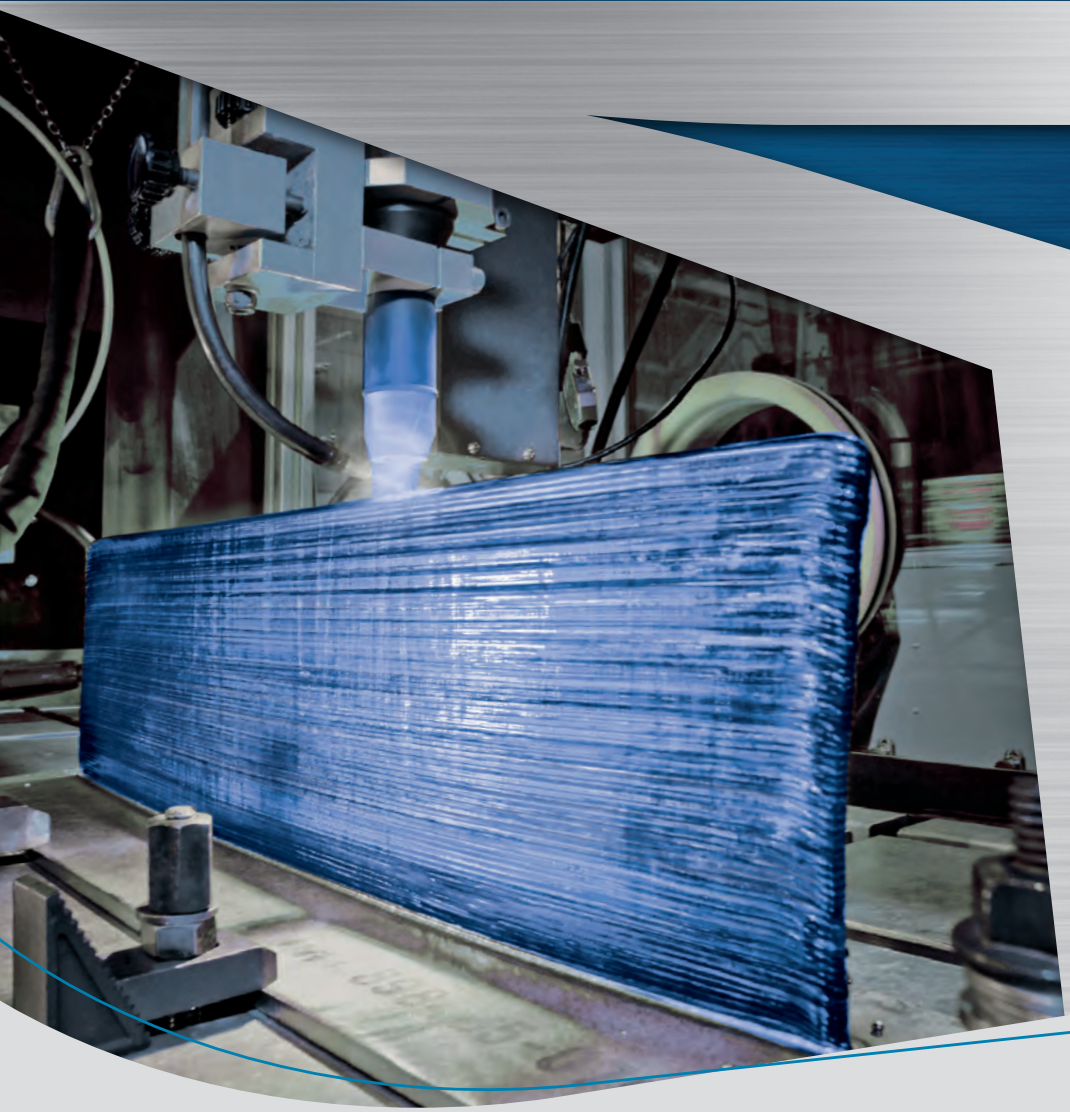
böhler welding by voestalpine
3Dprint

Lasting Connections

The Future of Productivity: Wire Arc Additive Manufacturing



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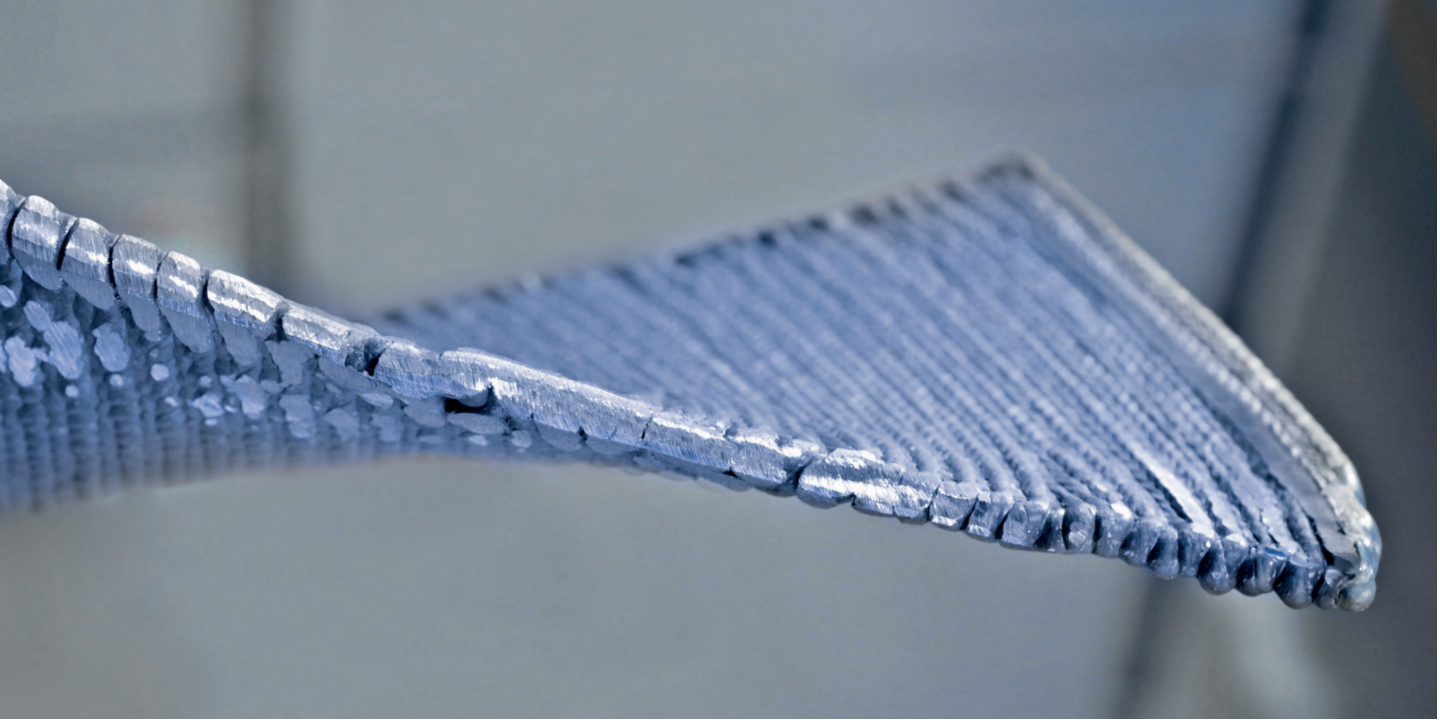


Product Name	C	Si	Mn	Cr	Mo	Ni	Rp0,2	Rm	A5	
Böhler 3Dprint AM50	0,10	0,65	1,40	<0,05	<0,05	1,35	>500 MPa	560 - 720 MPa	>18%	low alloyed steel
Böhler 3Dprint AM62	0,10	0,55	1,60	0,25	0,95	0,50	>620 MPa	700 - 890 MPa	>18%	medium alloyed steel
Böhler 3Dprint AM70	0,08	0,60	1,70	0,20	1,50	0,50	>690 MPa	770 - 940 MPa	>17%	medium alloyed steel

Product Name	C	Si	Mn	Cr	Mo	Ni	N	
Böhler 3Dprint AM2209	0,025	0,5	1,6	23	3	9	0,14	duplex steel (no heat treatment)
Böhler 3Dprint AM2205	0,025	0,5	1,5	22	3	5	0,15	duplex steel (with solution annealing heat treatment)

Product Name	C	Si	Mn	Cr	Mo	Ni	Cu	
Böhler 3Dprint AM304L	0,02	0,5	1,7	20		10		standard low carbon austenitic stainless steel
Böhler 3Dprint AM316L	0,02	0,5	1,7	18,5	2,6	12,3		standard low carbon austenitic stainless steel with Molybdenum
Böhler 3Dprint AM174PH	0,03	0,4	0,5	16,5		4,5	3,3	martensitic precipitation-hardening stainless steel
Böhler 3Dprint AM155PH	0,02	0,5	0,5	14,8		4,5	3,3	martensitic precipitation-hardening stainless steel - free of ferrite (aerospace grade)
Böhler 3Dprint AM410NiMo	0,03	0,8	0,7	13	0,5	4,7		martensitic stainless steel
Böhler 3Dprint AM430	0,02	0,5	0,5	18				ferritic stainless steel

Product Name	C	Si	Cr	Mo	Nb	Fe	Ni	W	Al	Ti	
Böhler 3Dprint AM625	0,03	0,25	22	9	3,6	0,5	balance				nickel base alloy with chromium, molybdenum and niobium
Böhler 3Dprint AM22	0,01	0,08	15,5	16		5,5	balance	3,5			nickel base alloy with chromium, molybdenum and tungsten
Böhler 3Dprint AM718	0,03	0,1	19	3	5	balance	53		0,5	1,0	precipitation hardening nickel base alloy

Product Name	Fe	C	N	O	H	Al	V	Ti	
Böhler 3Dprint AMTi5	< 0,25	< 0,08	< 0,05	< 0,13	< 0,012	6	4	balance	high strength titanium

Wire Arc Additive Manufacturing (WAAM): 3D printing with the best-in-class wire alloys

Additive manufacturing – popularly known as 3D printing – is one of the most revolutionary new manufacturing methods of our time.

Wire Arc Additive Manufacturing is a new disruptive technology that is being enthusiastically adopted at voestalpine Böhler Welding for its leading brand Böhler Welding. It not only allows almost lossless processing of high-value material but also results in high-strength components with a flexibility that would not be conceivable using conventional methods. Up to now, manufacturing methods such as casting / milling and forging have been used for production of large components. Material is removed from a casting or blank and creates scrap.
The specialists at Böhler Welding are researching special materials for the optimized production of highest quality solid and seamless cored wires with excellent surface finishing and properties required for a stable 3D printing processes.

Contact us personally and experience a new dimension in manufacturing.

Dr. Martin Peruzzi
CTO, voestalpine Böhler Welding

Pioneering Expertise

As a pioneer in innovative welding consumables, Böhler Welding offers a unique product portfolio for joint welding worldwide. More than 2000 products are adapted continuously to the current industry specifications and customer requirements, certified by well-respected institutes and thus approved for the most demanding welding applications. As a reliable partner for customers, “lasting connections” are the brand’s philosophy in terms of both welding and people.

As long ago as 1927 Böhler Welding developed the “Seelendraht” (“soul wire”) the predecessor of the modern-day flux cored wire. The company has been leading ever since, as current innovations, like the laser-sealed flux cored wires or the leadership in Wire Arc Additive Manufacturing, proves. Customers can rely on a outstanding product portfolio for all demanding welding tasks.

A revolutionary technology shapes the future of our life

Wire Arc Additive Manufacturing enables fast and highly efficient production processes replacing conventional technologies as casting and forging. The machining effort like milling and drilling is reduced to a minimum due to a near-net-shape using WAAM. Lead times can be reduced dramatically by high utilization of the wire consumables and by simplification of the production process in general.

Especially as the Wire Arc Additive Manufacturing is based on the well-known technology of joining and cladding materials with a wide range of commercialy available wire consumables from unalloyed, mid- and high alloyed steels. But also nickel- and cobalt base alloys can be used and combined, if metallurgical reasonable, to gradient structured parts.

Given the typical layer thickness applied, Wire Arc Additive Manufacturing is – compared to powder-based Additive Manufacturing – more suitable to generate low to medium complexity and up to large scale preform components. Due to a wide range of parameter settings it is possible to reach high deposition rates with rates up to 5kg/h, so that the production of large scale parts is feasible within reasonable time frames. Depending on the material alloy group, heat treatments and post-machining is usually required to give the components the final properties.

Key Benefits for Wire Arc Additive Manufacturing

- Wide range of deposition rates (low to high)
- Near-Net shape and therefore reduced material loss
- Conventional machining time reduced to minimum
- Reduced lead times
- Good structural integrity
- Low to medium complexity components

For Demanding Industries, e.g.

- Mechanical Engineering & Machinery
- Oil & Gas Upstream and Offshore
- Chemical Industry
- Power generation
- Aerospace

Best quality wire alloys for a revolutionary technology

With the manufacturing of wires which are tailor-made to its specific purpose, voestalpine Böhler Welding is creating the basis for innovative Wire Arc Additive Manufacturing. The metallurgical and application know-how of its materials specialists makes the company a central element in this technological revolution.

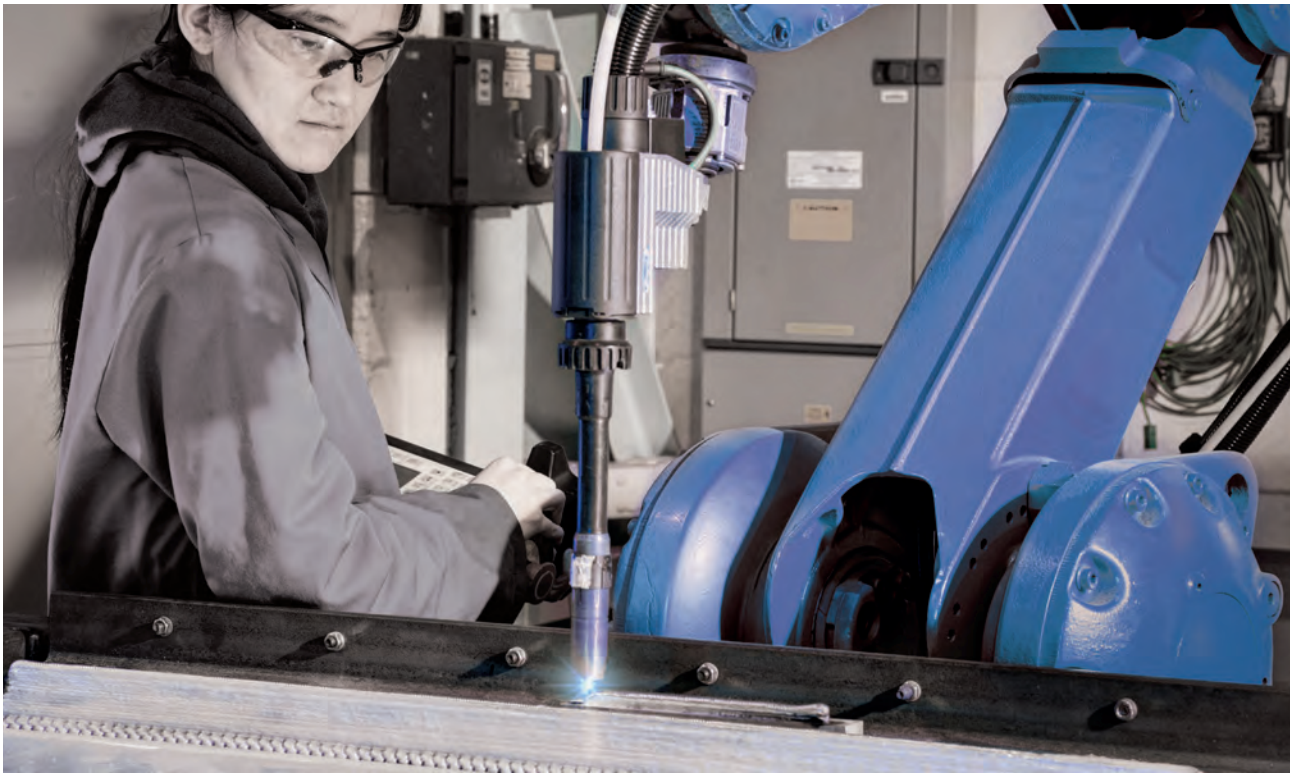
Wire alloys are the material basis for the revolutionary game-changing process. They may be made from low- and medium alloyed steel, aluminum, nickel, or titanium alloys. The wire alloys used determine the properties of the final printed component. Their production is therefore the focus of increasing attention – especially that of the materials and process specialists at voestalpine Böhler Welding. For example, application of wire alloys in Wire Arc Additive Manufacturing requires constant chemical composition within well-defined tolerances and excellent surfaces enabling good feeding properties.

Quality manufactured in Europe

With its production facilities for solid wire in Hamm, Germany, and for seamless cored wires in Kapfenberg, Austria, and Cittadella, Italy the company is equipped with the latest state-of-the-art and future manufacturing technologies for the production of wire alloys for additive manufacturing. Well-equipped laboratories allow in-house analysis and characterization of new developed products and ensure the best in class quality.

Cooperation for material and technology research

Together with its industrial and scientific partners, voestalpine Böhler Welding has initiated R&D programs to explore the application behavior of wire consumables in Wire Arc Additive Manufacturing. Results will allow to further optimize the wire consumables and to develop alloy compositions for the next generation 3D printing applications.



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voestalpine Böhler Welding

Welding know-how joins steel

With over 100 years of experience, voestalpine Böhler Welding is the global top company for the daily challenges in the areas of joint welding, repair, hardfacing and cladding as well as brazing. Customer proximity is guaranteed by more than 40 subsidiaries in 25 countries, with the support of 2,200 employees, and through more than 1,000 distribution partners worldwide. With individual consultation by our application technicians and welding engineers, we make sure that our customers master the most demanding welding challenges.voestalpine Böhler Welding offers three specialized and dedicated brands to cater our customers' and partners' requirements.

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utp maintenance by voestalpine

Tailor-Made Protectivity™ – UTP Maintenance ensures an optimum combination of protection and productivity with innovative and tailor-made solutions. Everything revolves around the customer and their individual requirements. That is expressed in the central performance promise: Tailor-Made Protectivity™.

fontargen brazing by voestalpine

In-Depth Know-How – As a leading manufacturer of soldering and brazing consumables, Fontargen Brazing offers proven solutions based on 50 years of industrial experience, tried and tested processes and methods. This In-Depth Know-How has made Fontargen Brazing an internationally preferred partner for every soldering and brazing task.

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