

Special material  
solutions  
for Aerospace  
applications



**Swiss  
Steel**  
Group



# Deutsche Edelstahlwerke + Ugitech

Materials for precision landing.

The combination of modern production facilities, a wide product range and the host of mill and product approvals has resulted in Deutsche Edelstahlwerke and Ugitech becoming prominent suppliers of aerospace materials.

As producers of aerospace materials with more than 50 years of experience, we strive to continuously improve our product range to better meet the increasing demands of this innovative and rapidly growing industry.

Deutsche Edelstahlwerke and Ugitech have an overlap in production capabilities and facilities and this, combined with our own mill stock facilities, ensures a high degree of security for supply chain management.

Together we can deliver most of the common aerospace steel grades to meet your requirements.

This brochure provides information about the range of product shapes and sizes as well as the main grades and specifications we are able to offer.



# Our product range for aerospace materials

## Deutsche Edelstahlwerke

Shapes	Size range	Surface condition	Tolerances
Billets / Blooms for forging	50 – 400 mm	Shot blasted, milled	Depending on size
Round bars	20 – 400 mm	Hot-rolled or forged, rough peeled, polished, ground	EN 10060, DIN 7527-6 ISO k12 - k13 ISO h8 – h11
Square bars	50 – 105 mm	Hot-rolled or forged, descaled, ground or milled	Depending on size
Flat bars	50 x 30 mm to 350 x 120 mm	Hot-rolled or forged, descaled, ground or milled	Depending on size

## Ugitech

Shapes	Size range	Surface condition	Tolerances
Round bars ex-mill	5 ≤ Ø < 20 20 ≤ Ø ≤ 120	Ground, drawn turned and polished	h8, h9
Round bars ex-stock	5 ≤ Ø < 20 20 ≤ Ø ≤ 300	Ground turned and polished	h9 h10, h11 k12, k13

Shapes	Size range	Surface condition/ profile shape	Tolerances	Packaging
Round drawn wire	0.05 – 15 mm	As drawn / ground	Up to IT depending on application	Coils, bars up to 15 mm (super alloys)
Profiled drawn wire	1.30 – 70 mm²	No limit	On measurement 0.01 mm standard deviation 0.002 mm	Coils, spools



## Steel grades and applications

Based on its extensive production facilities Deutsche Edelstahlwerke and Ugitech are able to supply the entire portfolio of steel grades and special materials required for aerospace applications.

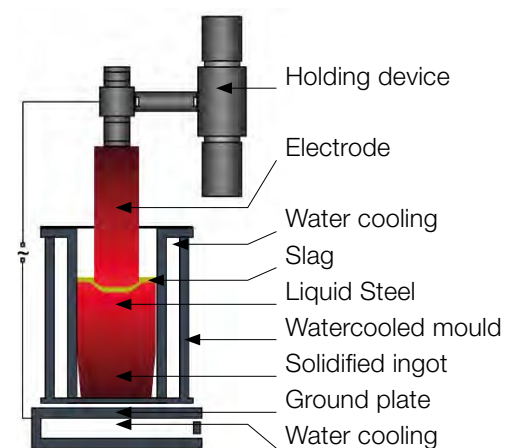
This includes stainless as well as engineering steels. If steels are specified for the most challenging demands in the aerospace industry, it is often required that the cleanliness of the steels fulfills the utmost requirements. This is especially the case when the components are subjected to fatigue or cycle loading in service. In such cases the steel can be remelted in our remelting facilities.

The remelting operation is required to remove non-metallic inclusions from the steel and can be performed under normal atmospheric conditions, under inert gas or even vacuum, using vacuum-arc-remelting facilities.

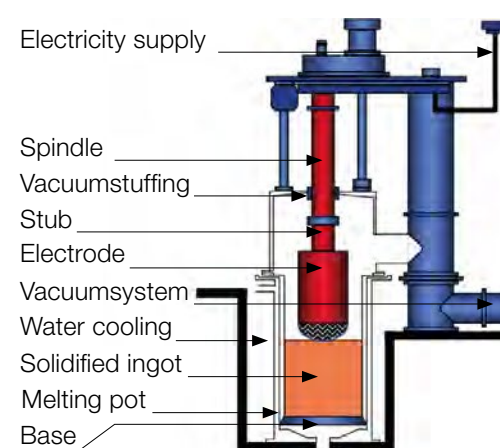
In addition to improve the cleanliness of the steel, the remelting operation also leads to significantly higher homogeneity of the steel and helps to minimize segregations.

### Remelting facilities

#### Electro-Slag-Remelting (ESR)



#### Vacuum-Arc-Remelting (VAR)



## Additional services

Other additional ex. mill services of Deutsche Edelstahlwerke and Ugitech are:

- Cutting facilities
- Heat treatment
- Marking (laser, hard stamping, ink, line)
- Specific NDT
- Lab testing
- 3<sup>rd</sup> party inspection
- Packaging and traceability
- Dedicated customer articles
- Customizations



Stainless steel

Brand	Common Designations		
	German	French	American / British
UGI® 4006A			
Aerodur® 4006	1.4006	Z12C13	AISI 410
Aerodur® 4014	1.4014 / 1.4021	Z20C13	AISI 420
UGI® 4028 AIR			
Aerodur® 4028	1.4028	Z30C13	AISI 420
UGI® 4057Q / UGIPURE® 4057			
Aerodur® 4044	1.4057 / 1.4044	Z15CN17-03	AISI 431
UGI® 4305 / UGIMA® 4305			
Aerodur® 4305	1.4305	X8CrNiS18-9	AISI 303
UGI® 4307Q / UGIMA® 4307HM			
Aerodur® 4307	1.4306 / 1.4307	Z2CN18-10	AISI 304/ 304L
UGIPURE® 4909 / UGIMA® 4404HM			
Aerodur® 4404	1.4404	Z3CND17-11-02	AISI 316/ 316L
UGI® 4418Q / UGI® 4418QHP / UGIPURE® 4418			
Aerodur® 4418	1.4418	Z8CND17-04	-
UGI® 4541Q / UGIPURE® 4541			
Aerodur® 4541 / 4544 Superclean	1.4541 / 1.4544	Z10CNT18-11, Z6CNT18-10	AISI 321
UGI® 4542Q / UGI® 17-4PH			
Aerodur® 4542	1.4542	Z7CNU17-04	AISI 630
UGIPURE® 15-5 PH / UGIPURE® 4545			
Aerodur® 4545 Superclean / Ultraclean	1.4545	E-Z5CNU15-05	UNS 15500 / 15-5
UGIPURE® 17-4 PH / UGIPURE® 4548			
Aerodur® 4548 Superclean	1.4548	E-Z7CNU17-04	UNS 17400/ 17-4
UGI® 4550Q			
Aerodur® 4546 / 4550	1.4546 / 1.4550	X6CrNiNb18-11	AISI 347
Aerodur® 4939	1.4939	Z12CNDV12	Jethete M152

Producer	Main Specifications
Ugitech	
Deutsche Edelstahlwerke	AMS 5613 - AMS-QQ-S-763
Deutsche Edelstahlwerke	WL 1.4014 - BS S62 - AMS-QQ-S-763
Ugitech	AIR 9160C - AMS QQS 763 - CCT 00211 - DMD 216-20 - NCT 10-140-01MD
Deutsche Edelstahlwerke	
Ugitech	WL 1.4044 - AIR 9160C - EN 3490 - ASNA 3138 - ASNA 3299 - CCT 00314 - DMD 280-20 - NCT 10-140-01MD - NCT 15-142-03 - 3300484512 R12 000 NCT 17-142-06
Deutsche Edelstahlwerke	WL 1.4044 - AIR 9160C - EN 3490 - BS 7S80 - LAT 1-9070 - ASNA 3138 & 3299 & 3186
Ugitech	AMS 5640
Deutsche Edelstahlwerke	AMS 5640
Ugitech	WL 1.4314 - NF EN 2465 - AMS 5639 - AMS 5647 - AMS-QQ-S-763 - ASNA 3366 - BLFF230101 - CCT 00312 - DGQT 1.3.0005 - DMD 200-22 - NCT 10-140-01MD - NCT 15-143-03
Deutsche Edelstahlwerke	WL 1.4314, AIR 9160C - NF EN 2465 - AMS 5639 - AMS 5647 - AMS QQ-S-763
Ugitech	AMS 5648 - AMS 5653 - AMS-QQ-S-763 - NCT 15-143-81 - 3300417276 R12 000
Deutsche Edelstahlwerke	AMS 5653 - AMS 5648
Ugitech	AIR 9160C - ASNA 6099 - CCT LA 244 - NCT 10-140-01MD - NCT 15-142-12 - NCT 15-142-14 - NCT 15-142-15 - NF EN 4628 - NF EN 4631 - E/DA/T N° 999815
Deutsche Edelstahlwerke	AIR 9160C
Ugitech	AIR 9160C - AMS 5645 - AMS-QQ-S-763 - ASNA 3139 - ASNA 3202 - BLFF248101 - BLFG248101 - CCT 00297 - DGQT 1.3.0.0005 - DMD 276-22 - HMDM0065 - NCT 10-140-01MD - NCT 15-143-43 - NF EN 3487 - WL 1.4544
Deutsche Edelstahlwerke	WL 1.4544 - AIR 9160C - EN 3487 - AMS 5645 - AMS QQ-S-763 - ASNA 3139 - CCT297
Ugitech	AMS 5643 - BLFF219101 - BLFF217102 - DMD 229-20 - HMDM0063 - HMDM0090 - NCT 17-144-10 - NCT 17-144-12 - NCT 17-144-13 - NF EN 3160 - NF EN 3161 - 3300228129 - 3300419525 R12 000
Deutsche Edelstahlwerke	AMS 5643
Ugitech	AMS 5659 type II - DMD 261-20 - HMDM0060 - NCT 10-140-01MD - NCT 15-144-03 - NCT 17-144-04 - NF EN 2815 - NF EN 2817 - NF EN 2821 - WL 1.4545 - 3300484501 R12 000
Deutsche Edelstahlwerke	AMS 5659 - WL 1.4545 - NF EN 2817 - LAT1-9037
Ugitech	AMS 5622 type II - NF EN 3161 - WL 1.4548
Deutsche Edelstahlwerke	AMS 5622 - WL 1.4548 - NF EN 3161
Ugitech	AMS 5646 - WL 1.4546 - AMS QQS 763
Deutsche Edelstahlwerke	WL 1.4546.9 - AMS 5646 – BS 2 S130 - AMS QQ-S-763 - IPSWL1.4546
Deutsche Edelstahlwerke	BS S151 - AIR9160C

Other specifications are  
available on demand

Superclean =  
Electro-slag-remelted  
Ultraclean =  
Vacuum-arc-remelted

Engineering steel

Brand	Common Designations			Producer	Main specifications
	German	French	American / British		
Aerodur® 3505	1.3505	100C6	-	Deutsche Edelstahlwerke	AMS 6440
Aerodur® 5815	1.5815	35NC6	-	Deutsche Edelstahlwerke	AIR 9160C - EN 2438 - ASNA 3132 & 3131 & 3195 & 3147 & 3179 & 3180 - CCT 307
Aerodur® 6562	1.6562	-	SAE / AISI 4340	Deutsche Edelstahlwerke	AMS 6414 - AMS 6415 - AMS 6409 - AMS6484 - MIL S5000 - MIL S8844
Aerodur® 6604	1.6604	30CND8	-	Deutsche Edelstahlwerke	WL 1.6604
Aerodur® 6657	1.6657	16NCD13	-	Deutsche Edelstahlwerke	BS S157 - AIR 9160C
Aerodur® 6657 mod	1.6657	-	SAE 9310	Deutsche Edelstahlwerke	AMS 6260 - AMS 6265 – AMS 6267
Aerodur® 6657 Superclean	1.6657 ESR	E16NCD13	-	Deutsche Edelstahlwerke	ECS 2136 annealed - ASNA 3122
Aerodur® 6722 / 6723	1.6722 / 1.6723	-	-	Deutsche Edelstahlwerke	BS S82
Aerodur® 6743	1.6743	-	-	Deutsche Edelstahlwerke	BS S97 - S154 - S140
Aerodur® 6745	1.6745	-	-	Deutsche Edelstahlwerke	BS S98, S99
Aerodur® 6747	1.6747	30NCD16	-	Deutsche Edelstahlwerke	AIR 9160C - ASNA 3130, 3178, 3194
Aerodur® 6747	1.6747	35NCD16	-	Deutsche Edelstahlwerke	AIR 9160C - ASNA 3133, 3134, 3146, 3149, 3181, 3197, 3318
Aerodur® 6928 Ultraclean	1.6928	-	300M - SAE 4340M	Deutsche Edelstahlwerke	AMS 6417 - AMS 6419 - BS S155 - LAT 1-9042
Aerodur® 7220	1.7220	35CD4	-	Deutsche Edelstahlwerke	AIR 9160C
Aerodur® 7223	1.7223	40CD4	SAE 4140	Deutsche Edelstahlwerke	AMS 6382
Aerodur® 7734	1.7734	15CDV6	-	Deutsche Edelstahlwerke	WL 1.7734 - AIR 9160C - EN 3523 - ASNA 3120, 3193, 3177
Aerodur® 8515	1.8515	30CD12	-	Deutsche Edelstahlwerke	BS S106 - AIR 9160C
Aerodur® 8522	1.8522	32CDV13	-	Deutsche Edelstahlwerke	AIR 9160C - LAT1-9036
Aerodur® 8523	1.8523	40CDV12	-	Deutsche Edelstahlwerke	BS S132 - AIR 9160C

Super alloy<sup>1</sup>

Brand	Common Designations			Producer	Main specifications
	German	French	American / British		
HQ286 AERO	1.4944	EZ6NCTDV25.15	UNS S66286	Ugitech	AMS 5931 - AMS 5853
HQ 400	2.4360	NiCu30Fe	UNS N04400	Ugitech	AMS 4730
HT600	2.4816	NC15Fe	UNS N06600	Ugitech	-
HT625	2.4856	NiCr22Mo9Nb	UNS N06625	Ugitech	AMS 5666
HT X750	2.4669	NiCr15Fe7Ti2A	UNS N07750	Ugitech	AMS 5698 - AMS 5699
HT 718	2.4668	NiCr19Fe19Nb5Mo3	UNS N07750	Ugitech	AMS 5962
HT90	2.4632	NCK20TA	UNS N07090	Ugitech	-
HT80	2.4952 / 2.4631	NC20TA	UNS N07080	Ugitech	-
HT605	2.4964	CoCr20W15Ni	UNS R30605	Ugitech	AMS 5759
KC35N	2.4999	-	UNS R30035	Ugitech	AMS 5844
PHYNOX® PHYNOX® is a registered trademark of APERAM	2.4711	K13C20N16Fe15D07	UNS R30003 / R 30008	-	-

Other specifications are available on demand

<sup>1</sup>These grades are only delivered as coils or bars Ø ≤ 15 mm (conversion processing)







## Know-How in metallurgy and manufacturing of metal powder

Deutsche Edelstahlwerke offers a wide range of gas atomized Fe-, Ni- and Co-based metal powders. These are ideally adapted for additive manufacturing.

The know-how of Deutsche Edelstahlwerke is characterized by more than 160 years of experience in steel production. All products are manufactured using state-of-the-art technology - from powder and semi-finished products to ready-to-install components.

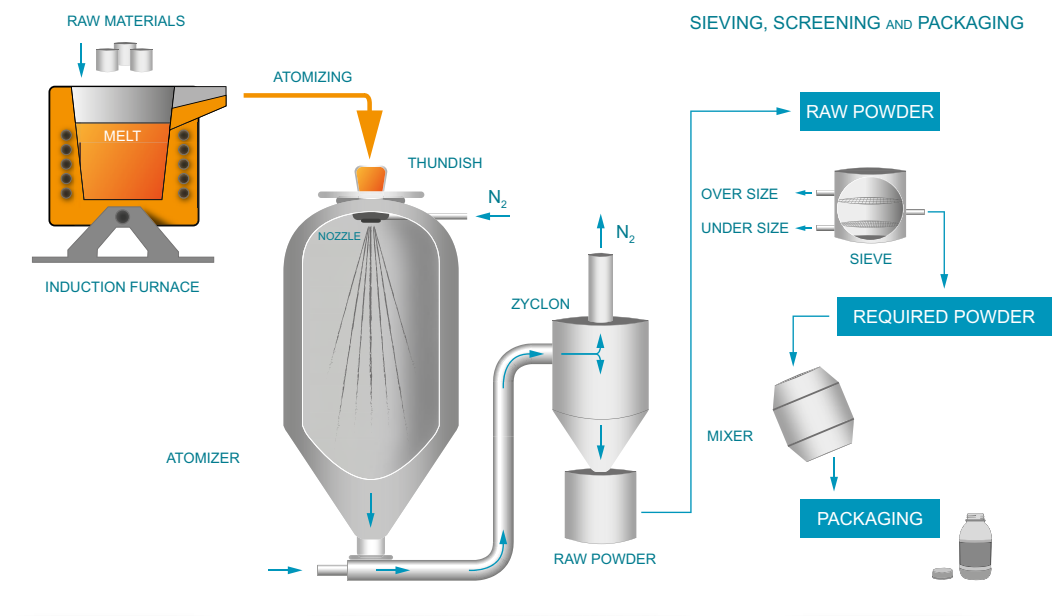
For powder production, raw materials are melted in an induction furnace and filled in an atomizer.

The atomization process takes place in a closed container in which the liquid melt is atomized under high pressure with an inert gas.

In gas atomization, the solidification rate is sufficiently low so that the particles are formed in spherical shape.

The spherical particles guarantee excellent flow characteristics and dosing of the powder. The powder is also separated under inert gas. This ensures that the powder cools down without surface oxidation. The result is a low oxygen content in the powder.

### Metal powder production: Fe-, Ni- and Co-based alloys



› Powder production at Deutsche Edelstahlwerke

# The Printdur®-Portfolio<sup>1</sup> for aerospace applications

## Iron-based alloys

Grade / Standard	Chemical composition [weight-%]									
	C	Si	Mn	Cr	Mo	Ni	Co	Cu	Nb	V
Printdur® 4404 (1.4404 / 316 L)	< 0.03	1.0	1.0	17.0	2.0	13.0	–	–	–	–
Printdur® 4545 (1.4545 / 15-5 PH)	< 0.04	0.3	0.6	15.0	–	5.0	–	3.0	0.3	–
Printdur® 4548 (1.4548 / 17-4 PH)	< 0.07	1.0	1.0	17.0	–	4.0	–	4.0	0.3	–

## Nickel-based alloys

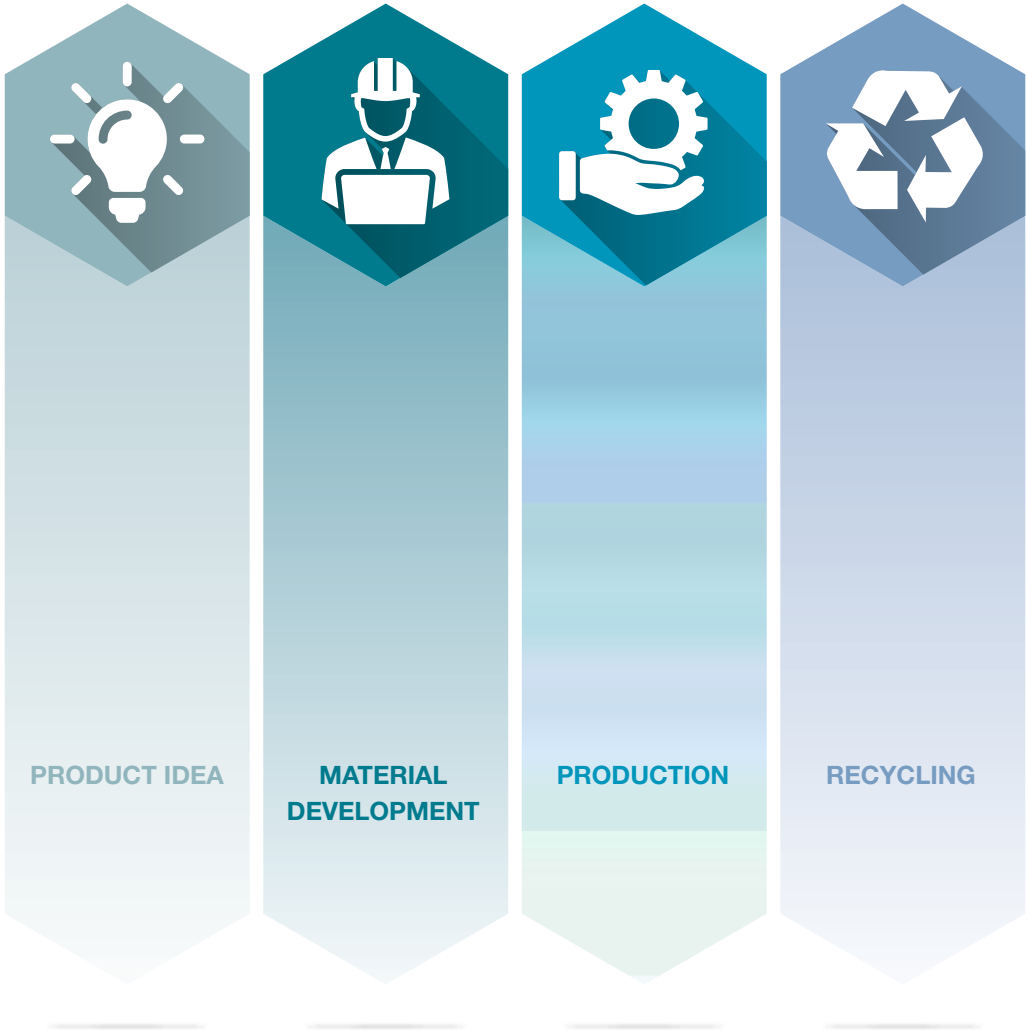
Grade / Standard	Chemical composition [weight-%]								
	C	Si	Mn	Cr	Mo	Fe	Co	Cu	Nb
Printdur® Ni625 LFe (~2.4856 / ~Alloy 625)	< 0.03	0.5	0.5	22.0	9.0	< 0.5	< 0.5	–	3.5
Printdur® Ni625 (2.4856 / Alloy 625)	< 0.03	0.5	0.5	22.0	9.0	5.0	< 1.0	–	3.5

<sup>1</sup> In addition to the illustrated Printdur® grades, we manufacture other grades by powder metallurgy. Customer-specific solutions are possible. Our powders are available in a grain size distribution from 0 - 250 µm. For Additive Manufacturing, a grain size distribution from 20 - 53 µm is typically used. Fractionations according to customer requirements are possible. Just contact us. Our metal powder production is certified according to IATF 16949 (Quality Management Automotive) and DIN EN ISO 13485 (Quality Management Medical Devices).

# From the idea to the ready-to-use product

From your own alloying idea to the end product - we support you in every step

- Definition of requirements
- Material development
- Powder atomization: from very small to large quantities
- Testing and optimization of materials in the latest AM systems
- Support for powder recycling





## UGIWAM® offer extends the Ugitech product range.

The promising WAAM\* technology develops a higher productivity than other processes (SLM, EBM) up to 5Kg per hour.

Synergies exist between welding sources and multi-axis robots in order to increase operating time of machines in workshops.

### Additive manufacturing allows:

- To make massive parts of large dimensions, small series, prototyping.
- Additions of material on large parts.
- Functional additions - Geometries not achievable by conventional or subtractive processes.
- "Near net shape" parts that reduce production and material costs.

Ugitech is equipped with the latest control and test technologies. The raw material is controlled in Ugine in an ISO 17 025 accredited laboratory.

Relying on the Ugitech Research Center, especially on its welding department (raw materials and processes), the technical support and its worldwide team of advisers and experts, is at the disposal of our customers to help, inform and support them in many areas such as corrosion, welding, stainless steel service life and the characterization of their mechanical and structural properties (MET and SEM analyses).



## Drawn wire for aerospace additive manufacturing materials

With our new range of products UGIWAM®, Ugitech guarantees total control of the process.

From the elaboration of steel to the welding filler wire, using our remelting capabilities when required, Ugitech supplies drawn wire of the highest quality for high demanding aerospace components, and all dedicated to the Wire Arc Additive Manufacturing (WAAM) technology.

Thanks to its two drawn wire production plants, Bourg-en-Bresse (France) and San Vendemiano (Italy), Ugitech has the resources and the technical expertise of a major leading group in stainless steels and Nickel alloys serving the welding market.

A key actor in the field of innovation thanks to its research and development center, Ugitech will be able to provide the solution that will meet your needs!

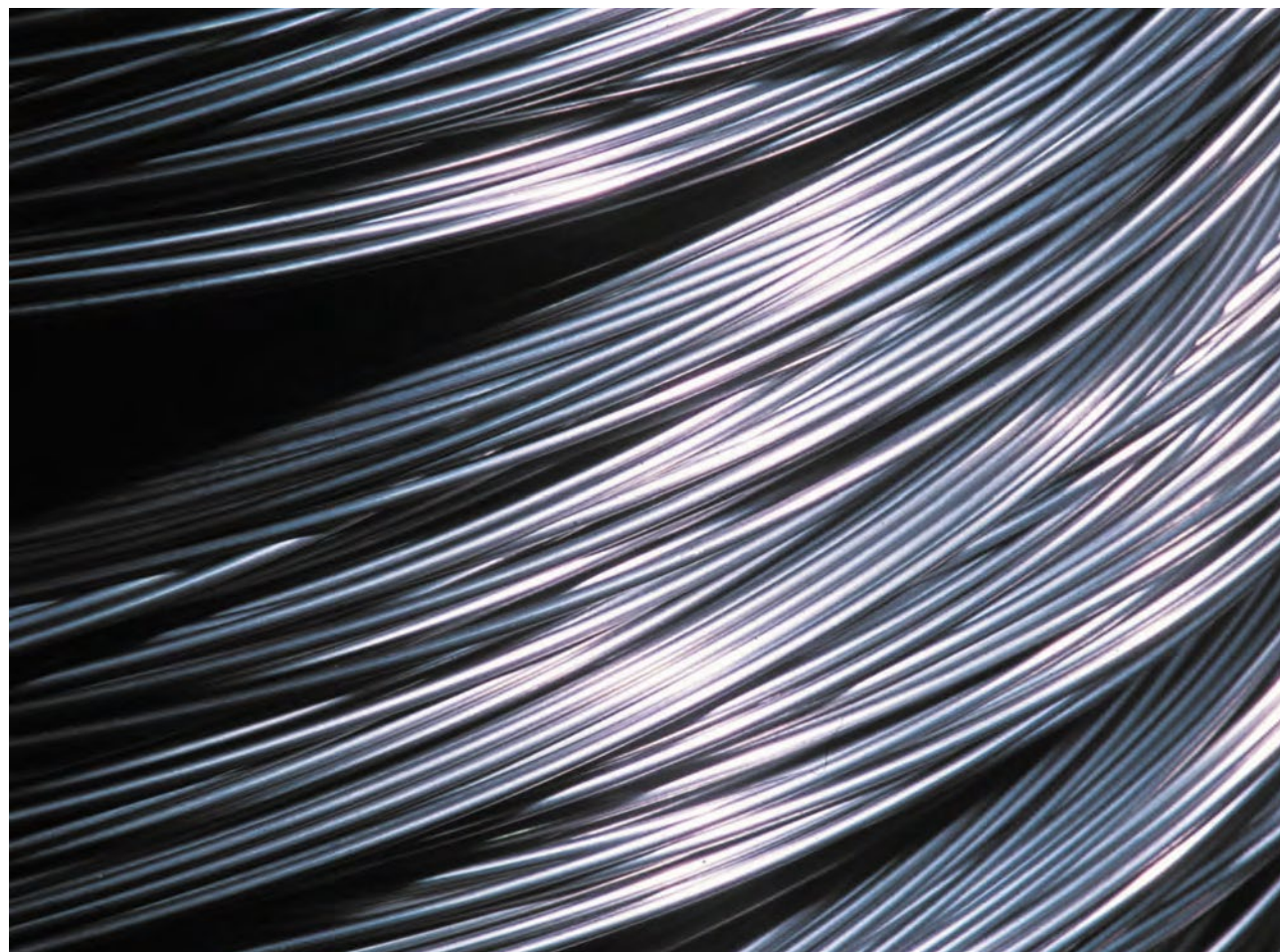


# UGIWAM® dedicated to the Aerospace market

Ugitech offers a wide range of products including stainless steels and nickel alloys.

		Chemical composition							Chemical composition	Comments
		C	Si	Mn	Ni	Cr	Mo	Cu	Other elements	
Austenitic	Ugitech Grades									
	UGIWAM® 304L	≤ 0.03	0.65 - 1.0	1.0 - 2.5	0.9 - 11.0	19.5 - 21.0	≤ 0.5	≤ 0.5		Excellent corrosion resistance in natural and urban environments.
	UGIWAM® 316L	≤ 0.03	0.65 - 1.0	1.0 - 2.5	11.0 - 14.0	18.0 - 20.0	2.5 - 3.0	≤ 0.5		Excellent corrosion resistance in natural, urban and industrial environments, even in the presence of a moderate concentration of chlorides.
PH Grades	UGIWAM® 347	≤ 0.08	0.65 - 1.0	1.0 - 2.5	9.0 - 11.0	19.0 - 21.0	≤ 0.5	≤ 0.5	Nb: 10xC - 1.0	Excellent corrosion resistance even at high temperatures (-> 810 °C). Chemical analysis according to AMS 5646.
	UGIWAM® 17-4PH	≤ 0.05	≤ 0.5	≤ 1.0	4.0 - 5.0	15.0 - 16.0	0.5	3.0 - 4.0	Nb: 5xC - 0.45	Excellent corrosion resistance combined with good toughness. Chemical analysis according to AMS 5643. Aging treatments can be carried out to get different levels of mechanical characteristics.
	UGIWAM® 15-5PH	≤ 0.05	≤ 0.5	≤ 1.0	4.0 - 5.0	14.5 - 15.5	0.5	2.5 - 3.5	Nb: 5xC - 0.45	Excellent corrosion resistance combined with good toughness up to 310 °C. Chemical analysis according to AMS 5659. Aging treatments can be carried out to get different levels of mechanical characteristics.
Base-Ni	UGIWAM® 625	≤ 0.03	≤ 0.5	≤ 1.0	≥ 60.0	21.0 - 23.0	8.5 - 9.5	≤ 0.5	Fe: ≤ 1.0 - (Nb+Ta): 3.2 - 4.0	Base-Nickel alloyed with Chromium and Molybdenum. Nuance with excellent corrosion resistance even in very aggressive environments.





## The benchmark materials for aerospace applications

### One Group – One Goal

The demanding quality requirements of the aerospace industry, to ensure optimal product quality and reproducibility, mandate that the supplying companies are extensively supervised. AS 9100, AS 9120 and NADCAP are prominent examples for certificates that aerospace related customers require. Ugitech and/or Deutsche Edelstahlwerke are certified/accredited by:

- ISO 9001 (quality management system)
- ISO 14001 (environmental management system)
- ISO 50001 (energy management system)
- AS 9100 (aerospace producer)
- AS 9120 (aerospace stockholder)
- NADCAP (heat treatment)
- ISO 17025 (testing laboratories)

In many cases individual customer approvals are additionally necessary for deliveries into the aircraft industry. Deutsche Edelstahlwerke and Ugitech have achieved a wide range of OEM and sub-contractor approvals.

### One Group - One Goal

Deutsche Edelstahlwerke and Ugitech combine their strengths to carry out common qualifications by major primes, and obviously offer a full range of products and logistic services dedicated to the Swiss Steel Group worldwide development.

Our customers can leverage on this alliance for their future.

### General note (liability)

Printing errors, omissions and changes accepted. Product-specific data sheets have priority over the information providing in this brochure. The desired performances characteristics are binding only if they are exclusively agreed upon at the conclusion of the contract.





**Swiss Steel Group**

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The information and data presented here in are typical or average values and are not a guarantee of maximum or minimum values. Only the information reported on our material certificates is to be considered as relevant.

Applications specifically suggested for material described herein are made for the purpose of illustration only to enable the reader to make its own evaluation and are not intended as warranties, either express or implied, of fitness for any purposes.