Technical Data Sheet

UGIALLOY® 686

Chemical composition (%)

C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti
≤ 0.01	≤ 0.08	≤ 0.1	≤ 2.0	≥ 49.0	19.0 – 23.0	15.0 – 17.0	3.0 – 4.4	≤ 0.5	≤ 0.5	≤ 0.25

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General presentation

UGIALLOY® 686 filler wire contains high quantities of chromium, molybdenum and tungsten, enabling it to be used for welds or claddings that are more resistant to corrosion and/or oxidation than the majority of nickel-based grades in many highly corrosive environments (chemical, waste treatment, fertilizers, etc.).

For example, its general corrosion resistance in very harsh aqueous environments is considered higher than that of Alloy 59 (which is itself much higher than that of alloy 625).

UGIALLOY® 686 is used for the homogenous welding of UNS N06686 and to weld many Ni-Cr-Mo alloys with a low C content and fewer alloying elements than UNS N06686, as well as for welding superaustenitic and super-duplex stainless steels.

Finally, UGIALLOY® 686 is used for coating steels or stainless steels to improve corrosion and/or oxidation resistance in very harsh environments (for example for incinerator parts).

Classification

Nickel-based alloy.

Designation

Material No.

Europe – EN ISO 18274	USA – AWS A5.14	Europe – WNr.
Ni 6686	ER NiCrMo-14	

Mechanical properties

Tension test on All-Weld metal

Temperature (°C)	-40°C	Room Temperature
Tensile strength (MPa)		798
Yield strength (MPa)		507
Elongation (%)		40
Impact ISO V (J)	85	

Swiss Steel Group

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

Chemical composition (%)

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Corrosion resistance

General corrosion

The table below gives the general corrosion rates in mm/year for different assemblies made from UGIALLOY® 686 and other filler wires kept in an acid environment of 10% H2SO4 + 2% HCl at 80°C for 7 days.

Base metal	Filler wire	Corrosion rate (in mm/year)		
		GTAW across thin sheets	GMAW across thin sheets	SAW across thin sheets
UNS N06686	UGIALLOY® 686	0.4	0.5	0.6
UNS N06022	UGIALLOY® 686	1.2	1.2	1.3
UNS N06022	UGIALLOY® 22	1.3	1.3	1.5
UNS N06276	UGIALLOY® 686	0.7(a)	0.6	0.8
UNS N06276	UGIALLOY® 276	0.7	0.7	0.9

(a) Slight attack in the heat affected zone

Localized corrosion

» Pitting corrosion

The table below gives the pitting corrosion rates in terms of maximum pitting depth in mm/year for different assemblies made from UGIALLOY® 686 and other filler wires kept in an SO2 + 26% NaCl saturated environment at 80°C for 14 days.

Base metal	Filler wire	Maximum attack depth (in mm/year): base metal /weld metal zone				
		GTAW across thin sheets	GTAW across thick sheets	GMAW across thin sheets	GMAW across thick sheets	SAW across thick sheets
UNS N06686	UGIALLOY® 686	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
UNS N06022	UGIALLOY® 686	0.4 / 0.1	0.3 / 0	0.2 / 0	0.4 / 0.1	0.4 / 0
UNS N06022	UGIALLOY® 22	0.3 / 0.5	0.4 / 0.7	0.2 / 0.3	0.6 / 0.6	0.4 / 0.8
UNS N06276	UGIALLOY® 686	0.8 / 0.4	0.7 / 0.5	0.6 / 0.5	0.7 / 0.5	0.7 / 0.3
UNS N06276	UGIALLOY® 276	0.7 / 0.8	0.6 / 0.9	0.4 / 0.6	0.6 / 1.0	0.5 / 1.1

The table below gives the pitting corrosion rates in terms of maximum pitting depth in mm/year for different assemblies made from UGIALLOY® 686 and other filler wires kept in an 11.9% H2SO4 + 1% CuCl2 environment at 103°C for 7 days.

UGIALLOY® 686

Chemical composition (%)

C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti
≤ 0.01	≤ 0.08	≤ 0.1	≤ 2.0	≥ 49.0	19.0 – 23.0	15.0 – 17.0	3.0 – 4.4	≤ 0.5	≤ 0.5	≤ 0.25

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Base metal	Filler wire	Maximum attack depth (in mm/year): base metal /weld metal zone				
		GTAW across thin sheets	GTAW across thick sheets	GMAW across thin sheets	GMAW across thick sheets	SAW across thick sheets
UNS N06686	UGIALLOY® 686	0 / 0	0 / 0	0.1 / 0	0 / 0	0 / 0
UNS N06022	UGIALLOY® 686	0.03 / 0	0.05 / 0	0 / 0	0.2 / 0	0 / 0
UNS N06022	UGIALLOY® 22	0 / 2.2	0.1 / 5.3	0 / 1.2	0.08 / 5.3	0 / 2.1
UNS N06276	UGIALLOY® 686	0 / 0	0 / 0	0.1 / 0	0 / 0	0 / 0
UNS N06276	UGIALLOY® 276	0 / 3.0	0 / 6.1	0 / 3.0	0 / 3.4	0 / 3.2

Intergranular corrosion

The table below gives the intergranular corrosion rates in mm/year for different assemblies made from UGIALLOY® 686 and other filler wires after 24 h under the conditions specified in ASTM G28B.

Base metal	Filler wire	Maximum attack depth (in mm/year): base metal /weld metal zone				
		GTAW across thin sheets	GTAW across thick sheets	GMAW across thin sheets	GMAW across thick sheets	SAW across thick sheets
UNS N06686	UGIALLOY® 686	1.4	0.6	1.2	0.5	0.6
UNS N06022	UGIALLOY® 686	0.5	0.5	0.7	1.2	0.4
UNS N06022	UGIALLOY® 22	0.6	10.2 (a)	5.6 (a)	20.1 (a)	7.9 (a)
UNS N06276	UGIALLOY® 686	2.0	1.9	1.6	4.1	1.8
UNS N06276	UGIALLOY® 276	1.8	1.4	9.2 (a)	45.0 (a)	1.8

(a) Marked intergranular corrosion

Welding

The tables below give the typical welding conditions to be used for UGIALLOY® 686 during MIG and TIG welding with filler wire.

» GMA welding

Transfer type	Wire diameter (mm)	Wire speed (m/min)	Welding voltage (V)	Welding current (A)
Non-pulsed spray	0.9	11.5 – 15	26 – 32	180 – 250
	1.2	6.0 – 9.0	26 – 32	220 – 300
	1.6	3.5 – 5.7	27 – 33	250 – 350
Pulsed spray	0.9	7.0 – 10.2	19 – 22	90 – 140
	1.2	2.5 – 5.5	21 – 26	120 – 190
	1.6	1.8 – 3.5	23 – 28	160 – 240

Shielding gas: Ar or mixture of Ar/He with a flow rate of 17 to 23 l/min

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» GTA welding

Wire / rod diameter (mm)	Tungsten electrode diameter (mm)	Shielding gas feed nozzle diameter (mm)	Welding current (A)
1.6	1.6 – 2.4	9.5 – 16	90 – 160
2.4	1.6 – 2.4	9.5 – 16	100 – 190
3.2	2.4 – 3.2	12.5 – 16	110 – 210

Available products

Process	Shape	Diameter Range	Packaging	Weight
TIG	Rods	1.0 – 4.0 mm	Cardboard tubes	5 kg
MIG	Wire	0.8 – 1.6 mm	Metallic spools – BS 300	15 – 18 kg
		0.8 – 1.2 mm	Plastic spools – D 200	5 kg
			Plastic spools – D 300	15 kg
		1.0 – 1.6 mm	Plastic spools – D 350	25 – 27 kg
		0.8 – 1.2 mm	Pay off pack - Drums	250 – 500 kg
SAW	Wire	1.6 – 3.2 mm	Rims K415 / 300 / 94	20 – 25 kg
			Rims K435 / 300 / 70	

Contact us for dimensions

Applications

Coatings or weldings in highly corrosive environments such as:

» Chemical treatments (including heat exchangers, reactors, evaporators, etc.)

» Pollution removal (including columns, pipes, housings, etc.)

» Paper manufacturing industry

» Waste treatment

» Petrochemical

» Harsh marine environment

» etc.