Technical Data Sheet
UGI® 4828

Chemical composition (%)

C	Si	Mn	Cr	Ni	Mo	N	P	S
≤ 0.15	1.50 – 2.50	≤ 2.0	19.0 – 20.0	11.0 – 12.5	-	≤ 0.10	≤ 0.040	≤ 0.015

10-10-2017 – REV 01

General presentation

UGI® 4828 is a heat-resistant austenitic stainless steel with a higher silicon content than type-309 stainless steel (UNS 30900). Its high chromium and nickel contents, in addition to the silicon, provide superior resistance to oxidation and good strength at both ambient and elevated temperatures, even in sulphur-containing gases.

UGI® 4828 is used for parts subject to high temperatures of up to 1000°C in furnaces, turbochargers, heat exchangers, and equipment used in the chemical, oil and glass industries.

Classification

Heat-resistant austenitic stainless steel

Designation

Material No.			
Europe EN10088		**EN 10095**	
1.4828	X15CrNiSi20-12	1.4828	Z17CNS20-12

Mechanical properties

Tensile data

Temperature	Tensile strength	Yield strength	Elongation
°C	Rm (MPa)	Rp0.2% (MPa)	A (%)
20	550 – 750	≥ 230	≥ 30
100	470 – 670	≥ 210	≥ 30
200	440 – 640	≥ 190	≥ 30
400	400 – 600	≥ 165	≥ 30
600	350 – 650	≥ 155	≥ 30
800	200 – 400	≥ 115	≥ 30

Hardness data

Temperature	Brinell	Rockwell B
°C	HB	HrB
20	≤ 223	≤ 95

Creep properties

Test Temperature	1 000 h		10 000 h		100 000 h	
°C	Rp 0,2 (MPa)	Rm (MPa)	Rp 0,2 (MPa)	Rm (MPa)	Rp 0,2 (MPa)	Rm (MPa)
600	120	190	80	120	40	65
700	50	75	25	36	20	10
800	20	40	10	18	5.5	7.5
900	8	15	4	8.5	1.5	3

Typical properties after solution annealing heat treatment.

Swiss Steel Group

Production sites: Ugitech SA
www.swisssteel-group.com

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Physical properties

Temperature	Density	Elastic modulus	Thermal conductivity	Expansion coefficient	Electrical resistivity	Specific heat
(°C)	(kg/dm³)	(N/mm²)	(W/m.°C)	(./°C)	(µΩ.m)	(J/kg.°C)
20	7.9	196	15		0.85	500
200		185	17	16.5	1.05	550
400		170	20	17.5	1.20	590
600		155	23	18.0	1.30	620
800		135	25	18.5	1.40	650
1,000		120	28	19.5	1.45	670

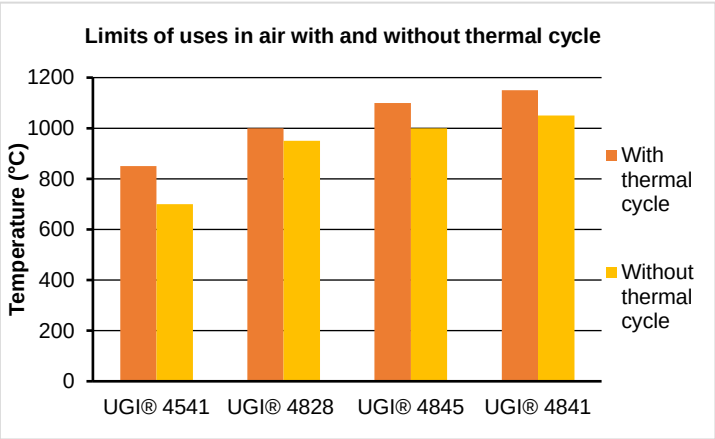
Corrosion resistance

UGI® 4828 has good corrosion resistance. The austenitic microstructure combined with the high silicon (≥1.5%) and chromium additions (≥ 19%) give this alloy a better high-temperature corrosion resistance than the AISI 321 or AISI 347 grades.

This grade is not designed for wet corrosion resistance purposes even though, in its annealed condition, UGI® 4828 provides better corrosion resistance in a marine atmosphere than UGI® 4307 (AISI 304L)

High-temperature oxidation resistance

UGI® 4828 has a high destructive scaling temperature and thus exhibits good scaling resistance in both continuous and intermittent service up to 1000°C.



Typical working temperatures of UGI® 4828 in sulphur-containing gases are as follows:

- Oxidizing atmospheres with maximum sulphur content of 2 g/m³: 1000°C maximum continuous service and 950°C with thermal cycles.
- Low oxygen-containing atmosphere with sulphur content lower than 2 g/m³: 850°C maximum.
- Low oxygen-containing atmosphere with sulphur content higher than 2 g/m³: 700°C maximum.
- UGI® 4828 is not designed for service in reducing nitriding or carburizing atmospheres.

Hot transformation

Forging

UGI® 4828 can be easily forged at between 800°C and 1150°C. Components should be cooled quickly; this can be done either in air or in water. Post-forging annealing heat treatment is not generally required since the material is designed for high-temperature applications.

Cold transformation

Bending – Forming

Like other austenitic steels and heat-resistant steels, UGI® 4828 can be cold worked easily. Because UGI® 4828 is ductile, it is well suited to bending and forming.

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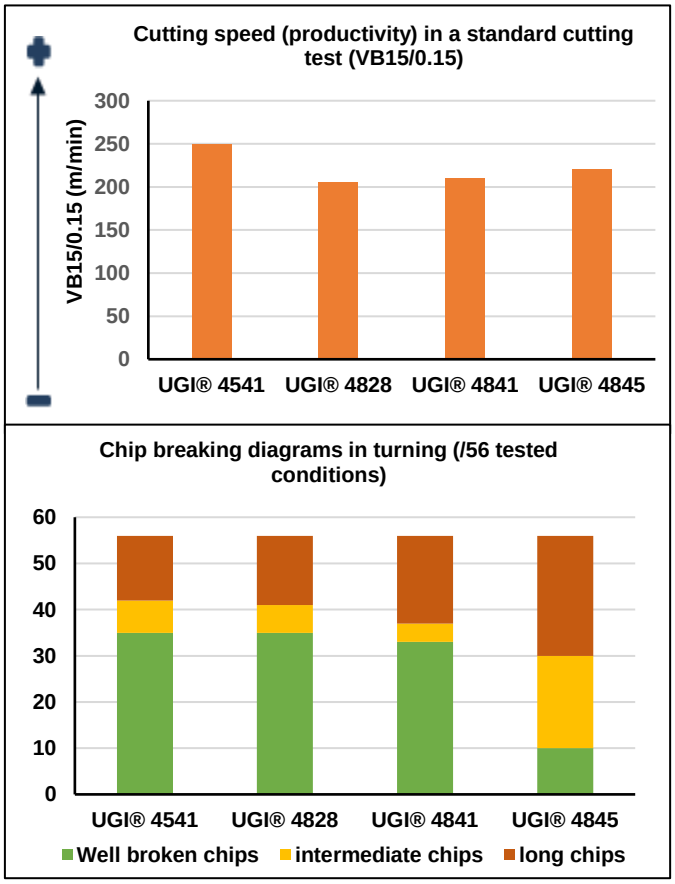
However, long-term high-temperature service may reduce the ductility of the steel. Initial ductility can be restored with a solution annealing heat treatment.

Machinability

Below is a comparison of UGI® 4828 with UGI® 4541, UGI® 4841 and UGI® 4845 in turning with a SECO TM2000 CNMG 120408-MF4 tool, in terms of:

- Productivity at a given tool-wear rate ($VB_{15/0.15}$, i.e. the cutting speed resulting in a flank wear VB of 0.15 mm in 15 min of effective cutting at f = 0.25 mm/rev and ap = 1.5 mm, without lubricant)
- Chip breakability (amount of well broken and intermediate chips over 56 tested conditions between f = 0.1 and 0.4 mm/rev and a_p = 1 and 4 mm).



Well broken chips

Intermediate chips

Long chips

In terms of productivity, UGI® 4828 is inferior to UGI® 4541 (mainly because of the high sulphur content of UGI® 4541) and similar to UGI® 4841 and UGI® 4845 (despite its much lower Ni content compared to these two grades).

In terms of chip breakability, owing to its moderate carbon content and high silicon content, UGI® 4828 is similar to UGI® 4541, despite its lower sulphur content. It is superior to UGI® 4841 and far superior to UGI® 4845, which have very low sulphur contents.

Welding

UGI® 4828 has good/very good weldability. It is weldable using all the usual arc welding processes such as GMAW, GTAW, SAW and SMAW. Laser beam welding must be used with care because of its tendency to promote hot cracking in this kind of austenitic grade.

No preheating is required and no post-weld heat treatment is required.

Nickel-based filler materials containing Niobium are not recommended since intermetallic intergranular precipitations may occur at the fusion line. The interpass temperature should be limited to 150°C.

Precautions:

- Cleaning and degreasing of weld areas.
- Mechanical methods are preferred to pickling to remove oxide, slag and incrustations.

Heat treatment

- Solution annealing

  Optimal material properties are produced after solution annealing at between 1050°C and 1150°C. This should be followed by a rapid cooling in air or water.

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Surface treatment

Pickling

Mechanical methods are preferred to pickling to remove oxides, slag and incrustations.

Strong pickling pastes should be avoided since the welded alloy is susceptible to intergranular corrosion.

Available products

Product	Form	Finish	Tolerance	Dimension	
Bars	Round	Drawn	h9	2 – 28	mm
	Round	Turned and polished	h10 – h11	22 – 130	mm
	Round	Descaled	h12 – k11	22 – 130	mm
	Hexagonal	Drawn		3 – 55	mm
Wire rod	Round	Pickled		5 – 32	mm
Drawn wire	Round	Hot		0.8 – 16	mm
	Profile	Bright		2 – 70	m²

Others contact us.

Applications

- Turbochargers: nozzle parts.
- Furnace equipment: conveyor belts, doors and burner fixings.
- Refinery and chemical process equipment.
- Energy conversion plants: grid, heat recuperators.
- Cement industry: rotary kilns, burner shields, refractory anchors.
- Iron, steel and non-ferrous industries: extraction hoods, heat exchanger elements.

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