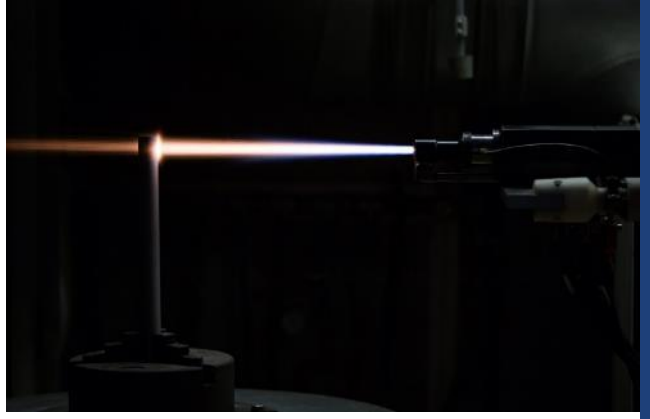
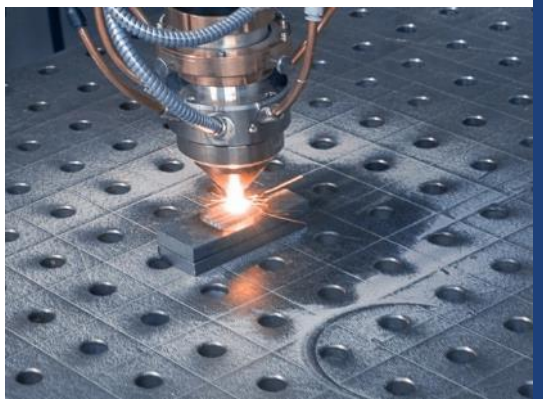
Höganäs

A leading provider for
Surface & Joining Technologies

Höganäs





Content overview

- Höganäs in brief
- Introduction to surface & joining technologies at Höganäs
- Surface coating
- Brazing
- Welding

Höganäs

Höganäs in brief

Founded in **1797** as a coal mining company.

Today we are the world's leading manufacturer of **iron and metal powders.**

- Annual production of nearly **500,000 tonnes**
- **2,400 employees** in 15 countries
- Turnover **2022: 12,256 MSEK**
- Owned by **Lindéngruppen** and **FAM**

Höganäs

Höganäs in brief

3,000 customers in 75 countries

More than **3,500 products**, mostly customer specific, produced in **18 plants in 11 countries**

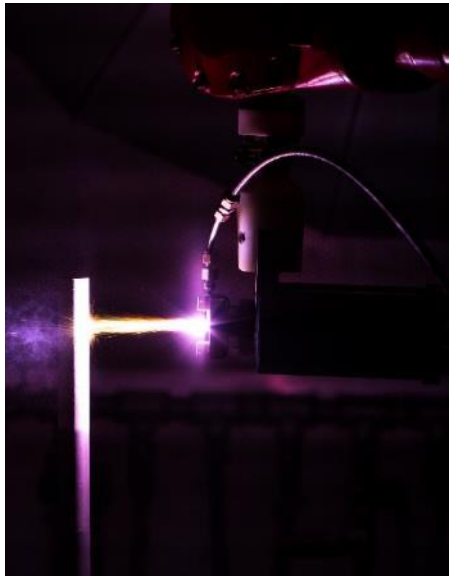
Around **1,000 granted patents**

Höganäs

Organized in four product areas

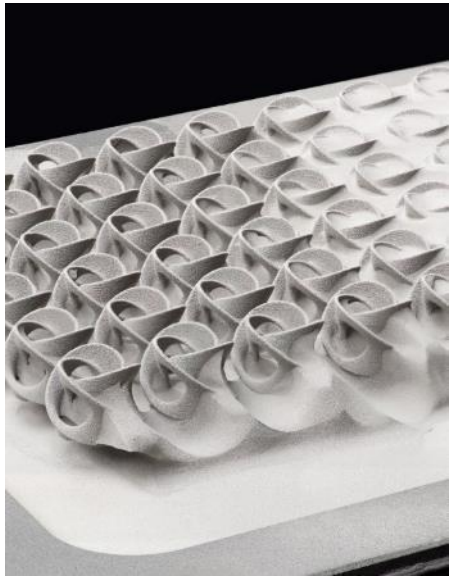
Electro & Mechanical Technologies

- Powder metallurgy
- Electromagnetics



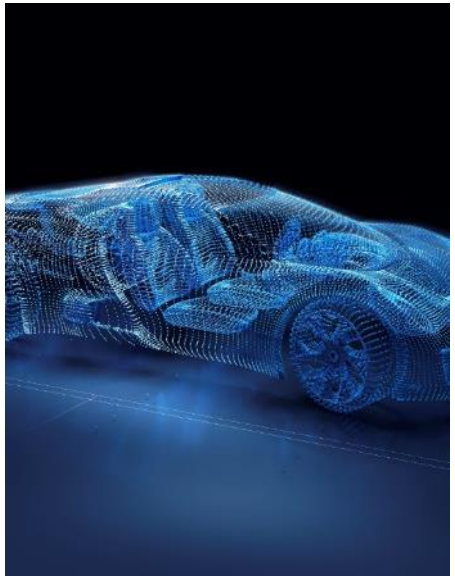
Surface & Joining Technologies

- Surface coating
- Brazing
- Welding



Customization Technologies

- Additive manufacturing
- MIM
- HIP



HIVE

- Advanced ceramic powders
- Environmental solutions
- Alvier PM-technology
- Alvier mechatronics

Höganäs

Innovation is our legacy

1797: Founded as a **coal-mining** company

1825: The **ceramic era** begins and lasts until the 1990's

1911: Sponge iron invented – the **Höganäs method** is born

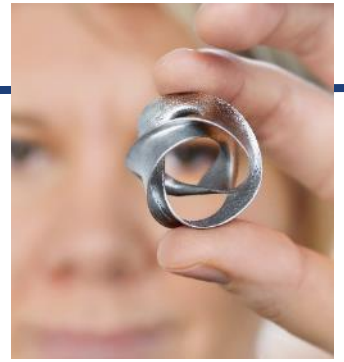
1946: The **Iron Powder plant** is built in Höganäs

1957: Expansion in **Asia**

1988: Start of production in the **Distaloy® plant**

1980's: Expansion in **Europe** – sales offices open, production units acquired

2000-03: Restart of production in the USA, plant in Brazil acquired

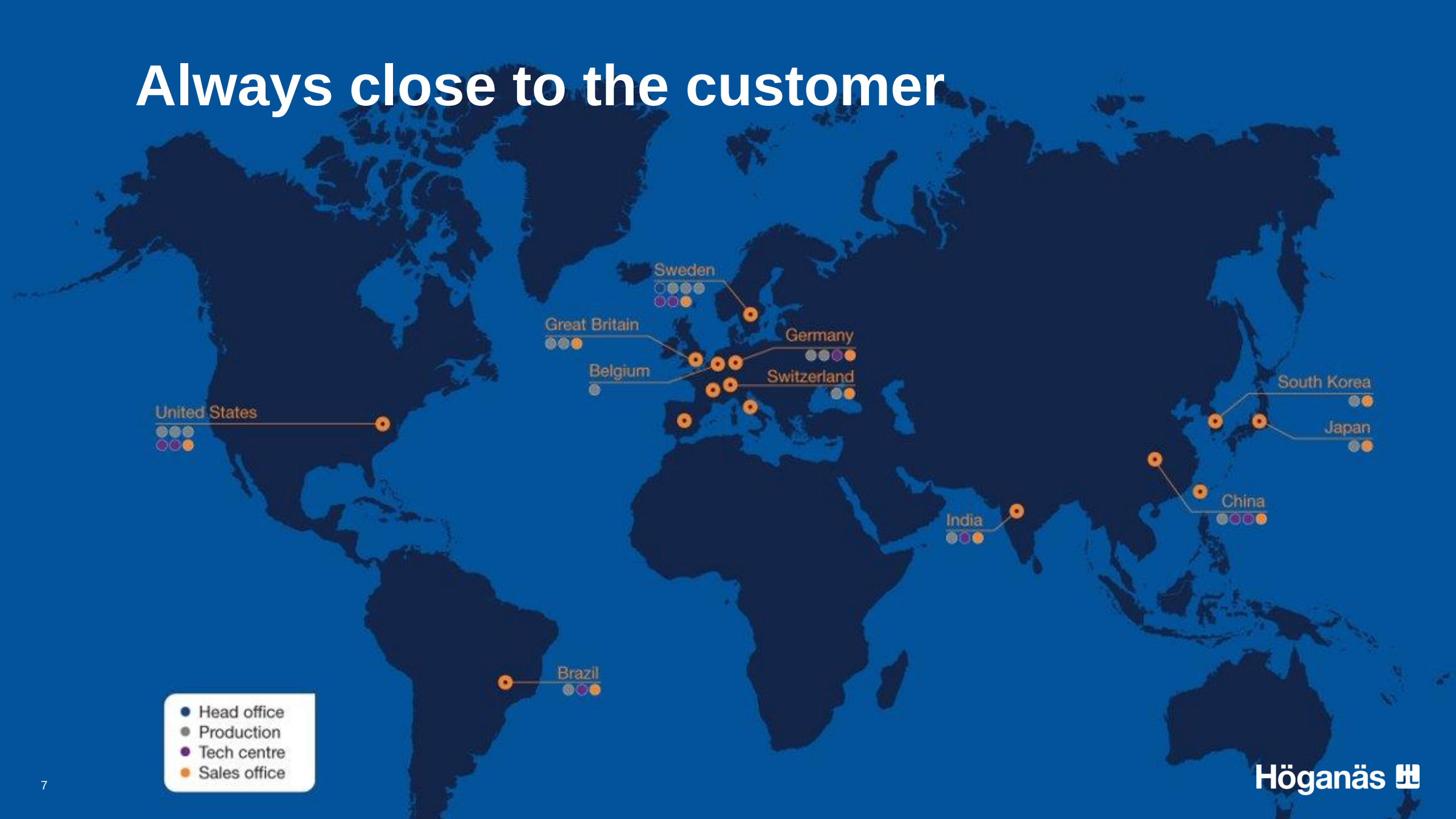


2012: Digital Metal® starts building 3D printers for metal powder binder jetting

2018: H.C. Starck's division for **surface technology** and ceramic powders is acquired

Höganäs

Always close to the customer



Höganäs

Surface & Joining Technologies at Höganäs

We extend lifetime in the harshest environments

Höganäs

A leading provider for surface and joining technologies

- Innovative powder solutions for:
  - Surface coating (thermal spraying and surface welding)
  - Brazing
  - Welding
- 19 granted patent families
- More than 1,400 customers in more than 60 countries
- Acquisition of H.C. Starck’s Surface Technology division in March 2018

Höganäs

At your side to support you with your surface and joining technology needs

Höganäs

Approvals and qualifications

» Qualified for among others at:

- **Aerospace:** GE Aviation, Pratt & Whitney, Safran, Rolls Royce, Boeing, GKN, MTU, Honeywell
- **Industrial gas turbines:** GE Power, Siemens, MHPS/MHI, Ansaldo Energia
- **Oil and gas:** Halliburton, NOV, Schlumberger, Stabil-Drill, GE/Baker Hughes, Gardner Denver
- **Automotive and industrial applications:** Eaton, Federal Mogul, Mahle, Volkswagen, Caterpillar, MAN

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Overview of our capabilities for surface and joining technologies

Surface coating

- **Application processes:** High velocity oxygen/air fuel (HVOF/HVAF), plasma spraying (APS, LPPS, VPS), spray & fuse, plasma transferred arc (PTA) welding, laser cladding
- **Product groups:** Oxides, carbides and other hard-phase powders, metals & alloys including MCrAlYs, blends
- **Production:** Ath (Belgium), Goslar and Laufenburg (Germany), Johnstown (US)
- **End markets:** Aviation, power generation, automotive, mining & construction, oil & gas, general industry

Brazing

- **Application processes:** Roller coating, dispensing, screen and stencil printing, spraying
- **Product groups:** Nickel (Ni) and iron (Fe) based powders and pastes
- **Production:** Ath (Belgium), Laufenburg (Germany)
- **End markets:** Automotive, heating, ventilation and air conditioning (HVACR), power generation, aviation

Welding

- **Application processes:** Welding with electrodes and cored wires, resistivity welding
- **Product groups:** Iron sponge and atomized, Cu-based GLIDCOP® alloys
- **Production:** Höganäs and Halmstad (Sweden), Johnstown (US), Ahmednagar (India), Mogi das Cruzes (Brazil)
- **End markets:** Electrodes and cored wires for industries such as automotive, marine, construction and infrastructure, power generation and heavy machinery

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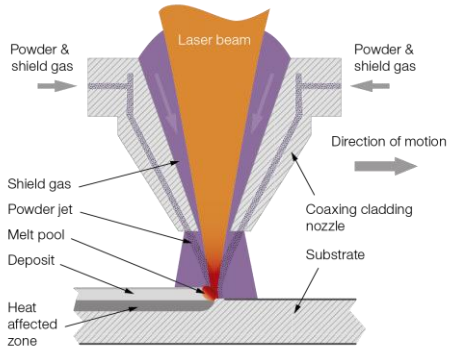
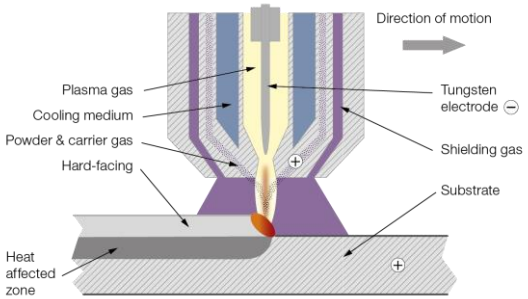
Solutions for surface technologies…

Surface welding

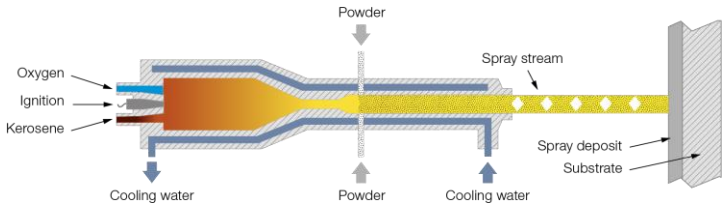


Laser cladding

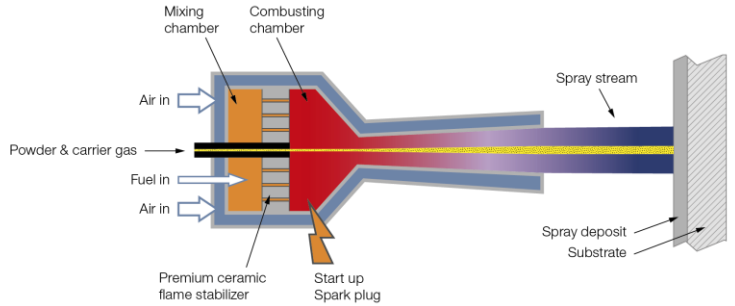


Plasma transferred arc

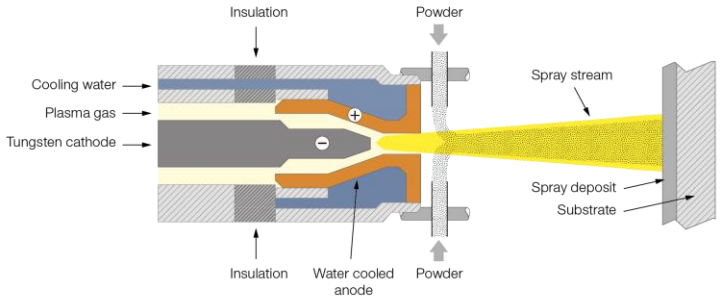
Thermal spraying



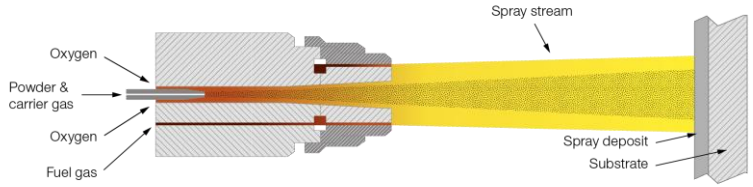
HVOF



HVAF



Plasma spraying



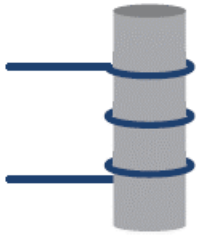
Powder flame spraying

Höganäs

..and joining technologies

Brazing

Induction furnace



Vacuum furnace

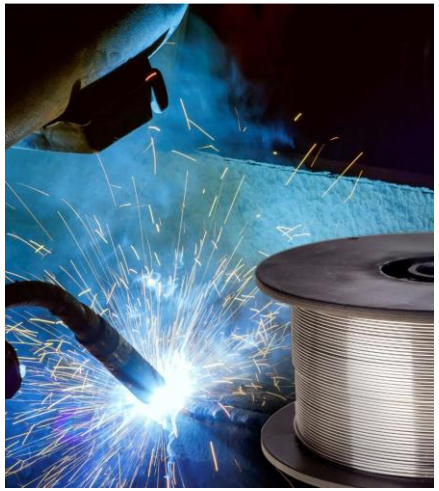
Batch furnace

Continuous furnace

Welding

Arc welding

- MIG/MAG
- MMA
- SAW



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Surface coating

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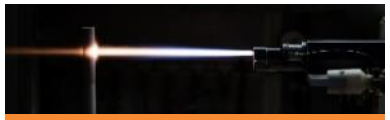
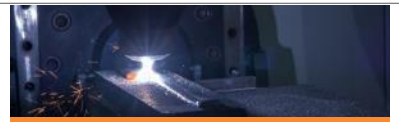
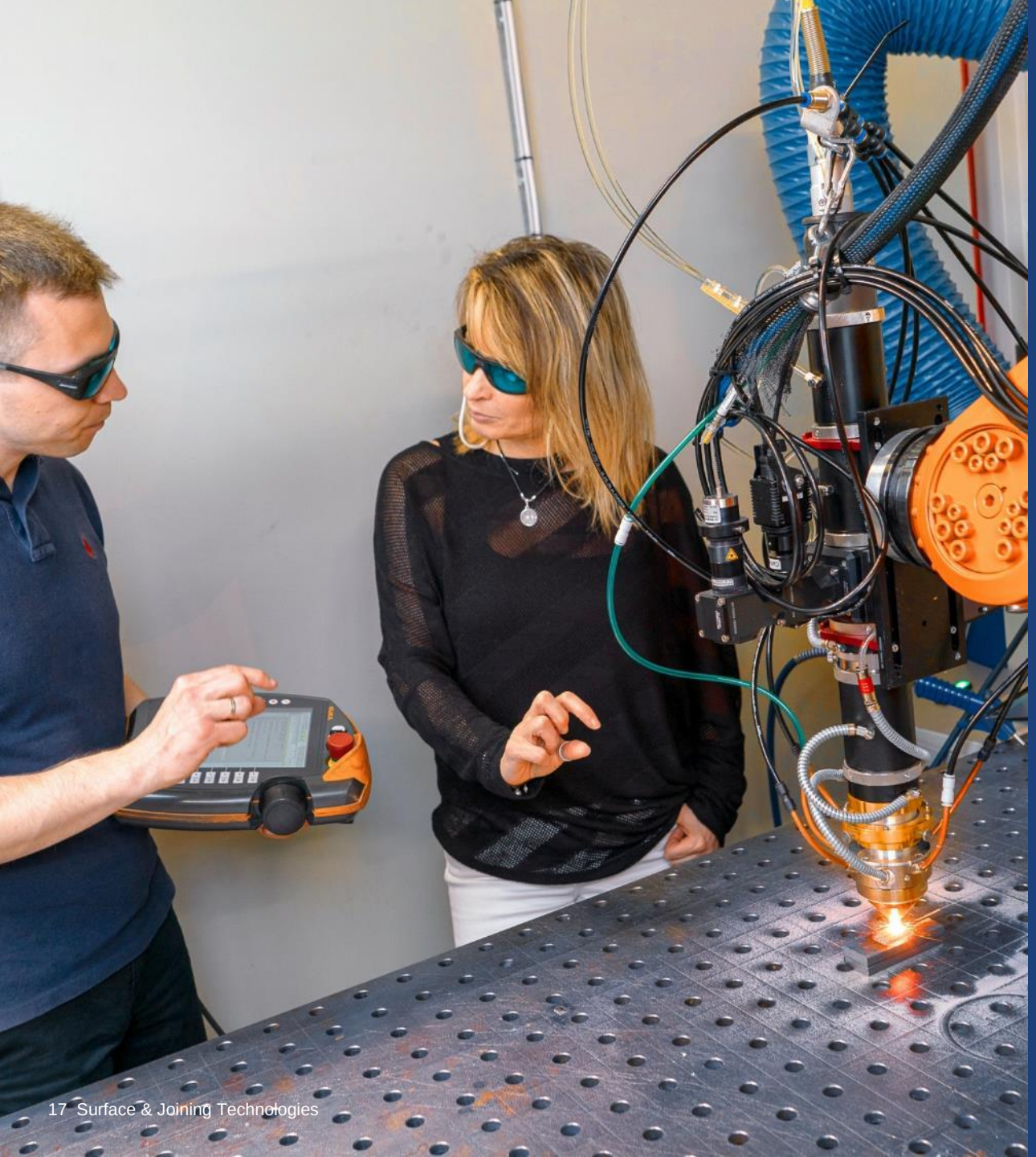
Solutions for all surface coating processes

	Deposition technique	Powder materials type	Typical particle size	Höganäs trademarks
Thermal spraying	 Plasma spraying	Metal & alloys: MCrAlYs, Cr, Ti, Ta etc. Carbides: W- and Cr-based Oxides: Zr-, Cr-, Ti-, Al-based	45-90 µm 15-45 µm 20-53 µm	Amperit®
	 HVOF/HVAF	Metal & alloys: MCrAlYs, Ni,- Co- and Fe-based Carbides: W- and Cr-based	15-45 µm 20-53 µm	
Surface welding and spray & fuse	 Plasma transferred arc	Metal & alloys: Ni-, Co- and Fe-based Ni SF alloys mixes with tungsten carbides	53-150 (180) µm	Rockit® Surfit® Amperweld®
	 Laser cladding	Metal & alloys: Ni-, Co- and Fe-based Ni SF alloys mixes with tungsten carbides	53-150 (180) µm	
	 Flame spraying & fuse	Metal & alloys: Ni-, Co-based Ni SF alloys mixes with tungsten carbides	45-125 µm	

Höganäs



ArcX

Our powerhouse of surface coating expertise and equipment

Höganäs

ArcX

Technical support throughout your value chain

Consistent and high quality

Material consultancy and powder development to find the right material for your specific needs

Maximised performance

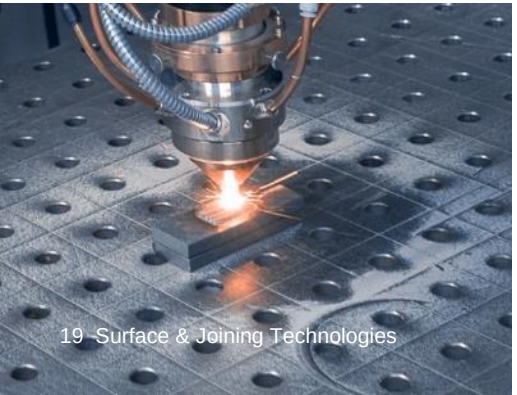
Coating development, prototyping and analysis to maximize the performance of your specific application

Increased efficiency

Process optimization, trouble shooting and on-site customer support to enhance your process performance

» **Strategically located across the globe to support you everywhere**

Höganäs



Capabilities of ArcX

- Coating equipment for:
  - Laser cladding (LC);
    High speed laser cladding (EHLA)
  - Plasma transferred arc (PTA)
  - High velocity oxygen fuel (HVOF) spraying (liquid and gas fuelled)
  - Atmospheric plasma spraying (APS)
  - Flame spraying
  - Powder welding
- Testing and evaluation:
  - Metallography
  - Wear testing
  - Corrosion testing
  - Mechanical testing
  - Cavitation testing

Höganäs

Solutions for a variety of demanding industries

Oil & Gas
Wear, abrasion and corrosion protection

Aviation
Heat and erosion protection

Power Generation
Heat and erosion protection

General Industry
Wear, abrasion, impact and corrosion protection

Mining & Construction
Abrasion, impact and wear protection

Automotive
Wear protection

» **We improve performance and extend life in the harshest environments**

Höganäs

Success story

Steel
Transportation roll

Customer challenges:

- Common industry solution, flamed sprayed Ni-self fluxing alloy coating, often peels-off and limits the lifetime to ~1,5 years

Höganäs' solution:

- Laser cladded Rockit® 400 series alloy on $42CrMo_4$ steel
  - Coatings reached 55 HRC in hardness and good high temperature wear resistance
  - The strong metallurgical bonding created by laser cladding solved the peeling off issues and extended lifetime to ≥2 years (still under service

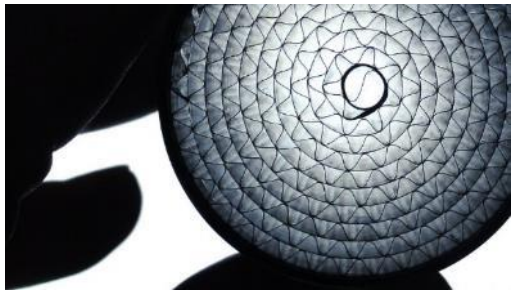
Höganäs

Brazing

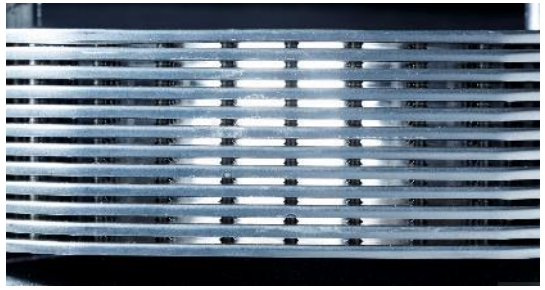
Höganäs

We help you finding solutions for your needs

Automotive



Catalytic converters
Minimize applied brazing filler metal amount by roller coating



Oil coolers
Increase lifetime with Cu-free brazing solutions

EGR cooler
Corrosion, oxidation and high-temperature resistant braze alloys

HVAC and Power generation

Brazed plate heat exchangers
Sustainable Cu-free brazing solutions

Aviation & Gas Turbines
Extend the lifetime of turbine components by repair brazing

Tubular heating elements
Customised pastes for dissimilar metal joints and belt furnace brazing

Höganäs

Welding

Höganäs

Iron powder portfolio

High purity powders for enhanced welding performance

Application technique	Iron powder type	Typical powder particle size
 Manual metal arc welding (MMAW)	Sponge iron powders Atomized iron powders	40 mesh
 Gas metal arc welding (MIG/MAG)	Sponge iron powders Atomized iron powders Mixes	100 mesh
 Submerged arc welding (SAW)	Mixes	100 mesh

» Improve your welding performance even further by combining different iron powders in the same formulation

Höganäs

Thank you!

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