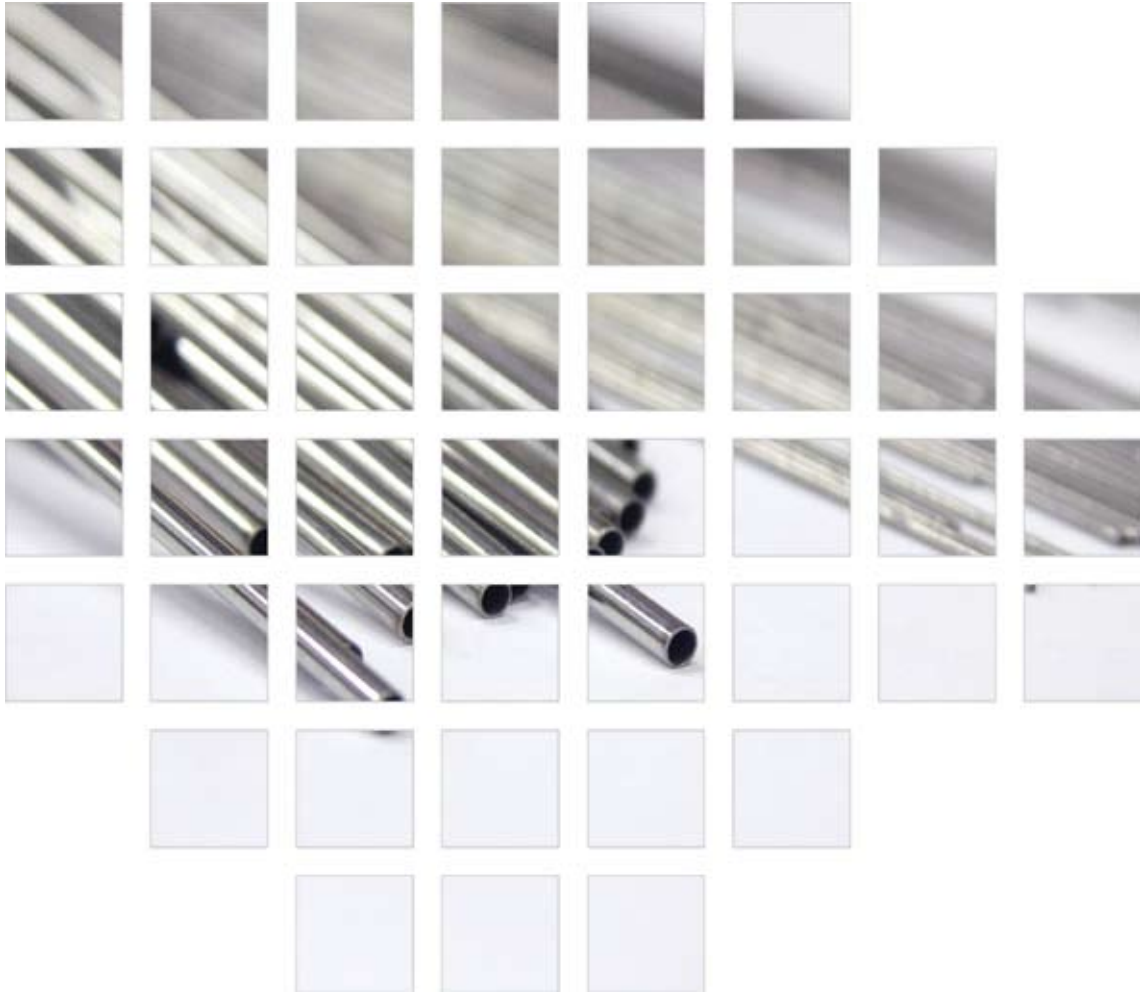


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PRODUCT CATALOGUE



HARALD PIHL AB

SPECIAL ALLOYS AND TITANIUM



Harald Pihl Sr. established the company HARALD PIHL in 1912

HARALD PIHL AB

INTRODUCTION

Harald Pihl, grandfather to the present owners, Johan and Klas Pihl, founded the company in 1912. The fourth generation of the Pihl family are now also working in the company.

The company's concept is to find solutions within the material technology, concentrating in materials with special properties, such as corrosion and heat resistant alloys, alloys with low expansion or alloys with high strength at elevated temperatures.

Customer designed solutions are also an important part of the business.

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CORROSION RESISTANT ALLOYS

Nickel alloys are, due to first-rate properties, extremely resistant to corrosion, in all forms.

NICKEL 200 (99,6 Ni)

High corrosion resistance in reducing atmosphere, particularly in soda solutions and in electro-chemical applications, for instance in batteries. Good electrical, thermal and magnetical shielding properties.

NICKEL 201 (99,6 Ni)

A low carbon content prevents embrittlement by carbon in the grain boundary.

Higher formability than NICKEL 200. As NICKEL 200 used in food processing, converting plants, chemical industries and where alkalis are used.

MONEL 400 (66 Ni/34 Cu)

A well-tried nickel alloy with maintained tensile properties up to 450°C and with high resistance against sea water corrosion. Used in the process- and petrochemical industries and in marine applications, such as propeller shafts, fittings and fasteners.

MONEL K-500 (66 Ni/32 Cu/2 Al)

An agehardenable quality of MONEL 400 with higher hardness and greater strength. Used for propeller shafts, pumps, valves, fasteners and fittings.

INCONEL 625 (61 Ni/22 Cr/9 Mo/4 Nb)

Excellent properties with high strength and due to high molybdenum content (10%) plus niobium, very good corrosion resistance in severe environments, especially resistant to sea water corrosion.

Used in offshore applications, aerospace and in the process industry.

INCOLOY 825 (42 Ni/22 Cr/3 Mo)

“Super stainless steel” - excellent against pitting and stress corrosion cracking. Good corrosion resistance where sulphuric and phosphoric acids are used in the pollution-control industry.

INCONEL C-276 (55 Ni/15 Cr/16 Mo)

Good resistance to pitting and crevice corrosion through a high molybdenum content (16%).

Very high corrosion resistance especially in chloride environments. Used in the paper and pulp industry and in seawater applications, for instance heat exchangers.



HEAT RESISTANT ALLOYS

INCONEL 600 (75 Ni/16 Cr)

Extremely good corrosion resistance in tough atmosphere up to 1175°C thanks to its high nickel content. The alloy is also used in low temperatures in the chemical- and in the process industry. Applications: Burner nozzles, furnace components such as muffles and retorts, salt bath electrodes and nitriding equipment.

INCONEL 601 (61 Ni/23 Cr/1,5 Al)

A development of INCONEL 600. INCONEL 601 has a higher chrome content and also an addition of aluminium, which increases the resistance to oxidation up to 1250°C. The alloy also has high mechanical properties at elevated temperatures.

Applications: Furnace components, heat treatment equipments, baskets, muffles and retorts and fasteners for ceramic insulation.

INCOLOY 800/800HT (32 Ni/21 Cr)

This alloy has an extremely good heat resistance up to 1000°C. Applications: Thermal processing equipment and furnace components such as radiant tubes, heat-treatment baskets, muffles etc. Also used in the petrochemical industry and for gas turbines.

INCOLOY DS (37 Ni/18 Cr/2,3 Si)

For thermal processing – especially resistant to carburisation. The addition of silicon makes the alloy resistant to oxidation in an atmosphere that varies between oxidizing and reducing. Applications: Same as for INCOLOY 800 but especially for continuous mesh belts, baskets, fixtures, enamelling equipment, furnace fans etc.

NIMONIC 75 (80 Ni/20 Cr)

A well-tried heat resistant alloy. In the beginning developed for the aircraft industry. With good mechanical properties and good oxidation resistance at high temperatures.



CREEP RESISTANT ALLOYS

INCONEL 718 (53 Ni/19 Cr/5 Nb)

A precipitation hardenable nickel-chromium-niobium alloy with good corrosion resistance and high strength, used in the aircraft- and the gas turbine industry. It also has excellent creep rupture strength up to 700°C. Other applications: Shafts and bolts and other fixtures.

NIMONIC 75 (80 Ni/20 Cr)

With good heat- and creep resistance at high temperatures. (1250°C) and with good mechanical properties. Suitable for furnace components, combustion chambers, parts for turbines and fixtures for heat treatment.

NIMONIC 80A (70 Ni/20 Cr/2 Co)

A precipitation hardenable alloy with extremely high tensile properties at temperatures to (815°C). Suitable for bolts. Other applications: Exhaust valves in combustion chambers.

NIMONIC 90 (55 Ni/20 Cr/17 Co)

A precipitation hardenable alloy with high heat-and wear strength and with good spring properties. Also used for anvils and for blades and discs in gas turbines.

NIMONIC 263 (55 Ni/20 Cr/20 Co)

A precipitation hardenable high strength alloy. High formability and high ductility in welded applications makes the alloy especially suitable in sheet constructions and in parts for aircraft engines and in gas turbines.

NIMONIC 901 (40 Ni/40 Fe/12 Cr/3 Ti)

A nickel-iron-chromium alloy precipitation hardened by aluminium and titanium for high yield strength and for good creep resistance. The iron content makes the alloy suitable for forging.

Used in the same applications as INCONEL 718, NIMONIC 80A, NIMONIC 90.



SPECIAL ALLOYS

NILOMAG 77 - Mu-metall - (83 Ni/16 Fe)

An alloy with high permeability. Used in electrical applications for electrical cores for transformers etc. Excellent material for electro magnetic shielding.

NILO K - Kovar - (30 Ni/17 Co/53 Fe)

Used especially when a material with controlled expansion is needed, but also in cryogenic applications. Also suitable for metal to glass seals or ceramics to metals.

NILO 36 - Invar – (36 Ni/63 Fe)

An alloy with low coefficient of expansion over a wide range of temperatures. Used for measuring equipment where precise reference points are needed (at temperature changes) and other measuring devices. Good properties for cryogenic applications.

NILO 42 (42 Ni/57 Fe)

An alloy with controlled expansion from room temperature up to 300°C. Used for semi-conductors, thermostats etc. The properties are also good in cryogenic applications.



STAINLESS STEEL

AUSTENITIC STEEL

Type: 1.4301, 1.4404

Used for pipelines, heat exchangers and other equipment in the chemical-, petrochemical-, cellulose- and in the food industry.

FERRITIC STEEL

Type: 1.4016, 1.4057

Characteristic for these alloys are good resistance to corrosion and insensitive to stress corrosion and they have a moderate ductility.

DUPLEX STEEL

Type: 1.4462, 1.4410

Alloys with a better tensile properties and a lower linear expansion than the austenitic steels. Very good resistance to corrosion in chloride containing solutions and weak organic acids

HIGH ALLOYED STEEL

Type: 1.4539, 1.4547

Used in phosphoric- and sulphuric acid environments, for instance in the petrochemical industry.

HIGH TEMPERATURE STEEL

Type: 1.4541, 1.4835

Good resistance to oxidation. Used for example as superheating protection tubes in steam power plants.



TITANIUM ALLOYS

Grade 1 (99,8 Ti)

Lower strength, softest, unalloyed* Ti grade with highest ductility, cold formability and impact toughness, with excellent resistance to mildly reducing to highly oxidizing media with or without chlorides and high weldability.

Grade 2 (99,7 Ti)

Moderate strength unalloyed* Ti with excellent weldability, cold formability, and fabricability; "workhorse" grade for industrial service with excellent resistance to mildly reducing to highly oxidizing media with or without chlorides.

Grade 3 (99,6 Ti)

Slightly stronger version of Gr.2 with similar corrosion resistance with good weldability and reasonable cold formability/ductility.

These grades are available in the following standards:

ASTM, AMS, ASTM F and **ASME**.

* Commercially pure alloy.

Grade 4 (99,5 Ti)

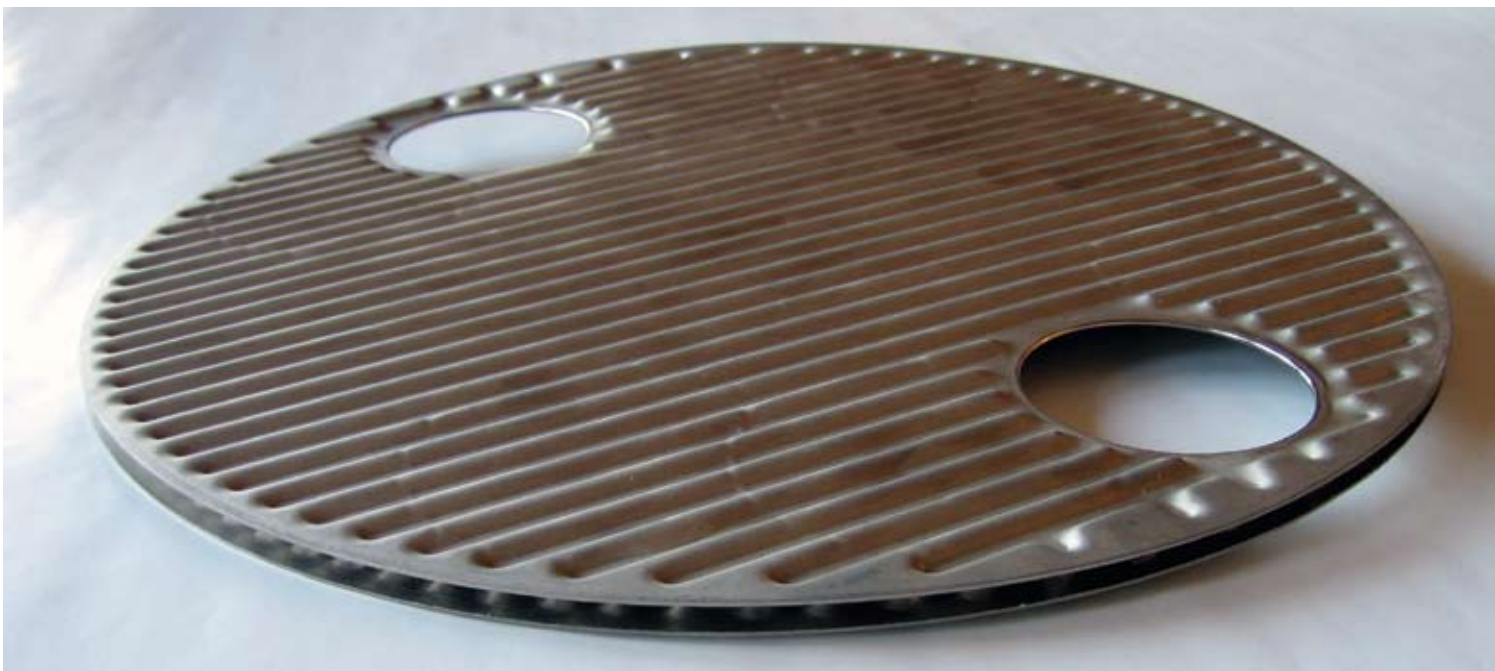
Much stronger, a higher interstitial version of Grades 2 and 3 with reasonable weldability and reduced ductility and cold-formability.

Grade 5 (6 Al/4 V/bal. Ti)

Heat treatable, high strength, most commercially available alloy ("workhorse" alloy for aerospace applications), for use up to 400°C offering an excellent combination of high strength, toughness and ductility along with good weldability and fabricability.

Grade 7 (0,2 Pd/99 Ti)

Most resistant Ti alloy to corrosion in reducing acids and localized attack in hot halide media, with physical/mechanical properties equivalent to Gr.2 and excellent weldability/fabricability.



LMPA ALLOYS

LMPA stands for Low Melting Point Alloys and are alloys with an extremely low melting point - below 250°C.

These alloys are used in various applications such as mould making, work holding, thermal safety devices and many other applications.

Very suitable for tube bending or as cores when casting – the melting point of the alloys are low; they start melting even in hot water (from 47°C).

Recycling of the alloys are easy, which gives a good economy when manufacturing.

Please check at our home page for the properties and for the proper alloy for a certain application.



COPPER ALLOYS

HOVADUR CCZ – zirconium copper – (0,7 Cr/0,1 Zr/bal. Cu)

For spot- and seam welding of carbon steel. Hard with a high electrical- and thermal conductivity.

Applications: Electrodes, electrode holders, cooling plates in continuous castings, jaws for flash welding, nozzles.

HOVADUR CCNB – beryllium copper – (0,5Be /1 Ni /1 Co/bal. Cu)

For spot- and seam welding of stainless steel. Also used for butt- and for flash welding. Very hard with a good wear resistance and a good electrical conductivity.

Applications: Cooling inserts in moulds, moulds for non-ferrous castings, die castings plunger tips for casting of aluminium.

HOVADUR CNCS (0,4 Co/0,7 Si/2,5 Ni/bal. Cu)

A beryllium free alternative. A hard material with good thermal conductivity.

Applications: For die casting plunger tips for casting of aluminium and for moulds for non-ferrous castings.

HOVADUR CuBe2 (1,9 Be/0,4 Ni+Co/bal. Cu)

Extremely hard with a high thermal conductivity.

Electrodes and jaws for resistance and flash welding, especially when high mechanical forces are used.

BERYLLIUM COPPER 25 1/2H

(1,8 Be/0,2 Ni+Co/bal. Cu)

For springs and connectors, High wear- and corrosion resistance and with good thermal conductivity. Stamping and forming is easily done. In half hard condition HV 200 but after precipitation hardening (2 h, 315°C) HV 400.

BERYLLIUM COPPER M 25H

(1,8 Be/0,2-0,6 Pb/0,2 Ni+Co/bal. Cu)

For connectors. This is a leaded beryllium copper, specially manufactured for automatic machining operations. The small amount of lead results in easy removal of chips.

TIN BRONZE – CuSn6 (6 Sn/0,2 P/bal. Cu)

A material with good properties, used mainly for springs.



COPPER ALLOYS

ToughMet® Alloys – (Ni/Sn, bal. Cu)

We are Brush Wellman's Swedish/Finnish distributor for these alloys.

TUNGSTEN-WOLFRAM

With its high density in many cases used for balance weights. Also used for shielding due to its high capacity to absorb electromagnetic radiation. Other applications: Tools, heating elements and wire for other electrical applications (filament wire), electrodes for TIG-welding.

TUNGSTEN-WOLFRAM COPPER –

70W/30Cu, 75W/25Cu, 80W/20Cu, 90W/10Cu
Mainly used as wear electrodes for spark erosion and as electrodes for spot welding.

MOLYBDENUM

With a high melting point and with a high strength at elevated temperatures.

Used for heating elements in gas furnaces and as an important alloying element in steel.

WELDING MATERIALS - NICKEL ALLOYS

NICKEL 141 (96 Ni/2,5 Ti) and

NICKEL 61 (96 Ni/3 Ti)

For NICKEL 200/201, cast iron, nodular cast iron and welding NICKEL 200 to steel.

MONEL 190 (65 Ni/31 Cu)

MONEL 60 (65 Ni/27 Cu)

For MONEL 400 and overlay welding of corrosion resistant surface layer. MONEL 60 is also suitable for welding nodular cast iron.

MONEL 187 (32 Ni/65 Cu)

MONEL 67 (21 Ni/65 Cu)

For copper-nickel (90/10, 80/20, 70/30, Cu/Ni) and for overlay welding of corrosion resistant surface layer.

INCOLOY 65 (42 Ni/21 Cr/17 Co)

For INCOLOY 825 and for overlay welding of corrosion resistant surface layer (after a first layer of INCONEL).

NIMONIC 90 (55 Ni/20 Cr/17 Co)

For welding NIMONIC 80 A and NIMONIC 90. For overlay welding of surfaces with high wear resistance and good spring properties at high temperature (for instance press anvils, valve seats, shears).

INCO-WELD A (70 Ni/15 Cr)

NC 80/20 (80 Ni/20 Cr)

For heat resistant alloys (INCONEL 600; INCOLOY 800/800H, INCOLOY DS, AISI 310) and for dissimilar welding (ferritic steel to austenitic or nickel alloys and certain Cu-alloys).

INCONEL 182 (67 Ni/15 Cr/8 Mn)

INCONEL 82 (72 Ni/17 Cr/3 Nb)

For INCONEL 600 to itself and to steel, dissimilar welding, for heat resistant alloys. When high hot strength is required – choose INCO-WELD A/INCONEL 112.

INCONEL 718 (53 Ni/19 Fe/5 Nb/3 Mo)

For welding of INCONEL 718

INCONEL 112 (61 Ni/22 Cr/9 Mo)

INCONEL 625 (61 Ni/22 Cr/9 Mo)

For INCONEL 625, Avesta 254 SMO, overlay welding of corrosion resistant surface layer – can also be used for high temperatures (approx. 1200°C). Hardens readily by deformation – good wear resistance.

INCONEL C-276 (59 Ni/15 Cr/16 Mo/4 W)

For welding ALLOY C and ALLOY C-276. Excellent corrosion- and heat resistance.

NIMONIC 263 (47 Ni/21 Co/21 Cr/6 Mo)

For welding of NIMONIC 263

INCONEL 617 (52 Ni/22 Cr/12 Co/9 Mo)

For welding of INCONEL 617

WELDING MATERIALS – COPPER ALLOYS

HP-CuSn (98 Cu/0,8 Sn/0,3 Mn/0,2 Si)

For pure copper type SS 5010, 5013, 5015 etc. Also for copper to brass and copper to steel.

HP-CuSi (95 Cu/3 Si/1 Mn)

For repair and overlay welding of copper and steel.

HP-CuSn6 (93 Cu/7 Sn)

HP-CuSn8 (91 Cu/8 Sn/0,1 P)

HP-CuSn12 (86 Cu/12,5 Sn/0,25 P)

For tin bronzes, gunmetal and brass and for repair welding of castings, also for brass.

High wear- and heat resistance.

HP-CuAl8 (92 Cu/8 Al)

HP-CuAl8Fe (90,5 Cu/8 Al/1,5 Fe)

For aluminium bronzes and overlay welding on steels, i.e. bearings and for thermal spraying.

Also available as coated electrode.

HP-CuAl8MnF (86 Cu/8 Al/2 Mn/2 Ni/2 Fe)

For aluminium bronzes and for overlay welding on steels. High wear resistance even in marine atmosphere. Also for thermal spraying.

HP-CuMn13Al (75 Cu/13 Mn/8 Al)

For aluminium bronzes and for overlay welding on steels. High hardness- and corrosion resistance in marine atmosphere.

MONEL 187 (32 Ni/65 Cu)

MONEL 67 (32 Ni/67 Cu)

For copper-nickels (90/10, 80/20, 70/30 Cu7Ni). For overlay welding of corrosion resistant surface layer (after a first layer of MONEL190/MONEL 60 alternatively NICKEL 141/NICKEL 61).



WELDING MATERIALS

Welding materials for titanium and titanium alloys

We have probably one of Europe's largest stock of welding materials for titanium and titanium alloys.

Welding materials for stainless steel

On our stock, we carry several different alloys – mainly in MIG and TIG wire.

Welding material - Tungsten-Wolfram

Pure Tungsten/Wolfram, labelled green and Tungsten/Wolfram with 2% thorium, labelled red.

**For more information about our welding materials
– please contact our sales department.**



HARALD PIHL AB

WELDING MATERIALS – POWDER

HP-55 (28,5 Cr/4,7 C)

Hardness 58-60 RC. A high strength wire with a high welding speed = high productivity. Can be welded in several layers up to 8 mm. Suitable for dipper teeth for excavators etc.

HP-59 (34 Cr/4,5 C/1,2 Si)

Hardness 59-63 RC. A high strength wire with a high welding speed = high productivity. Can be welded in several layers up to 8 mm, Suitable for drum bakers etc.

HP 60 (32 Cr/4 C)

Hardness 57-60 RC. An easily weldable electrode, that gives high productivity and a smooth, bright weld. For overlay welding of material exposed to high wear for instance dipper teeth for excavators.



FABRICATED PRODUCTS

Harald Pihl has, for many years now, been a joint owner in a mechanical workshop situated in Skultuna not far from Stockholm.

The shop has been in operation for almost 50 years and has during this period obtained a good reputation and sound knowledge in building equipment especially for the heat treatment industry.

With an experienced staff and with suitable machines they are well organized to make good jobs in all kind of materials.

Please contact Harald Pihl AB when you need an offer for the following fabricated products:

- Bell furnaces
- Muffles
- Retorts
- Continuous mesh belts
- Scrubbers and water cleaning equipment
- Furnace fans and fixtures
- Radiant tubes/burners
- Baskets and trays
- Welded constructions

Through our suppliers, we can also offer a wide range of finished fabric-ated products, like centrifugally and static cast products.



PRODUCTS NOT ON STOCK

- **Castings** – in heat resistant materials, corrosion resistant, bronzes, bushes and bearings, etc., centrifugal castings – sand castings.
- **Forgings** – nickel alloys, copper alloys, titanium, stainless steel.
- **Slitting knives** – circular and straight knives for cold- and hotslitting.
- **Material for springs** – berylliumcopper, tin bronze, high nickel alloys, wolfram etc.
- **Fasteners** – screws, rivets and bolts in special alloys like MONEL, NIMONIC, titanium, bronzes and wolfram etc.
- **Insulating materials** – we market and sell material for thermal and acoustic insulation.
- **Rolls** – furnace rolls – Zenzimir rolls – up to 150 mm.
- **Electrical resistant material** – semis and own fabrication.
- **Fittings** – flanges, elbows, T-joints etc. in special alloys.
- **Filters** – demisters for pollution control.
- **Woven wire mesh** – in corrosion- and heat resisting alloys.
- **Metal powders** – for manufacturing of electrodes, thermal spraying etc.
- **Rare Metals** - we can supply bismuth, gallium, indium etc. in pellets or ingots.



HARALD PIHL on the web

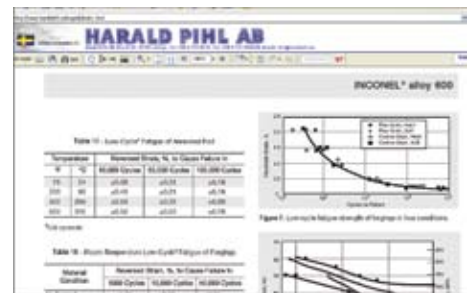
Visit our website for access to a lot of useful information about our materials, our staff, our warehouse and much more.

We have the ambition to serve you with the latest and most accurate information at all times, easily accessible around the clock at no cost.

Regardless if you are a constructing engineer or a welder you find the useful information you need.

Among other things you can find:

- Daily updated stocklist, with both materials on stock and incoming materials.
- Extensive information about our alloys.
- Manufacturing data with cutting and hot- and cold forming information.
- Information about weldability in different alloys.
- Tables with AMS and ASTM specifications and tolerances.



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INFORMATION

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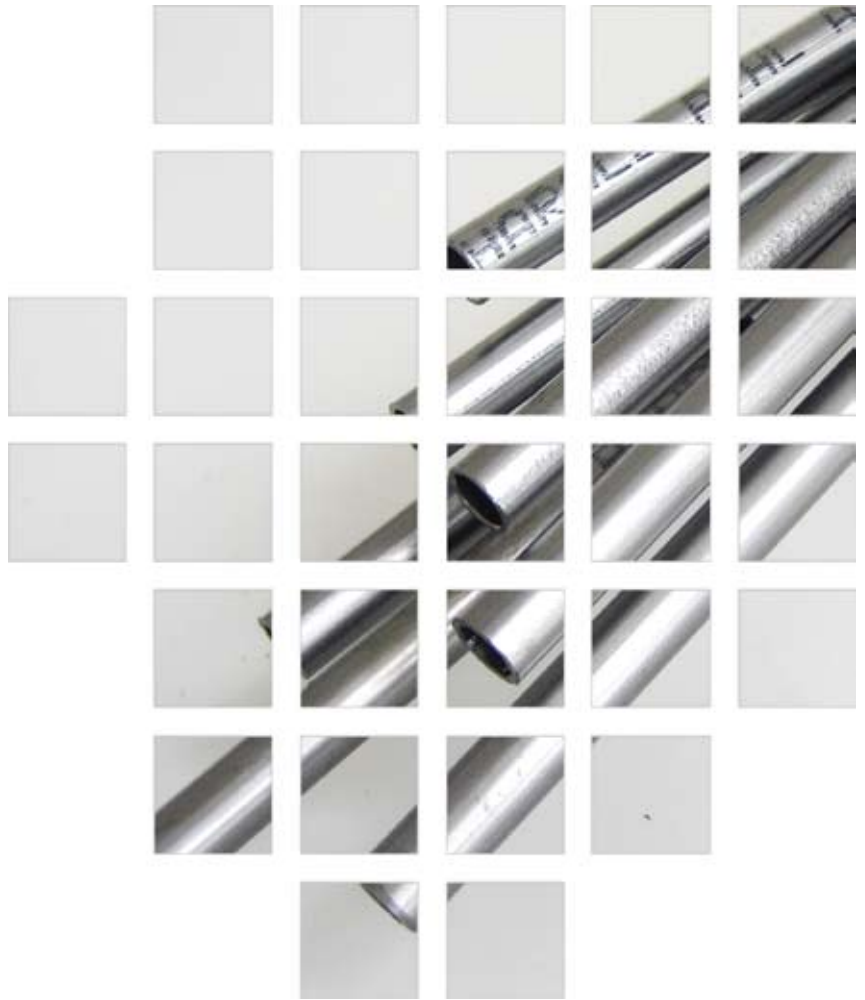
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