I. du Recou, Avenue de Champlevret  
FR-69520 GRIGNY  
Telephone: +33 (0)4 72 49 95 61

LE POINT ACIERS  
UDDEHOLM - Aciers à outils  
Z.I. Nord 27, rue François Rochaix  
FR-01100 OYONNAX  
Telephone: +33 (0)4 74 73 48 66

### Germany

*Head office*  
UDDEHOLM  
Hansaallee 321  
DE-40549 Düsseldorf  
Telephone: +49 211 5351-0  
www.uddeholm.de

#### *Branch offices*

UDDEHOLM  
Falkenstraße 21  
DE-65812 Bad Soden/TS  
Telephone: +49 6196 6596-0

UDDEHOLM  
Albstraße 10  
DE-73765 Neuhausen  
Telephone: +49 7158 9865-0

UDDEHOLM  
Friederikenstraße 14b  
DE-06493 Harzgerode  
Telephone: +49 39484 727 267

### Great Britain

UDDEHOLM DIVISION  
BOHLER-UDDEHOLM (UK) LIMITED  
European Business Park  
Taylors Lane, Oldbury  
GB-West Midlands B69 2BN  
Telephone: +44 121 552 5511  
Telefax: +44 121 544 2911  
www.uddeholm.co.uk

### Greece

STASSINOPOULOS-UDDEHOLM  
STEEL TRADING S.A.  
20, Athinon Street  
GR-Piraeus 18540  
Telephone: +30 210 4172 109  
www.uddeholm.gr

SKLERO S.A.  
Heat Treatment and Trading of Steel  
Uddeholm Tool Steels  
Industrial Area of Thessaloniki  
P.O. Box 1123  
GR-57022 Sindos, Thessaloniki  
Telephone: +30 2310 79 76 46  
www.sklero.gr

### Hungary

UDDEHOLM TOOLING/BOK  
Dunaharaszti, Jedlik Ányos út 25  
HU-2331 Dunaharaszti 1. Pf. 110  
Telephone/fax: +36 24 492 690  
www.uddeholm.hu

### Ireland

*Head office:*  
UDDEHOLM DIVISION  
BOHLER-UDDEHOLM (UK) LIMITED  
European Business Park  
Taylors Lane, Oldbury  
UK-West Midlands B69 2BN  
Telephone: +44 121 552 5511  
Telefax: +44 121 544 2911  
www.uddeholm.co.uk  
*Dublin:*  
Telephone: +353 1845 1401

### Italy

UDDEHOLM  
Divisione della Bohler Uddeholm  
Italia S.p.A.  
Via Palizzi, 90  
IT-20157 Milano  
Telephone: +39 02 39 49 211  
www.uddeholm.it

### Latvia

UDDEHOLM TOOLING LATVIA SIA  
Piedrujas Street 7  
LV-1035 Riga  
Telephone: +371 7 702133  
Telefax: +371 7 185079

### Lithuania

UDDEHOLM TOOLING AB  
BE PLIENAS IR METALAI  
T. Masiulio 18B  
LT-52459 Kaunas  
Telephone: +370 37 370613, -669  
www.besteel.lt

### The Netherlands

UDDEHOLM  
Isolatorweg 30  
NL-1014 AS Amsterdam  
Telephone: +31 20 581 71 11  
www.uddeholm.nl

### Norway

UDDEHOLM A/S  
Jernkroken 18  
Postboks 85, Kalbakken  
NO-0902 Oslo  
Telephone: +47 22 91 80 00  
www.uddeholm.no

### Poland

BOHLER UDDEHOLM POLSKA  
Sp. z o.o./Co. Ltd.  
ul. Kolejowa 291, Dziekanów Polski,  
PL-05-092 Lomianki  
Telephone: +48 22 429 2260, -203, -204  
www.uddeholm.pl

### Portugal

F RAMADA Aços e Industrias S.A.  
P.O. Box 10  
PT-3881 Ovar Codex  
Telephone: +351 256 580580  
www.ramada.pt

### Romania

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

### Russia

UDDEHOLM TOOLING CIS  
9A, Lipovaya Alleya, Office 509  
RU-197183 Saint Petersburg  
Telephone: +7 812 6006194  
www.uddeholm.ru

### Slovakia

Bohler-Uddeholm Slovakia s.r.o.  
divizia UDDEHOLM  
Čsl.Armády 5622/5  
SK-036 01 Martin  
Telephone: +421 (0)434 212 030  
www.uddeholm.sk

### Slovenia

*Representative office*  
UDDEHOLM  
Divisione della Bohler Uddeholm  
Italia S.p.A.  
Via Palizzi, 90  
IT-20157 Milano  
Telephone: +39 02 39 49 211  
www.uddeholm.it

### Spain

*Head office*  
UDDEHOLM  
Guifré 690-692  
ES-08918 Badalona, Barcelona  
Telephone: +34 93 460 1227  
www.acerosuddeholm.com

#### *Branch office*

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

### Sweden

*Head office*  
UDDEHOLM TOOLING SVENSKA AB  
Aminogatan 25  
SE-431 53 Mölndal  
Telephone: +46 31 67 98 50  
www.uddeholm.se

#### *Branch offices*

UDDEHOLM TOOLING SVENSKA AB  
Box 45  
SE-334 21 Anderstorp  
Telephone: +46 371 160 15

UDDEHOLM TOOLING SVENSKA AB  
Box 148  
SE-631 03 Eskilstuna  
Telephone: +46 16 15 79 00

UDDEHOLM TOOLING SVENSKA AB  
Aminogatan 25  
SE-431 53 Mölndal  
Telephone: +46 31 67 98 70

UDDEHOLM TOOLING SVENSKA AB  
Nya Tanneforsvägen 96  
SE-582 42 Linköping  
Telephone: +46 13 15 19 90

UDDEHOLM TOOLING SVENSKA AB  
Derbyvägen 22  
SE-212 35 Malmö  
Telephone: +46 40 22 32 05

UDDEHOLM TOOLING SVENSKA AB  
Honnörsgatan 16A  
SE-352 36 Växjö  
Telephone: +46 470 457 90

### Switzerland

HERTSCH & CIE AG  
General Wille Strasse 19  
CH-8027 Zürich  
Telephone: +41 44 208 16 66  
www.hertsch.ch

### Turkey

*Head office*  
ASSAB Korkmaz Celik A.S.  
Organize Sanayi Bölgesi  
2. Cadde No: 26 Y. Dudullu  
Umraniye-Istanbul Turkey  
Telephone: +90 216 420 1926-121/124  
www.assabkorkmaz.com



## America

### Argentina

ACEROS BOEHLER UDDEHOLM S.A  
Mozart 40  
1619-Centro Industrial Garin  
Garin-Prov.  
AR-Buenos Aires  
Telephone: +54 332 7444 440  
www.uddeholm.com.ar

### Brazil

AÇOS BOHLER-UDDEHOLM DO  
BRASIL LTDA- DIV. UDDEHOLM  
Estrada Yae Massumoto, 353  
CEP 09842-160  
BR-Sao Bernardo do Campo - SP Brazil  
Telephone: +55 11 4393 4560, 4554  
www.uddeholm.com.br

### Canada

Head Office & Warehouse  
UDDEHOLM  
2595 Meadowvale Blvd.  
Mississauga, ON L5N 7Y3  
Telephone: +1 905 812 9440  
www.bucanada.com

#### Branch Warehouses

UDDEHOLM  
3521 Rue Ashby  
St. Laurent, QC H4R 2K3  
Telephone: +1 514 333 8000

#### UDDEHOLM

730 Eaton Way - Unit #10  
New Westminster, BC V3M 6J9  
Telephone: +1 604 525 3354

#### Heat Treating

THERMO-TECH  
2645 Meadowvale Blvd.  
Mississauga, ON L5N 7Y4  
Telephone: +1 905 812 9440

### Colombia

AXXECOL S.A.  
Carrera 35 No 13-20  
Apartado Aereo 80718  
CO-Bogota 6  
Telephone: +57 1 2010700  
www.axxecol.com

#### ASTECO S.A.

Carrera 54 No 35-12  
Apartado Aereo 663  
CO-Medellin  
Telephone: +57 4 2320122  
www.asteco.com

### Dominican Republic

RAMCA, C. POR A.  
Luis Puigbó Alegre, EPS P-2289  
P O Box 02-5261  
DO-Santo Domingo  
Telephone: +1 809 682 4011  
domrep@assab.com

### Ecuador

IVAN BOHMAN C.A.  
Apartado 1317  
Km 6 1/2 Via a Daule  
Guayaquil  
Telephone: +593 42 254111

#### IVAN BOHMAN C.A.

Casilla Postal 17-01370  
Quito  
Telephone: +593 2 2248001

### El Salvador

ACAVISA DE C.V.  
25a. Avenida Sur 463  
zona 1  
Apartado Postal 439  
SV-San Salvador  
Telephone: +503 22 711700  
www.acavisa.com

### Guatemala

IMPORTADORA ESCANDINAVA  
Apartado postal 2042  
GT-Guatemala City  
Telephone: +502 23 659270  
guatemala@assab.com

### Mexico

#### Head office

ACEROS BOHLER UDDEHOLM S.A.  
de C.V.  
Calle Ocho No 2, Letra "C"  
Fraccionamiento Industrial Alce Blanco  
C.P. 52787 Naucalpan de Juarez  
MX-Estado de Mexico  
Telephone: +52 55 9172 0242  
www.bu-mexico.com

#### Branch office

BOHLER-UDDEHOLM MONTERREY,  
NUEVO LEON  
Lerdo de Tejada No.542  
Colonia Las Villas  
MX-66420 San Nicolas de Los Garza,  
N.L.  
Telephone: +52 81 83 525239

### Peru

C.I.P.E.S.A.  
Av. Oscar R. Benavides  
(ante Colonial) No. 2066  
PE-Lima 1  
Telephone: +51 1 336 8673  
peru@assab.com

### U.S.A.

#### Head Office

UDDEHOLM  
4902 Tollview Drive  
Rolling Meadows IL 60008  
Telephone: 1-847-577-2220  
Sales phone: 1-800-638-2520  
www.bucorp.com

#### Region East Warehouse

UDDEHOLM  
220 Cherry Street  
Shrewsbury MA 01545

#### Region Central Warehouse

UDDEHOLM  
548 Clayton Ct.  
Wood Dale IL 60191

#### Region West Warehouse

UDDEHOLM  
9331 Santa Fe Springs Road  
Santa Fe Springs, CA 90670

### Venezuela

PRODUCTOS HUMAR C.A.  
Multicentro Empresarial del Este,  
Edf Libertador, Núcleo A.  
Piso 9, Of. A-93, Chacao  
VE-Caracas 1060  
Telephone: +58 212 2655040  
humar@assab.com

### Other Countries in America

ASSAB INTERNATIONAL AB  
Box 42  
SE-171 11 Solna, Sweden  
Telephone: +46 8 564 616 70  
www.assab.se

## Asia & Pacific

### Australia

BOHLER UDDEHOLM Australia  
129-135 McCredie Road  
Guildford NSW 2161  
Private Bag 14  
AU-Sydney  
Telephone: +61 2 9681 3100  
www.buau.com.au

### Bangladesh

ASSAB INTERNATIONAL AB  
P.O. Box 17595  
Jebel Ali  
AE-Dubai  
Telephone: +971 488 12165  
www.assab.se

### North China

#### Head office

ASSAB Tooling (Beijing) Co Ltd  
No.10A Rong Jing Dong Jie  
Beijing Economic Development Area  
Beijing 100176, China  
Telephone: +86 10 6786 5588  
www.assabsteels.com

#### Branch offices

ASSAB Tooling (Beijing) Ltd  
Dalian Branch  
8 Huanghai Street, Haerbin Road  
Economic & Technical Develop. District  
Dalian 116600, China  
Telephone: +86 411 8761 8080

#### ASSAB Qingdao Office

Room 2521, Kexin Mansion  
No. 228 Liaoning Road, Shibei District  
Qingdao 266012, China  
Telephone: +86 532 8382 0930

#### ASSAB Tianjin Office

No.12 Puwangli Wanda Xincheng  
Xinyibai Road, Beichen District  
Tianjin 300402, China  
Telephone: +86 22 2672 0006

### Central China

#### Head office

ASSAB Tooling Technology  
(Shanghai) Co Ltd  
No. 4088 Humin Road  
Xinzhuang Industrial Zone  
Shanghai 201108, China  
Telephone: +86 21 5442 2345  
www.assabsteels.com

#### Branch offices

ASSAB Tooling Technology  
(Ningbo) Co Ltd  
No. 218 Longjiaoshan Road  
Vehicle Part Industrial Park  
Ningbo Economic & Technical Dev.  
Zone  
Ningbo 315806, China  
Telephone: +86 574 8680 7188

#### ASSAB Tooling Technology

(Chongqing) Co Ltd  
Plant C, Automotive Industrial IPark  
Chongqing Economic & Technological  
Development Zone  
Chongqing 401120, China  
Telephone: +86 23 6745 5698

### South China

#### Head office

ASSAB Steels (HK) Ltd  
Room 1701-1706  
Tower 2 Grand Central Plaza  
138 Shatin Rural Committee Road  
Shatin NT - Hong Kong  
Telephone: +852 2487 1991  
www.assabsteels.com

#### Branch offices

ASSAB Tooling (Dongguan) Co Ltd  
Northern District  
Song Shan Lake Science & Technology  
Industrial Park  
Dongguan 523808, China  
Telephone: +86 769 2289 7888  
www.assabsteels.com

#### ASSAB Tooling (Xiamen) Co Ltd

First Floor Universal Workshop  
No. 30 Huli Zone  
Xiamen 361006, China  
Telephone: +86 592 562 4678

### Hong Kong

ASSAB Steels (HK) Ltd  
Room 1701-1706  
Grand Central Plaza, Tower 2  
138 Shatin Rural Committee Road  
Shatin NT, Hong Kong  
Telephone: +852 2487 1991  
www.assabsteels.com

### India

ASSAB Sripad Steels LTD  
T 303 D.A.V. Complex  
Mayur Vihar Ph I Extension  
IN-Delhi-110 091  
Telephone: +91 11 2271 2736  
www.assabsripadsteels.com

#### ASSAB Sripad Steels LTD

709, Swastik Chambers  
Sion-Trombay Road  
Chembur  
IN-Mumbai-400 071  
Telephone: +91 22 2522-7110, -8133

#### ASSAB Sripad Steels LTD

Padmalaya Towers  
Janaki Avenue  
M.R.C. Nagar  
IN-Chennai-600 028  
Telephone: +91 44 2495 2371

### Indonesia

#### Head office

PT ASSAB Steels Indonesia  
Jl. Rawagelam III No. 5  
Kawasan Industri Pulogadung  
Jakarta 13930, Indonesia  
Telephone: +62 21 461 1314  
www.assabsteels.com

#### Branch offices

SURABAYA BRANCH  
Jl. Berbek Industri 1/23  
Surabaya Industrial Estate, Rungkut  
Surabaya 60293, East Java, Indonesia  
Telephone: +62 31 843 2277

#### MEDAN BRANCH

Komplek Griya Riatur Indah  
Blok A No.138  
Jl. T. Amir Hamzah  
Halvetia Timur, Medan 20124  
Telephone: +62 61 847 7935/6

#### BANDUNG BRANCH

Komp. Ruko Bumi Kencana  
Jl. Titian Kencana Blok E  
No.5 Bandung 40233  
Telephone: +62 22 604 1364

#### TANGERANG BRANCH

Pusat Niaga Cibodas  
Blok C No. 7 Tangerang  
Telephone: +62 21 921 9596, 551 2732

#### SEMARANG BRANCH

Jl. Imam Bonjol No.155  
R.208 Semarang 50124  
Telephone: +62 358 8167

## Iran

ASSAB INTERNATIONAL AB  
P.O. Box 19395  
IR-1517 TEHRAN  
Telephone: +98 21 888 35392  
www.assabiran.com

## Israel

PACKER YADPAZ QUALITY  
STEELS Ltd  
P.O. Box 686  
Ha-Yarkon St. 7, Industrial Zone  
IL-81106 YAVNE  
Telephone: +972 8 932 8182  
www.packer.co.il

## Japan

UDDEHOLM KK  
Atago East Building  
3-16-11 Nishi Shinbashi  
Minato-ku, Tokyo 105-0003, Japan  
Telephone: + 81 3 5473 4641  
www.assabsteels.com

## Jordan

ENGINEERING WAY Est.  
P.O. Box 874  
Abu Alanda  
JO-AMMAN 11592  
Telephone: +962 6 4161962  
engineeringway@assab.com

## Malaysia

*Head office*  
ASSAB Steels (Malaysia) Sdn Bhd  
Lot 19, Jalan Perusahaan 2  
Batu Caves Industrial Estate  
68100 Batu Caves  
Selangor Malaysia  
Telephone: +60 3 6189 0022  
www.assabsteels.com

### *Branch offices*

**BUTTERWORTH BRANCH**  
Plot 146a  
Jalan Perindustrian Bukit Minyak 7  
Kawasan Perindustrian Bukit Minyak  
14000 Bukit Mertajam, SPT Penang  
Telephone: +60 4 507 2020

### **JOHOR BRANCH**

No. 8, Jalan Persiaran Teknologi  
Taman Teknologi  
81400 Senai  
Johor DT, Malaysia  
Telephone: +60 7 598 0011

## New Zealand

VIKING STEELS  
25 Beach Road, Otahuhu  
P.O. Box 13-359, Onehunga  
NZ-Auckland  
Telephone: +64 9 270 1199  
www.ssm.co.nz

## Pakistan

ASSAB International AB  
P.O. Box 17595  
Jebel Ali  
AE-Dubai  
Telephone: +971 488 12165  
www.assab.se

## Philippines

ASSOCIATED SWEDISH STEELS  
PHILS Inc.  
No. 3 E. Rodriguez Jr., Avenue  
Bagong Ilog, Pasig City  
Philippines  
Telephone: +632 671 1953/2048  
www.assabsteels.com

## Republic of Korea

*Head office*  
ASSAB Steels (Korea) Co Ltd  
116B-8L, 687-8, Kojan-dong  
Namdong-ku  
Incheon 405-310, Korea  
Telephone: +82 32 821 4300  
www.assabsteels.com

### *Branch offices*

**BUSAN BRANCH**  
14B-5L, 1483-9, Songjeong-dong  
Kangseo-ku, Busan 618-270, Korea  
Telephone: +82 51 831 3315

### **DAEGU BRANCH**

Room 27, 7-Dong2 F  
Industry Materials Bldg.1629  
Sangyeog-Dong, Buk-Ku  
Korea-Daegu 702-710  
Telephone: +82 53 604 5133

## Lebanon

WARDE STEEL & METALS SARL MET  
Charles Helou Av, Warde Bldg  
P.O. Box 165886  
LB-Beirut  
Telephone: +961 1 447228  
lebanon@assab.com

## Saudi Arabia

ASSAB INTERNATIONAL AB  
P.O. Box 255092  
SA-Riyadh 11353  
Telephone: +966 1 4466542  
saudiarabia@assab.com

## Singapore

*Head office Pacific*  
ASSAB Pacific Pte Ltd  
171, Chin Swee Road  
No. 07-02, SAN Centre  
SG-Singapore 169877  
Telephone: +65 6534 5600  
www.assabsteels.com

### *Jurong*

ASSAB Steels Singapore (Pte) Ltd  
18, Penjuru Close  
SG-608616 Singapore  
Telephone: +65 6862 2200

## Sri Lanka

GERMANIA COLOMBO (Ptd ) Ltd  
451/A Kandy Road  
LK-Kelaniya  
Telephone: +94 11 2913556  
www.iwsholdings.com

## Syria

WARDE STEEL & METALS SARL MET  
Charles Helou Av, Warde Bldg  
P.O. Box 165886  
LB-Beirut  
Telephone: +961 1 447228  
lebanon@assab.com

## Taiwan

*Head office*  
ASSAB Steels (Taiwan) Co Ltd  
No. 112 Wu Kung 1st Rd.  
Wu Ku Industry Zone  
TW-Taipei 248-87, Taiwan (R.O.C.)  
Telephone: +886 2 2299 2849  
www.assabsteels.com

### *Branch offices*

**NANTOU BRANCH**  
No. 10, Industry South 5th Road  
Nan Kang Industry Zone  
Nantou 540-66, Taiwan (R.O.C.)  
Telephone: +886 49 225 1702

## TAINAN BRANCH

No. 180, Yen He Street,  
Yong Kang City  
Tainan 710-82, Taiwan (R.O.C.)  
Telephone: +886 6 242 6838

## Thailand

ASSAB Steels (Thailand) Ltd  
9/8 Soi Theedinthai,  
Taeparak Road, Bangplee,  
Samutprakarn 10540, Thailand  
Telephone: +66 2 385 5937,  
+66 2 757 5017  
www.assabsteels.com

## United Arab Emirates

ASSAB INTERNATIONAL AB  
P.O. Box 17595  
Jebel Ali  
AE-Dubai  
Telephone: +971 488 12165  
www.assab.se

## Vietnam

CAM Trading Steel Co Ltd  
90/8 Block 5, Tan Thoi Nhat Ward  
District 12, Ho Chi Minh City  
Vietnam  
Telephone: +84 8 5920 920  
www.assabsteels.com

## Other Asia

ASSAB INTERNATIONAL AB  
Box 42  
E-171 11 Solna, Sweden  
Telephone: +46 8 564 616 70  
www.assab.se

# Africa

## Egypt

UNITED FOR IMPORT AND  
INDUSTRIAL SUPPLIES  
Montaser Project No 20  
Flat No 14  
Al Ahram Street-El Tabia  
EG-Giza Cairo  
Telephone: +254 20 7797751  
www.assab.se

## Kenya

SANDVIK Kenya Ltd  
P.O. Box 18264  
Post code 00500  
KE-Nairobi  
Telephone: +254 20 532 866  
sandvik@africaonline.co.ke

## South Africa

UDDEHOLM Africa (Pty.) Ltd.  
P.O. Box 539  
ZA-1600 Isando/Johannesburg  
Telephone: +27 11 974 2781  
www.bohler-uddeholm.co.za

## Tunisia

MCM Distribution  
4 Bis, Rue 8610 - Z.I.  
2035 Chargula 1  
TN-Tunis  
Telephone: + 216 71 802479  
www.mcm.com.tn

## Zimbabwe

*Representative office:*  
UDDEHOLM Africa (Pty.) Ltd.  
P.O. Box 539  
ZA-1600 Isando/Johannesburg  
Telephone: +27 11 974 2781  
www.bohler-uddeholm.co.za

## Other African Countries

ASSAB INTERNATIONAL AB  
Box 42  
SE-171 11 Solna, Sweden  
Telephone: +46 8 564 616 70  
www.assab.se



## Network of excellence

Uddeholm is present on every continent. This ensures you high-quality Swedish tool steel and local support wherever you are. Assab is our wholly-owned subsidiary and exclusive sales channel, representing Uddeholm in various parts of the world. Together we secure our position as the world's leading supplier of tooling materials.

Uddeholm is the world's leading supplier of tooling materials. This is a position we have reached by improving our customers' everyday business. Long tradition combined with research and product development equips Uddeholm to solve any tooling problem that may arise. It is a challenging process, but the goal is clear – to be your number one partner and tool steel provider.

Our presence on every continent guarantees you the same high quality wherever you are. Assab is our wholly-owned subsidiary and exclusive sales channel, representing Uddeholm in various parts of the world. Together we secure our position as the world's leading supplier of tooling materials. We act worldwide, so there is always an Uddeholm or Assab representative close at hand to give local advice and support. For us it is all a matter of trust – in long-term partnerships as well as in developing new products. Trust is something you earn, every day.

For more information, please visit [www.uddeholm.com](http://www.uddeholm.com) or [www.assab.com](http://www.assab.com)

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