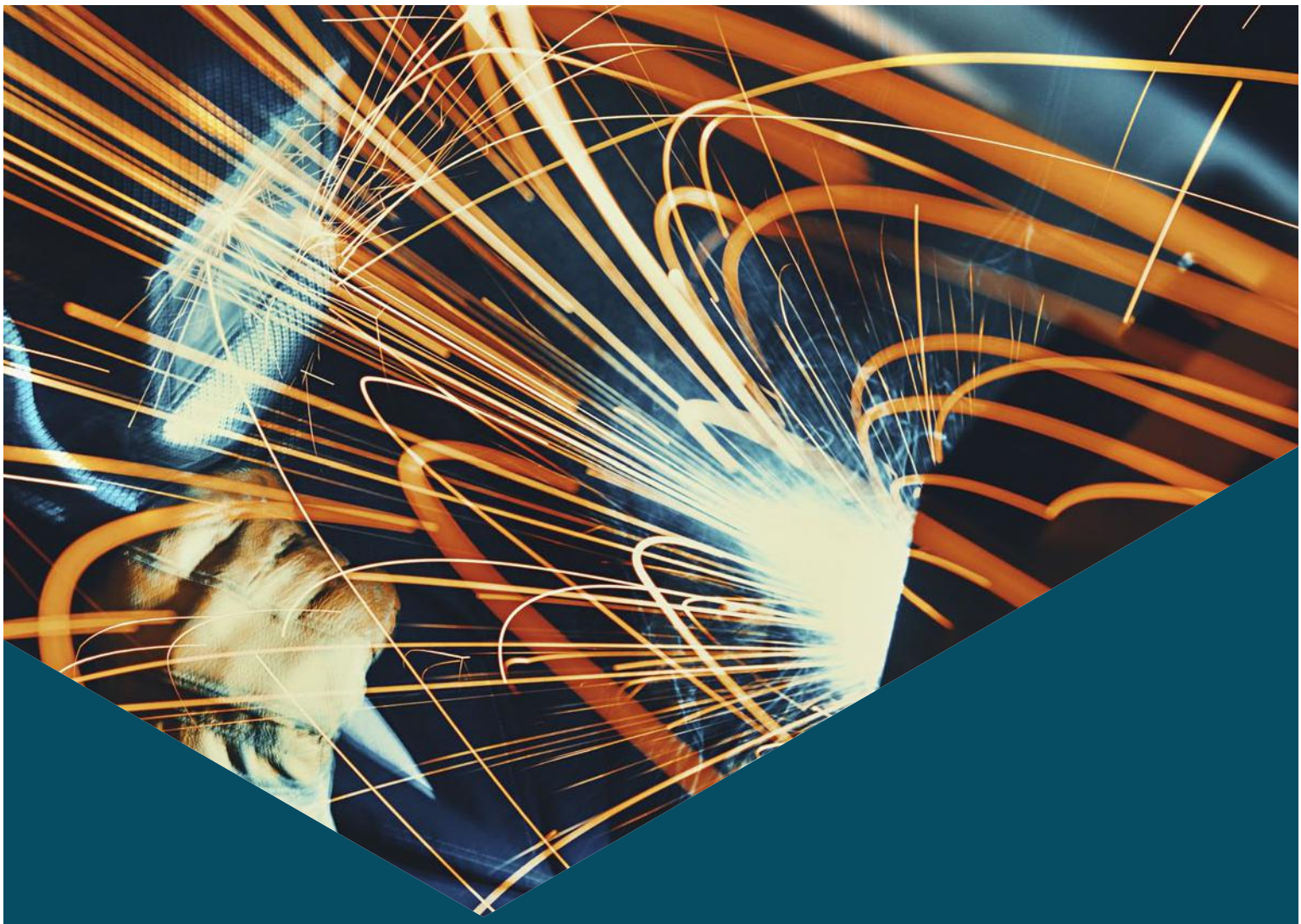


Ugitech

Filler metals for welding

DATA SHEETS

SCHMOLZ + BICKENBACH GROUP

UGITECH

CONTENTS

MIG

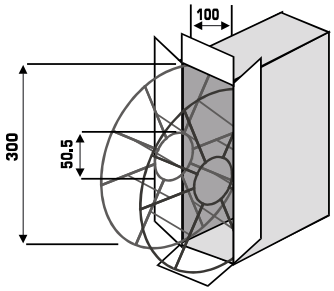
MIG Spool

Standard presentation

Black or blue painted wire basket spool BS300 or black plastic spool D300

» ⌀ 0.80 mm 15 kg max

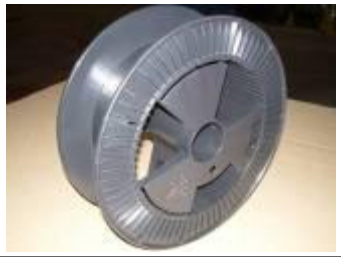
» ⌀ 1.00 to 1.60 mm 15 to 18 kg



Other Possibilities

Spool

ø	Wire basket spool	Plastic spool		
	BS300	D200	D300	D350
0.80	15 kg	5 kg	15 kg	-
1.00	15 – 18 kg			25 – 27 kg
1.20				
1.60		-	-	

Wire basket		Plastic spool				
	BS300			**D**	**d**	**F**	**L**
			D200	200	50.5	105	55
			D300	300	50.5	190	100
			D350	350	50.5	212,5	100

MIG Spool

Packaging / Packing

Packaging

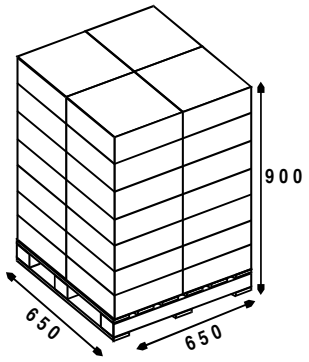
» Ugitech cardboard box 300 x 300 x 100

» On request, we can also pack in neutral or in customer's cardboard boxes

Packing

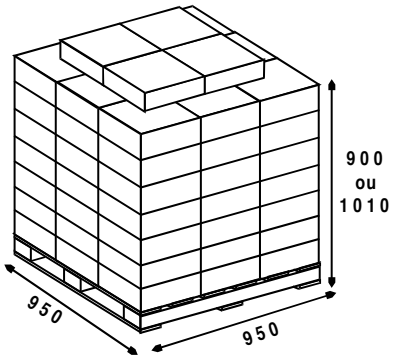
» Plastic-wrapped pallet (wooden crate on request)

28 spools



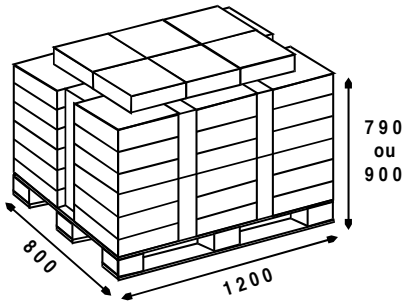
or 63 spools

67 spools

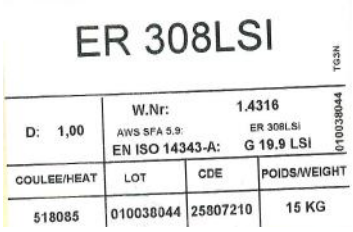
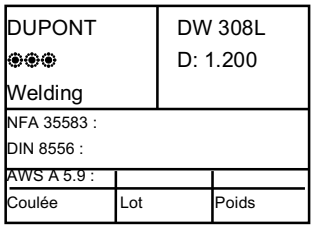


or 50 spools

56 spools



Identification and Labelling

Neutral tag	Ugitech tag	Personalized tag
		

MIG Pay off pack

Standard presentation

» Ø 0.80 to 1.20 mm

» 250 kg (Stainless steel)

» Other quantity on request

» With internal cardboard core

Characteristics of the Wire

Self decoiling wire with pre-twist and controlled straightness.

On 10 meters length we guarantee:

» The rotation of the wire is inferior to 360° (1 turn)

» The amplitude of undulation is not inferior to 130 mm

» The flatness does not exceed 30 mm

Packing

We deliver pay off packs on wooden pallets:

» 1100 x 560 mm For 2 drums

» 1200 x 800 mm For 2 drums (on request)

MIG Pay off pack

Handling

During handling, we recommend you to keep the drum on the pallet when using a forklift.

The drum can also be moved by using the handles but this has to be done with the drum lid still on.

Try to keep the drum vertical during handling. Handling the drums according to the recommendations on the label sticked on the drum.

Instructions for use

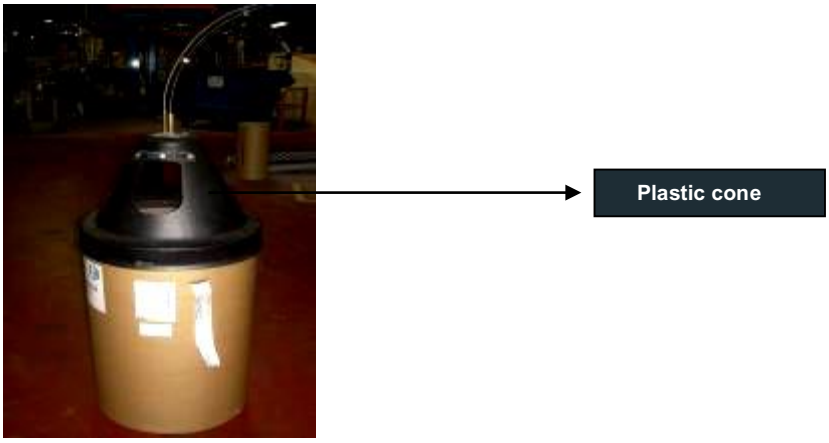
After installing the drum:

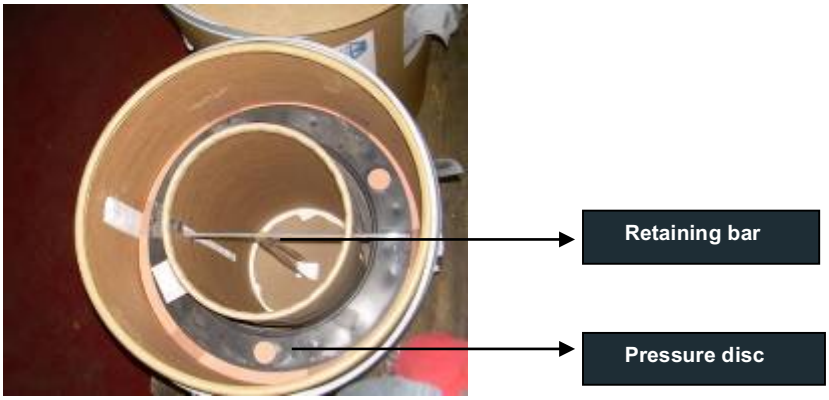
» Take off the drum top.

» Remove the horizontal retaining bar
Insure you leave the pressure disc.

» Add the plastic cone to the drum and fix it, according to the type of cone.

» Pull out the wire through the center of the pressure disc.





TIG

TIG Stick

Standard presentation

Stick

» ⌀ 1.00 to 4.00 mm stamped

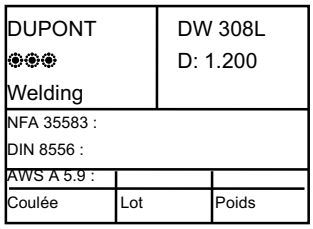
Length:

» 500 or 1000 mm (other lengths available on request)

Packaging / Packing

In boxes		In bulk	
		Customer model:	
Ugitech model in 5 kg white square cardboard box 47 x 27 x 1005		100 kg	1040 x 260 x 130
		200 kg	1040 x 540 x 130
		400 kg	1040 x 540 x 260
Customer model:			
Tube	1kg and 5 kg		
Boxes	5 kg		
The tubes and boxes are packed in cardboard crate:		**Shipping on European palet**	
200 kg	1040 x 610 x 150	1200 x 800	
400 kg	1040 x 620 x 300		
		Wood box on palet:	
Cardboard crate are stapled on the pallet		200 kg	1050 x 320 x 200
		500 kg	1050 x 570 x 250

Labelling of the tubes and boxes

Neutral tag	Ugitech tag	Personalized tag
		

SAW

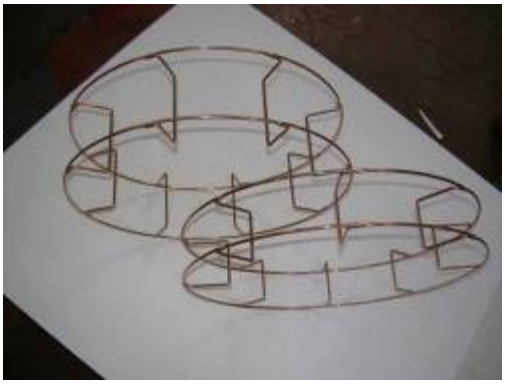
SAW wire

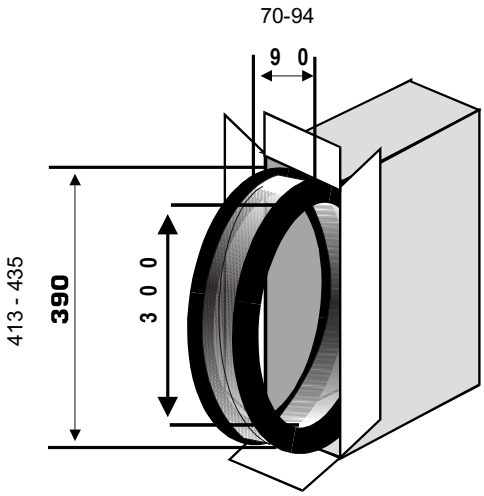
Standard Presentation

» Open centre wire basket 20 to 25 kg Ø 1.60 to 3.20mm

» K 435 / 300 / 70

» K 415 / 300 / 94





Packaging / Packing

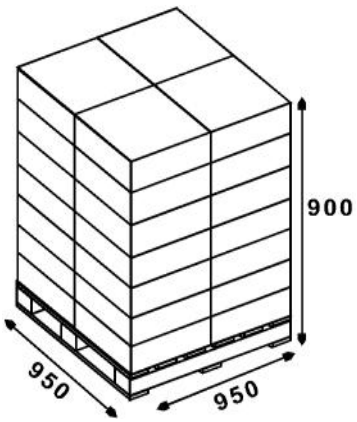
Packaging

» Individual Ugitech cardboard box
(On request we can package with neutral cardboard boxes).

Packing

» Plastic wrapped pallet

» 28 spools - 700 Kg



AUSTENITIC

UGIWELD™ 308LT

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	≤ 0.65	1.0 – 2.5	9.0 – 11.0	19.5 – 21.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 - A 19 9 L
» AWS – A 5.9 ER308L
» W.Nr 1.4316

Approvals

	MIG	TIG
TÜV (Germany)	X	X
CE	X	X
DB	X	X

Corrosion resistance

» Good general corrosion resistance. This grade is particularly recommended where there is a risk of intergranular corrosion.
» Very good atmospheric corrosion resistance in urban and rural medias.
» UGIWELD™ 308LT suits most food products and lot of chemical products such as cold alkaline solutions when diluted, cold organic acids when diluted, neutral and alkaline salt without holides…

Applications

UGIWELD™ 308LT is a filler metal well suited for welding of austenitic stainless steels type 304 and 304L, and also stabilized austenitic stainless steel type 321.

» Equipment for chemical industry.
» Equipment for food processing industry.
» Pipes and tubes.
» Boiler making.

UGIWELD™ 308LT may be used for welding of some ferritic steels such as 409: automotive exhaust systems.

UGIWELD™ 308LT

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	≤ 0.65	1.0 – 2.5	9.0 – 11.0	19.5 – 21.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**

Argon and/or Helium.

» **Welding parameters:**

Follow the recommendations of the torch producer:

Current 50 - 250 A

Voltage 10 - 20 V

Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**

Recommended shielding gases are:

Argon + Oxygen (1 to 3 %)

Argon + CO_2 (1 to 2.5 %)

» **Welding parameters:**

∅ Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	26/29	27/30
Gas Flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 308LT is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows :

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	460		600	440
Yield (MPa)		400	320		360	270
Elongation (5 Ø) (%)		40	30		35	25
Striction (%)		60			55	
Impact ISO V (J/cm²)	110	160		70	120	

UGIWELD™ 308LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.0	1.0 – 2.5	9.0 – 11.0	19.5 – 21.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 – A 19 9 L Si
» AWS – A 5.9 ER308LSi
» W Nr. 1.4316

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Good general corrosion resistance. This grade is particularly recommended where there is a risk of intergranular corrosion.
» Very good atmospheric corrosion resistance in urban and rural medias.
» UGIWELD™ 308LM suits most food products and lot of chemical products such as cold alkaline solutions when diluted, cold organic acids when diluted, neutral and alkaline salt without halogen.

Applications

» UGIWELD™ 308LM is a filler metal well suited for welding of austenitic stainless steels type 304, 304L and also stabilised austenitic stainless steel type 321.
» Equipment for chemical industry.
» Equipment for food processing industry.
» Pipes and tubes.
» Boiler engeenering.

UGIWELD™ 308LM may be used for welding of some ferritic steels such as 409: automotive exhaust systems.

UGIWELD™ 308LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.0	1.0 – 2.5	9.0 – 11.0	19.5 – 21.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3 %)
Argon + CO_2 (1 to 2.5 %)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	26/29	27/30
Gas Flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 308LM is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	460		600	440
Yield (MPa)		400	320		360	270
Elongation (5 Ø) (%)		40	30		35	25
Striction (%)		60			55	
Impact ISO V (J/cm²)	110	160		70	120	

UGIWELD™ 4370M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.20	≤ 1.2	5.0 – 8.0	7.0 – 10.0	17.0 – 20.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 - A 18 8 Mn

» AWS – A5.9 **(307Si)

» W Nr 1.4370

*** Usual naming not referenced in the standard AWS A5.9*

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Corrosion resistance of this type of steel is equivalent to that of austenitic stainless steels type 304 (18Cr 8Ni)

» In case of heterogeneous, corrosion resistance has no effective importance.

Applications

UGIWELD™ 4370M is a very well adapted filler metal for the following applications:

» Armor plate welding.

» High manganese austenitic stainless steel welding.

» Welding of steels used for high temperature up to 850°C.

» Welding of austenitic and ferritic stainless steels for automotive exhaust system, type 304, 309, 409 and others.

» Heterogeneous welding.

UGIWELD™ 4370M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.20	≤ 1.2	5.0 – 8.0	7.0 – 10.0	17.0 – 20.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3 %)
Argon + CO_2 (1 to 2.5 %)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/29
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 4370M is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG		MIG	
Temperature	-80° C	20° C	-80°C	20°C
Tensile (MPa)		620		620
Yield (MPa)		450		420
Elongation (5Ø) (%)		42		40
Striction (%)		55		50
Impact ISO V (J/cm²)	60	120	50	100

UGIWELD™ 309L

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤0.03	≤ 0.65	1.0 – 2.5	12.0 – 14.0	23.0 – 25.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 – A 23 12 L
» AWS – A 5.9 ER309L
» W.Nr 1.4332

Approvals

	SAW
TÜV (Germany)	X
CE	X
DB	

Corrosion resistance

» In no case shall a temperature of 950°C be exceed for use under intermittent oxidation conditions.
» Good performance under carburizing atmospheres. This grade may be used in contact with fused salts and can also be used in some cases of contamination by fuel ashes.
» The above are general indications intended to guide users in their choice.

For each more specific case, please contact us.

Applications

Because of its high temperature oxidation and corrosion resistance, UGIWELD™ 309L is recommended for the following applications:

» Industrial furnace and boiler parts.
» Annealing chambers.
» Heat exchangers.
» Fused salt treatment installations.

Due to its high ferrite level, UGIWELD™ 309L is very well suited for the first layer during stainless steel cladding on carbon steel.

UGIWELD™ 309L

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤0.03	≤ 0.65	1.0 – 2.5	12.0 – 14.0	23.0 – 25.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3 %)
Argon + CO_2 (1 to 2.5 %)

» **Welding parameters**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	20	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 309L is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above mentioned welding parameters, the mechanical properties shall be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620			600	
Yield (MPa)		420			400	
Elongation (5Ø) (%)		35			35	
Striction (%)		60			55	
Impact ISO V (J/cm²)		150			130	

UGIWELD™ 309LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.0	1.0 – 2.5	12.0 – 14.0	23.0 – 25.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 – A 23 12 L Si
» AWS A5.9 ER309LSi
» W.Nr 1.4332

Approvals

	MIG	TIG
TÜV (Germany)	X	X
CE	X	X
DB	X	X

Corrosion resistance

» In no case shall a temperature of 950°C be exceed for use under intermittent oxidation conditions.
» Good performance under carburizing atmospheres. This grade may be used in contact with fused salts and can also be used in some cases of contamination by fuel ashes.

The above are general indications intended to guide users in their choice. For each more specific case, please contact us.

Applications

Because of its high temperature oxidation and corrosion resistance, UGIWELD™ 309LM is recommended for the following applications:

» Industrial furnace and boiler parts.
» Annealing chambers.
» Heat exchangers.
» Fused salt treatment installations.

Due to its high ferrite level, UGIWELD™ 309LM is very well suited for the first layer during stainless steel cladding on carbon steel.

UGIWELD™ 309LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.0	1.0 – 2.5	12.0 – 14.0	23.0 – 25.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:

Current	50 - 250 A
Voltage	10 - 20 V

Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3 %)
Argon + CO_2 (1 to 2.5 %)

» **Welding parameters**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	20	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 309LM is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above mentioned welding parameters, the mechanical properties shall be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620			600	
Yield (MPa)		420			400	
Elongation (5Ø) (%)		35			35	
Striction (%)		60			55	
Impact ISO V (J/cm²)		150			130	

UGIWELD™ 310

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	0.08 – 0.15	≤ 0.65	1.0 – 2.5	20.0 – 22.0	25.0 – 27.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic stainless steel.

Standards

- » EN ISO 14343 – A 25 20
- » AWS SFA 5.9 ER310
- » W.Nr 1.4842

Corrosion resistance

- » The temperature limits for use under intermittent oxidation depend on cycle frequency. In no case shall a temperature of 1000°C be exceeded.
- » UGIWELD™ 310 can withstand relatively severe thermic shock and is superior to UGIWELD™ 309L.
- » The above are general indications intended to guide users in their choice. For each more specific case, please contact us.

Applications

UGIWELD™ 310 is recommended for high temperature applications:

- » Industrial furnace and boiler parts,
- » Annealing chambers,
- » Heat exchangers,
- » Fused salt treatment installations.

UGIWELD™ 310 is a pure austenitic stainless steel so there is a risk of hot cracking, therefore a good control of welding parameters is essential.

UGIWELD™ 310

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	0.08 – 0.15	≤ 0.65	1.0 – 2.5	20.0 – 22.0	25.0 – 27.0	≤ 0.5	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas**

Argon and/or Helium.

» **Welding Parameters:**

Follow the recommendations of the torch producer:

Current 50 – 250 A

Voltage 10 – 20 V

Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas**

Recommended shielding gases are :

Argon + Oxygen (1 to 3 %)

Argon + CO_2 (1 to 2.5 %)

» **Welding Parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2
Short-Arc			
Current (A)	60/80	80/120	100/150
Voltage (V)	15/17	15/17	17/19
Spray-Arc			
Current (A)	140/21	180/25	200/290
Voltage (V)	25/28	26/29	26/29
Gas flow (l/min)	15	20	20

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 310 is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above mentioned welding parameters, the mechanical properties shall be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	500		580	480
Yield (MPa)		400	260		380	240
Elongation (5Ø) (%)		40	28		35	25
Striction (%)		60	63		65	60
Impact ISO V (J/cm²)		150		55	120	

UGIWELD™ 316LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.00	1.0 – 2.5	11.0 – 14.0	18.0 – 20.0	2.5 – 3.0	≤ 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire.

Classification

Austenitic grade

Standards

» EN ISO 14343 - A 19 12 3 L Si
» AWS - A 5.9 ER316LSi
» W.Nr 1.4430

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Good general corrosion resistance higher than 304L
» Excellent corrosion resistance in acid media.
» Very good corrosion resistance in chlorinated solutions.

Applications

UGIWELD™ 316LM is a filler metal well suited for welding of austenitic stainless steels type 316, 316L and also stabilised austenitic stainless steel type (316Ti).

» Chemical industry and industrial food processing equipment: tanks, pipes, pumps,
» Household: hot water tanks.
» Building: architectural and roofing.
» Ship building.

UGIWELD™ 316LM

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.03	0.65 – 1.00	1.0 – 2.5	11.0 – 14.0	18.0 – 20.0	2.5 – 3.0	≤ 0.5

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3 %)
Argon + CO_2 (1 to 2,5 %)

» Welding parameters:

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	26/29	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 316LM is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196° C	20° C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	490		560	420
Yield (MPa)		400	350		370	270
Elongation (5Ø) (%)		40	28		35	25
Striction (%)		65			58	
Impact ISO V (J/cm²)	60	150		50	100	

UGIWELD™ 318M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	0.65 – 1.0	1.0 – 2.5	11.0 – 14.0	18.0 – 20.0	2.5 – 3.0	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Stabilised austenitic grade

Standards

» EN ISO 14343 – A 19 12 3 Nb Si
» AWS - A 5.9 (ER318)
» W.Nr 1.4576

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Good general corrosion resistance, close to stainless steel type 316L.
» Because of its high Niobium content, good intergranular corrosion resistance is obtained.
» Pitting corrosion resistance close to the stainless steel type 316L.

Applications

UGIWELD™ 318M is recommended for welding stabilised austenitic stainless steel type 316Ti and 316Nb.
Because of Niobium content, UGIWELD™ 318M is recommended for use at temperatures higher than 400°C.

UGIWELD™ 318M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	0.65 – 1.0	1.0 – 2.5	11.0 – 14.0	18.0 – 20.0	2.5 – 3.0	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**

Argon and/or Helium.

» **Welding parameters:**

Follow the recommendations of the torch producer:

Current	50 - 250 A
Voltage	10 - 20 V

Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**

Recommended shielding gases are:

Argon + Oxygen (1 to 3 %)

Argon + CO_2 (1 to 2.5 %)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/29
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 318M is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620	470		620	450
Yield (MPa)		400	320		400	300
Elongation (5Ø) (%)		35	23		30	24
Striction (%)		43			50	
Impact ISO V (J/cm²)	40	135		40	120	

UGIWELD™ 347

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	≤ 0.65	1.0 – 2.5	9.0 – 11.0	19.0 – 21.0	≤ 0.5	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Stabilised austenitic grade

Standards

» EN ISO 14343 - A 19 9 Nb
» AWS - A 5.9 ER347
» W Nr. 1.4551

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Good general corrosion resistance similar to austenitic stainless steels type 304 / 304L.
» Because of its high Niobium content, good intergranular corrosion resistance is obtained.
» Pitting corrosion resistance similar to austenitic stainless steel type 304L

Applications

UGIWELD™ 347 is recommended for welding stabilized austenitic stainless steel type 321 and 347.
Because of Niobium content, UGIWELD™ 347 is recommended for use at temperatures higher than 400°C.

UGIWELD™ 347

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	≤ 0.65	1.0 – 2.5	9.0 – 11.0	19.0 – 21.0	≤ 0.5	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas**:
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas**:
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 347 is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620	500		620	480
Yield (MPa)		400	360		400	320
Elongation (5Ø) (%)		35	27		30	28
Striction (%)		55			50	
Impact ISO V (J/cm²)	40	130		30	110	

UGIWELD™ 347M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	0.65 – 1.0	1.0 – 2.5	9.0 – 11.0	19.0 – 21.0	≤ 0.5	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Stabilised austenitic grade

Standards

» EN ISO 14343 - A 19 9 Nb Si
» AWS - A 5.9 ER347Si
» W Nr. 1.4551

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	X
CE	X	X	X
DB	X	X	

Corrosion resistance

» Good general corrosion resistance similar to austenitic stainless steels type 304 / 304L.
» Because of its high Niobium content, good intergranular corrosion resistance is obtained.
» Pitting corrosion resistance similar to austenitic stainless steel type 304L

Applications

UGIWELD™ 347M is recommended for welding stabilized austenitic stainless steel type 321 and 347.
Because of Niobium content, UGIWELD™ 347M is recommended for use at temperatures higher than 400°C.

UGIWELD™ 347M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.08	0.65 – 1.0	1.0 – 2.5	9.0 – 11.0	19.0 – 21.0	≤ 0.5	≤ 0.5	10xC-1.0

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 347M is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620	500		620	480
Yield (MPa)		400	360		400	320
Elongation (5Ø) (%)		35	27		30	28
Striction (%)		55			50	
Impact ISO V (J/cm²)	40	130		30	110	

UGIWELD™ 385

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.025	≤ 0.50	1.0 – 2.5	24.0 – 26.0	19.5 – 21.5	4.2 – 5.2	1.2 – 2.0

16-04-2016 – REV02

Category

Stainless steel welding wire

Classification

Super Austenitic grade

Standards

» EN ISO 14343 - A 20 25 5 Cu L

» AWS SFA 5.9 ER385

Corrosion resistance

» General corrosion resistance far superior to 316L, especially in sulphuric and phosphoric medias.

» Pitting and crevice corrosion resistance higher than the one of austenitic stainless steel type 317L.

» Stress corrosion resistance higher than standard austenitic stainless steels.

Applications

UGIWELD™ 385 is a filler metal suited to "super austenitic" stainless steel welding type 904L and derivatives.

» Phosphates, phosphoric acid and chemical fertiliser industries. Sulphuric acid industry.

» Exchangers and condensers for chemical industry.

» Flue pipes.

» Sea water applications.

UGIWELD™ 385

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.025	≤ 0.50	1.0 – 2.5	24.0 – 26.0	19.5 – 21.5	4.2 – 5.2	1.2 – 2.0

16-04-2016 – REV02

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/29
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 385 is suited for pulsed arc welding.

Mechanical properties on all weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	400		580	400
Yield (MPa)		400	250		400	250
Elongation (5Ø) (%)		30	28		30	28
Striction (%)		50			50	
Impact ISO V (J/cm²)	60	130		50	120	

UGIWELD™ 4455

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	0.30 – 0.65	5.0 – 9.0	15.0 – 18.0	19.0 – 22.0	2.5 – 3.0	≤ 0.5	0.1 – 0.2

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 – A 20 16 3 Mn N L
» AWS A5.9 ER316LMn
» W.Nr 1.4455

Applications

Well adapted filler wire for the following applications:

» Cryogenic application
» Good intergranular corrosion resistance.
» Non magnetic assemblages.

Not affected by the hot cracking.

Recommended welding conditions

TIG Welding

» **Shielding gas**
Argon and/or Helium.

MIG Welding

» **Shielding gas**
Recommanded shielding gases are :
Argon + Oxygène (1to 3%)
Argon + CO_2 (1to 2.5%)

The heat imput must not exceed 2 kJ/mm and the interpass temperature should remain below 150°C.

UGIWELD™ 4455

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	0.30 – 0.65	5.0 – 9.0	15.0 – 18.0	19.0 – 22.0	2.5 – 3.0	≤ 0.5	0.1 – 0.2

14-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG		MIG	
Temperature	-136°C	20°C	-196°C	20°C
Tensile (MPa)		660		650
Yield (MPa)		460		450
Elongation (5Ø) (%)		30		30
Impact ISO V (J/cm^2)			40	80

UGIWELD™ 4829

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	0.08 – 0.12	0.65 – 1.2	1.0 – 2.5	12.0 – 14.0	22.0 – 24.0	≤ 0.5	≤ 0.5

16-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Austenitic grade

Standards

» EN ISO 14343 - A 22.12 H

» AWS SFA 5.9 (ER 309Si)

Corrosion resistance

» Temperature shall not exceed 950°C for use under intermittent oxidation conditions.

» Good performance under carburizing atmospheres. This grade may be used in contact with fused salts and can also be used in some cases of contamination by fuel ashes.

The above are general indications intended to guide users in their choice. For each more specific case, please contact us.

Applications

Because of its high temperature oxidation and corrosion resistance, UGIWELD™ 4829 is recommended for the following applications:

» Industrial furnace and boiler parts.

» Annealing chambers.

» Heat exchangers.

» Fused salt treatment installations.

Due to its high ferrite level, UGIWELD™ 4829 is very well suited for the first layer during stainless steel cladding on carbon steel.

UGIWELD™ 4829

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	0.08 – 0.12	0.65 – 1.2	1.0 – 2.5	12.0 – 14.0	22.0 – 24.0	≤ 0.5	≤ 0.5

16-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	20	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A. Inter pass must be controlled to less than 150°C.

UGIWELD™ 4829 is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above mentioned welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		620			600	
Yield (MPa)		420			400	
Elongation (5Ø) (%)		25			25	
Striction (%)		60			55	
Impact ISO V (J/cm²)		150			130	

UGIWELD™ B6N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.025	≤ 1.0	1.0 – 2.5	24.0 – 26.0	19.5 – 21.5	4.2 – 5.2	1.2 – 2.0	0.1 – 0.2

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Super Austenitic grade

Standards

» EN ISO 14343 - A 20 25 5 Cu N L

» AWS A5.9 (ER 385)

Corrosion resistance

» General corrosion resistance far superior to 316L, especially in sulphuric and phosphoric medias.

» Pitting and crevice corrosion resistance higher than austenitic stainless steel type 317L.

» Stress corrosion resistance higher than standard austenitic stainless steels.

Applications

UGIWELD™ B6N is a filler metal suited to "super austenitic" stainless steel welding type 904L and derivatives.

» Phosphates, phosphoric acid and chemical fertiliser industries. Sulphuric acid industry.

» Exchangers and condensers for chemical industry.

» Flue pipes.

» Sea water applications.

Because of its Nitrogen content, UGIWELD™ B6N is insensitive to hot cracking, and its mechanical properties are significantly improved.

UGIWELD™ B6N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.025	≤ 1.0	1.0 – 2.5	24.0 – 26.0	19.5 – 21.5	4.2 – 5.2	1.2 – 2.0	0.1 – 0.2

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/29	26/29	26/29	27/29
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ B6N is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-196°C	20°C	400°C
Tensile (MPa)		600	400		580	400
Yield (MPa)		400	250		400	250
Elongation (5Ø) (%)		30	28		30	28
Striction (%)		50			50	
Impact ISO V (J/cm²)	60	130		50	120	

FERRITIC

UGIWELD™ 409Nb

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.08	≤ 1.0	≤ 0.8	≤ 0.6	10.5 – 13.5	≤ 0.5	≤ 0.75

14-04-2016 – REV04

Category

Stainless steel welding wires

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A Z 13 Nb

» AWS A 5.9 ER409Nb

Applications

UGIWELD™ 409Nb is especially suitable for welding ferritic stainless steels such as type 409 used for catalytic exhaust.

For this application, sheets are very thin (1 to 2 mm).

Recommended welding conditions

Due to grain growth:

» Use the smallest diameter (1.2 mm max)

» Avoid multipass

» Restrict heat imput at 0.25 kJ/mm

The best way to limit heat imput is to have very high welding speed (about ≥1 m/min) workable in MIG process.

MIG

» Shielding gas:

» Recommanded shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5 %)

Typical parameters in spray arc with a 1.00 mm wire

» Current: 180 to 250 A

» Voltage: 26 to 29 V

» Welding speed: 100 to 200 cm/min

» No preheating, no post weld heat treatment.

UGIWELD™ 409Nb

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.08	≤ 1.0	≤ 0.8	≤ 0.6	10.5 – 13.5	≤ 0.5	≤ 0.75

14-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

Tensile test

Values measured on as welded assembly of 409 sheets, thickness 1.5 mm, in MIG process.

Rm (MPa)	E 0,2 (MPa)	A %	Rupture Zone
410	260	25	Base metal

Hardness measurements

Small increase in weld metal compared to base metal (+ 30/40 HV100).

Erichsen test

Erichsen deflection on welded assembly reach 85% of the values on base material.

Fatigue test at high temperature

The 409 sheets welded with the wire UGIWELD™ 409Nb have been tested between 300°C to 850°C.

After 200 000 cycles, the values are the same as with an austenitic filler metal.

EXHAUST® F1

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	≤ 0.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A 18 L Nb

» AWS A5.9 **(430 LNb)

*** Usual naming not referenced in the standard AWS A5.9*

Available presentation

Exhaust® F1 welding wire is an improvement in the technology of welding of the exhaust line.

» Quality: welds have a better behaviour in exhaust line than if obtained with type 308LSi, 307Si or 409Nb

» Cost: improvement of the productivity by an increasing welding speed.

» Price: no influence by the Nickel quotation.

Corrosion resistance

» No intergranular corrosion on stabilized stainless steel assemblies (according to ASTM A262E test procedure), provided that the gas specifications are respected.

» Dip-Dry simulation of external or internal corrosion between 300°C and 800°C shows a corrosion resistance of the weld zone equivalent to that of the base metal.

» The cyclic oxidation test didn't show any penetration of oxide on ferritic AISI 441/AISI 441 assemblies, whereas assemblies obtained with austenitic wires show.

Applications

Welding of stabilized ferritic stainless steels used in exhaust applications

EN	1.4512	1.4510	1.4526	1.4509
AISI	409	439	436	441

Welding of heterogeneous assemblies in exhaust system applications including carbon steel (Fe 37…) and austenitic (AISI 304…) or ferritic stainless steel base metals.

EXHAUST® F1

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	≤ 0.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Recommended welding conditions

MIG / GMAW

Recommended shielding-gas:

» Argon + Oxygen (1 to 3%)

» Argon + CO_2(1 to 2%)

» Nitrogen and hydrogen are forbidden

» Conditions for 1.0 mm diameter wire in spray arc transfer

» For more information contact us

To avoid growth in the weld zone, welding wires are limited to 1.2 m maxi diameter and pulsed current is recommended.

TIG / GTAW

GTAW parameters are similar of those of welding wire type 308LSi:

Intensity (A)	Voltage (V)	Shielding-gas
50-250	10 to 15	Pure argon

Nitrogen and hydrogen are forbidden.

EXHAUST® F1

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	≤ 0.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Mechanical properties on as welded ferritic stainless steel assemblies

Tensile test

On welded assemblies have mechanical properties at least equivalent as those of the base metal.

Hardness measurements

The micro hardness profiles HV 100g across the welded seams are ‘flat’ thanks to a wholly ferritic structure.

Erichsen cupping test

Erichsen deflection of weld seams is greater than 90% of the values obtained on base metals. Their drawability is much better than the drawability of assemblies with austenitic wires.

Fatigue tests at high temperature and thermal fatigue

Welds of ferritic stainless steel sheets obtained with EXHAUST® F1 wire exhibit, compared to that obtained with 308LSi or 307Si, behaviors:

» Far better in thermal fatigue between 250 and 900°C

» Identical in high cycle fatigue at 300, 750, 850 and 950°C

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A 18 L Nb Si

» AWS A5.9 **(430 LNbSi)

*** Usual naming not referenced in the standard AWS A5.9*

General presentation

EXHAUST® F1 Evo is a new stabilized ferritic grade and evolution of EXHAUST® F1, welding filler wire widely used since the early 2000s for welding automobile exhaust lines.

While preserving all the many advantages offered by the EXHAUST® F1 for welding stainless steel, whether ferritic or austenitic, and the low carbon steels used in automobile exhaust lines, the EXHAUST® F1 Evo offers several advantages over its predecessor:

» greater implementation facility for exhaust manufacturers (more widely spread beads that collapse less, brighter beads with fewer projections)

» significantly improved weld life of the exhausts (gain of approximately 50% by heat cycling between T = 250 and T > 900°C on ferritic assemblies

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Microstructure on welded joints

Edge to edge welded joints of bi-stabilized ferritic 1.4509 plates were made using EXHAUST® F1 Evo filler wire.

The MIG welding conditions were as follows:

» Base metal thickness: 1.5 mm

» Filler wire diameter: 1 mm

» Voltage (smooth): 30 V

» Welding speed: 208 cm/min

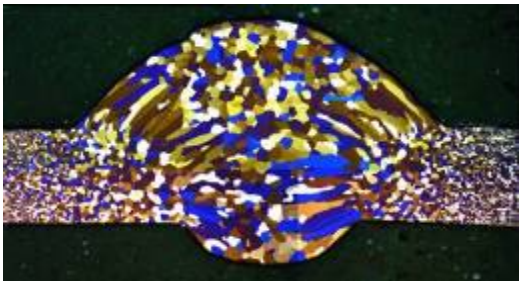
» Wire speed: 10 m/min

» Front welding gas: Argon + 2%CO_2 (18 l/min)

» Back protection gas: Pure Argon (8 l/min)

» Average resulting intensity: 205 to 215 A

» Resulting linear welding energy:
1.80 to 1.95 kJ /cm



MIG edge to edge welding of sheet metal with thickness of 1.5 mm of 1.4509 plates with EXHAUST® F1 Evo filler wire.

Welded joint corrosion resistance

Generalized Corrosion

» EXHAUST® F1 Evo, because of its high chromium content (18%) produces welds with generalized resistance to corrosion equalling or exceeding the plates it is intended for, in particular for stabilized ferritic sheet metal plates with 17% chromium widely used in automotive exhaust.

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Localized Corrosion

» **Intergranular Corrosion**

Test ASTM A262-E revealed excellent resistance to intergranular corrosion of ferritic assemblies (thanks to the stabilization of the grade by niobium), even when using high amount of CO_2 in the shielding gas (tested up to 8% of CO_2).

» **Corrosion Under Stress**

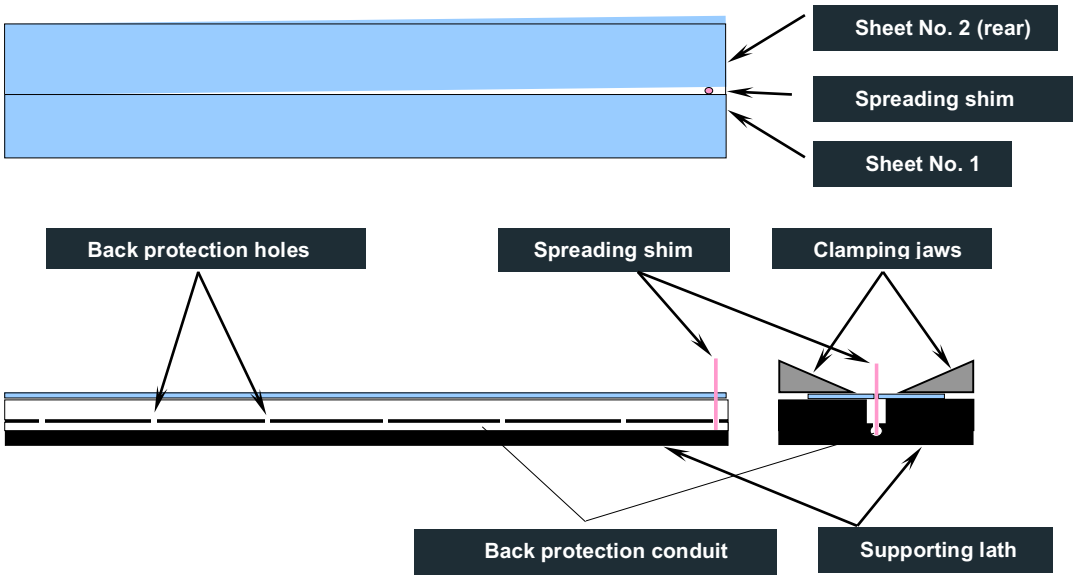
Like all the ferritic grades, EXHAUST® F1 Evo and assembly welds using this wire are not exposed to phenomena of corrosion under stress.

Implementation of MIG wire in "Exhaust" environment

Resistance to liquid bath collapse

Specific "resistance to collapse" tests have been performed to simulate the industrial difficulties of obtaining collapse-free welds related to the non-optimum quality of automatic approaches between the parts to be welded.

To do this, edge to edge assemblies of thin sheet metal parts (1.5 mm) were made with a continuously variable gap between the plates of between 0 and 1 mm (see the following schematic diagram). Comparatively, we tested EXHAUST® F1 Evo filler wires and wires bearing EXHAUST® F1 and UGIWELD™4370M references. Average abscissas (5 measurements) where collapsing occurred were measured and converted into average deviations between plates.



The following tables summarize the results obtained, demonstrating that EXHAUST® F1 Evo offers far higher performance than EXHAUST® F1 approaching UGIWELD™4370M, allowing us to consider setting up conditions for industrial welding installations that are much easier compared to the trickier arrangements of EXHAUST® F1.

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Average gap (5 measurements) between 1.4509 stabilized ferritic sheets when collapsing.

Grade	Ar gas + 2 % CO_2	Ar gas + 4 % CO_2	Ar gas + 8 % CO_2
EXHAUST® F1	0.31 mm	0.34 mm	0.13 mm
EXHAUST® F1 Evo	0.57 mm	0.58 mm	0.28 mm
UGIWELD™4370M	0.84 mm	0.76 mm	0.49 mm

Average gap (5 measurements) between austenitic 1.4307 sheets when collapsing.

Grade	Ar gas + 2 % CO_2	Ar gas + 4 % CO_2	Ar gas + 8 % CO_2
EXHAUST® F1	0.46 mm	0.48 mm	0.24 mm
EXHAUST® F1 Evo	0.61 mm	0.63 mm	0.26 mm
UGIWELD™4370M	0.75 mm	0.83 mm	0.53 mm

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Bead appearance

Beads produced with EXHAUST® F1 Evo have fewer projections and are often brighter (less oxidization) than those obtained under the same conditions with EXHAUST® F1 or UGIWELD™4370M.

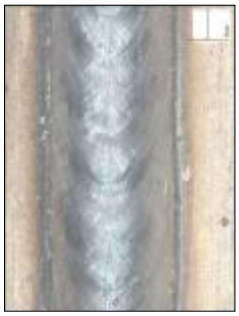
The following pictures reveal the less oxidized effect observed with EXHAUST® F1 Evo on MIG deposits on austenitic sheet metal in low oxidizing gas (Ar + 2%CO_2) and in highly oxidizing gas (Ar + 8%CO_2).

Shielding gas: Ar + 2%CO_2

EXHAUST® F1

EXHAUST® F1 Evo

UGIWELD™4370M



EXHAUST® F1

EXHAUST® F1 Evo

UGIWELD™4370M

Front gas: Ar + 8%CO_2

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Thermal Fatigue

Resistance of welded joints to "Exhaust" environment obtained, demonstrating an improved life duration of the assemblies using EXHAUST® F1 Evo.

Specific "thermal fatigue" tests were carried out to simulate the up and down cycles in temperature of automotive exhausts and their consequences on the deterioration of exhaust line welded assemblies.

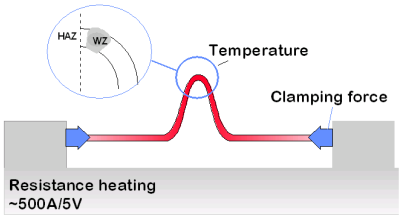
To do this, specimens (see diagram below) were put through cycles ranging from 250 to ~ 935°C (assembly 1) or between 250 and ~ 910°C (assembly 2) through to cracking (reduction of the maximum forces measured on each 50% cycle because of the propagation of a crack).

The following table summarizes the results of the EXHAUST® F1 Evo

» + 50% compared to those obtained with EXHAUST® F1

» + 80% compared to those obtained with UGIWELD™4370M

Assembly schematic diagram for thermal fatigue



Life duration = nb of cycles from 250°C to 900°C (about 200 s / cycle)
until 50% reduction of clamping force

Number of cycles to failure (average of 3 tests per filler wire and assembly)

Grade	Assembly	Nber of cycles with force reduced by 50%	Average
EXHAUST® F1	1	3074	3793
	2	4512	
EXHAUST® F1 Evo	1	4911	5726
	2	6540	
UGIWELD™4370M	1	2624	3207
	2	3790	

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Welding parameters

MIG welding

Recommended shielding gas:

» Argon + Oxygen 1 to 3% (15-20 l/min)

» Ar + CO_2 1 to 2% (15-20 l/min)

Nitrogen and hydrogen are prohibited, helium can partially replace argon.

For information, welding conditions to obtain a "spray" regime with 1 mm wire:

» Voltage 22 to 26V (smooth)

» Wire speed 9 to 11 m/min

» Welding speed 100 to 200 cm/min

Inducing average welding intensity of 180 to 250 A and linear welding energy of between 1.8 and 2.2 kJ/cm. For more information, consult us.

To avoid the grain growth in HAZ (Heat Affected Zones), the recommended wire diameter is 1 mm (maximum 1.2 mm) We recommend using a "pulsed" welding method. For the same reasons, multipass deposits are prohibited.

TIG Welding

With this process, the welding conditions to be used are the same as those used for EXHAUST® F1 or type 308LSi filler wires, for information:

» Intensity: 50 to 250 A

» Voltage: 10 to 15 V

» Shielding gas: Argon (+/- Helium).

Nitrogen and hydrogen are prohibited in shielding gases.

EXHAUST® F1 Evo

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Nb
	≤ 0.02	0.5 – 1.5	≤ 0.8	≤ 0.5	17.8 – 18.8	≤ 0.5	≤ 0.5	0.05 + 7x(C+N) – 0.5

14-04-2016 – REV04

Heat Treatment

No heat treatment is to be performed before or after welding

Welded joint surface treatment

Pickling

For a local pickling, at room temperature, the following bath can be used for a few minutes: 50%vol. water + 45%vol. hydrochloric acid 35% + 5%vol. nitric acid 52%.

There are also pickling pastes designed specifically for the job. Pickling treatment must be followed by rinsing with water and passivation.

Passivation

Passivation can then be performed in the following cold bath for a few minutes: 75%vol. water + 25%Vol. nitric acid 52%. It must be followed by rinsing in water.

Applications

Developed for the MIG/TIG welds of automobile exhaust lines, EXHAUST® F1 Evo is more generally suitable for welding of the following grades:

» Stabilized ferritic stainless steels

» Austenitic stainless steels

» Low carbon steels (manifold flanges…)

And for homogeneous and heterogeneous sheet metal configurations (i.e. sheets of different grades are welded together).

EXHAUST® Bi Stab

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti	Nb
	≤ 0.03	≤ 1.5	≤ 1.0	≤ 0.5	17.5 – 19.5	≤ 0.5	≤ 0.5	10xC – 0.5	8xC – 0.8

16-04-2014 – REV02

Category

Stainless steel welding wire

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A 18 L Nb Ti

» AWS A5.9 **(430 LNbTi)

*** Usual naming not referenced in the standard AWS A5.9*

General presentation

EXHAUST® Bi Stab is one of the stabilised ferritic filler wire variants offered by Ugitech for welding automotive exhaust lines.

Its bi-stabilisation with niobium and titanium gives it the advantages of both these ferritic structure stabilisers:

» Titanium minimises grain growth in Weld Metal zones (WM) due to titanium nitride (TiN) precipitation in the still liquid metal in these zones, thus avoiding the risk of brittleness, which may sometimes occur when very thick welds are made (> 3 mm of sheet metal to be welded).

» Niobium traps the residual carbon and nitrogen through its transfer of between 85 and 95% in the welding arc under all standard welding conditions, thus avoiding any risk of intergranular corrosion in the WM.

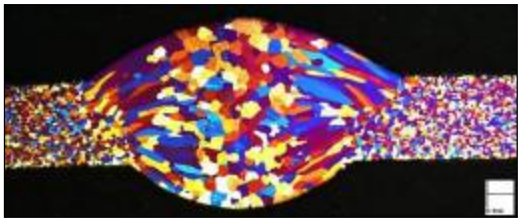
EXHAUST® Bi Stab

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti	Nb
	≤ 0.03	≤ 1.5	≤ 1.0	≤ 0.5	17.5 – 19.5	≤ 0.5	≤ 0.5	10xC – 0.5	8xC – 0.8

16-04-2014 – REV02

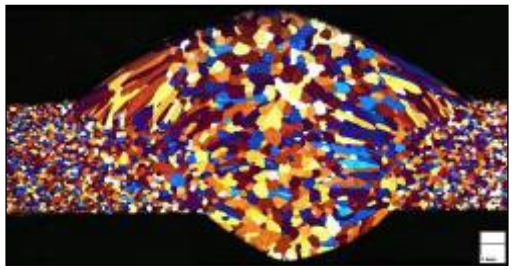
Microstructure

Edge-to-edge welding of bi-stabilised ferritic sheet metals (1.4509) under argon+ 2% CO_2 with EXHAUST® Bi Stab MIG filler wire ∅ 1 mm



1.4 mm thick sheets

(U = 23 V; Vf = 10 m/min; Vs = 1.7 m/min)



2.0 mm thick sheets

(U = 26 V; Vf = 12 m/min; Vs = 1.2 m/min)

Mechanical properties

Tensile test data for ∅ 1 mm MIG wire

Temperature T (°C)	Tensile strength Rm (MPa)	Yield strength Rp0.2% (MPa)	Elongation A (%)
20	1100	990	3.0

Values given for information only

EXHAUST® Bi Stab

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti	Nb
	≤ 0.03	≤ 1.5	≤ 1.0	≤ 0.5	17.5 – 19.5	≤ 0.5	≤ 0.5	10xC – 0.5	8xC – 0.8

16-04-2014 – REV02

Physical properties

Temperature (°C)	Density (kg/dm^3)	Elasticity modulus (N/mm^2)	Thermal conductivity (W/m.°C)	Expansion coefficient (/°C)	Electrical resistivity (µΩ.mm)	Specific heat (J/kg.°C)
20	7.7	220	25	-	60	460
100		215		10.0		
200		210		10.0		
300		205		10.5		
400		195		10.5		

Welding

EXHAUST® Bi Stab filler wire is designed for welding stabilised ferritic stainless steel sheets, whatever their stabilising element (1.4509, 1.4510, 1.4511, 1.4512, etc.). It can, however, also be used in certain cases for heterogeneous welding of ferritic stainless steel/austenitic stainless steel or austenitic stainless steel/austenitic stainless steel.

The niobium present in the filler grade ensures its stabilisation (essential for preventing intergranular corrosion phenomena in the WM during use).

Although bi-stabilisation with niobium and titanium ensures a stabilised WM, including when highly oxidising and recarburising gases such as argon + 8% CO_2 are used, slightly oxidising shielding gas is preferred (argon [possibly partly substituted by helium] + 1 to 3% CO_2 or O_2) and this will give the welds a slightly oxidised surface appearance. H_2 and N_2 are prohibited in shielding gas.

Heat treatment

Homogeneous welds (stabilised ferritic sheet metal welds) must not be subjected to heat treatment above 900°C, as this may cause grain growth in the heat-treated zone and weaken the toughness of these welds.

Applications

Developed for MIG/TIG welding on automotive exhaust lines, EXHAUST® Bi Stab is most suitable for welding the following grades:

» Stabilised ferritic stainless steels

» Austenitic stainless steels

and in both homogeneous and heterogeneous sheet metal configurations (sheets of different grades welded together).

UGIWELD™ 439

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	≤ 0.8	≤ 0.8	≤ 0.5	17.0 – 18.0	≤ 0.5	≤ 0.5	10xC – 1.1

16-04-2016 – REV01

Category

Stainless steel welding wire

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A Z 18 L Ti

» AWS A5.9 ER439

General presentation

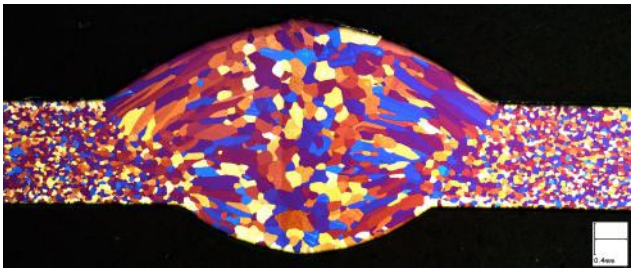
Also delivered under UGIWELD™ 430Ti trade mark

UGIWELD™ 439 is one of the stabilised ferritic filler wire variants offered by Ugitech for welding automotive exhaust lines. It is stabilised by titanium to minimise grain growth in Weld Metal zones (WM) and thus avoid the risk of brittleness, which may sometimes occur when very thick welds are made (> 3 mm of sheet metal to be welded).

We wish to draw attention to the fact that unlike EXHAUST® F1 and EXHAUST® F1 Evo (ferritic stainless steel filler wires stabilised with niobium), MIG filler wires stabilised with titanium such as UGIWELD™ 439 require properly controlled welding conditions (mainly welding energy and shielding gas) to ensure that the WM zones are well stabilised and thus avoid any risk of intergranular corrosion in these zones.

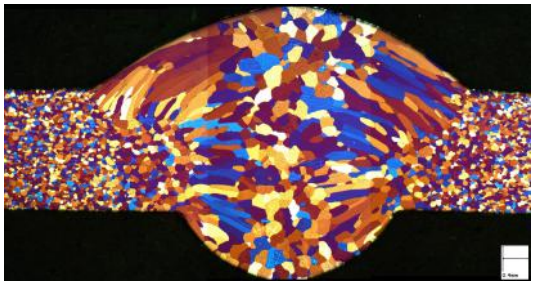
Microstructure

Edge-to-edge welding of bi-stabilised ferritic stainless steel sheets (1.4509) under argon + 2% CO_2 with UGIWELD™ 439 MIG filler wire ∅ 1 mm



1.4 mm thick sheets

(U = 23 V; Vf = 9 m/min; Vs = 1.5 m/min)



2.0 mm thick sheets

(U = 26 V; Vf = 12 m/min; Vs = 1.2 m/min

UGIWELD™ 439

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	≤ 0.8	≤ 0.8	≤ 0.5	17.0 – 18.0	≤ 0.5	≤ 0.5	10xC – 1.1

16-04-2016 – REV01

Mechanical properties

Tensile test data for ∅ 1 mm MIG wire

Temperature T (°C)	Tensile strength Rm (MPa)	Yield strength Rp0.2% (MPa)	Elongation A (%)
20	1120	1000	3.5

Physical properties

Temperature (°C)	Density (kg/dm^3)	Elasticity modulus (N/mm^2)	Thermal conductivity (W/m.°C)	Expansion coefficient (/°C)	Electrical resistivity (µΩ.mm)	Specific heat (J/kg.°C)
20	7.7	220	25	-	60	460
100		215		10.0		
200		210		10.0		
300		205		10.5		
400		195		10.5		
500				11.0		

Welding

UGIWELD™ 439 filler wire is designed for welding stabilised ferritic stainless steel sheets, whatever their stabilising element (1.4509, 1.4510, 1.4511, 1.4512, etc.). It can, however, also be used in certain cases for heterogeneous welding of ferritic stainless steel/austenitic stainless steel or austenitic stainless steel/austenitic stainless steel.

The titanium present in the filler grade ensures its stabilisation (essential for preventing intergranular corrosion phenomena in the WM during use). However, unlike EXHAUST® F1 and EXHAUST® F1 Evo (ferritic stainless steel filler wires stabilised with niobium), MIG filler wires stabilised with titanium, such as UGIWELD™ 439, require well controlled welding conditions to ensure that the WM zones are properly stabilised and thus avoid any risk of intergranular corrosion in these zones.

In particular, it is important to use very slightly oxidising shielding gases (argon [possibly partly substituted by He] + 1 to 2.5% CO_2 or O_2; H_2 and N_2 are prohibited) and, as far as possible, minimise welding heat input by preferring "short-circuit", rather than "spray" transfers in the welding arc.

Heat treatment

Homogeneous welds (stabilised ferritic sheet metal welds) must not be subjected to heat treatment above 900°C, as this may cause grain growth in the heat-treated zone and weaken the resilience of these welds.

UGIWELD™ 439

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	≤ 0.8	≤ 0.8	≤ 0.5	17.0 – 18.0	≤ 0.5	≤ 0.5	10xC – 1.1

16-04-2016 – REV01

Applications

Developed for MIG/TIG welding on automotive exhaust lines, UGIWELD™ 439 is most suitable for welding the following grades:

» Stabilised ferritic stainless steels

» Austenitic stainless steels

and in both homogeneous and heterogeneous sheet metal configurations (sheets of different grades welded together).

UGIWELD™ 439M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	0.8 – 1.0	≤ 0.8	≤ 0.5	17.0 – 19.0	≤ 0.5	≤ 0.5	10xC – 1.1

16-04-2016 – REV01

Category

Stainless steel welding wire

Classification

Stabilised ferritic grade

Standards

» EN ISO 14343 – A Z 18 L Ti Si

» AWS A5.9 (ER439)

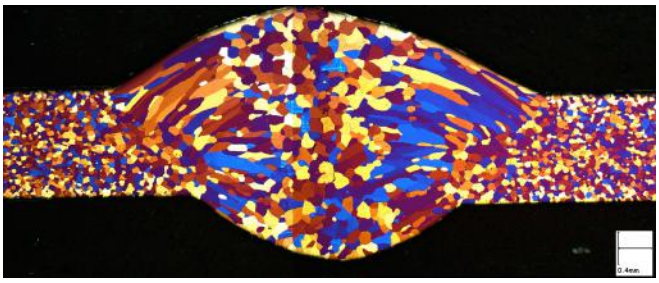
General presentation

UGIWELD™ 439M is one of the stabilised ferritic filler wire variants offered by Ugitech for welding automotive exhaust lines. It is stabilised by titanium to minimise grain growth in Weld Metal zones (WM) and thus avoid the risk of brittleness, which may sometimes occur when very thick welds are made (> 3 mm of sheet metal to be welded).

We wish to draw attention to the fact that unlike EXHAUST® F1 and EXHAUST® F1 Evo (ferritic stainless steel filler wires stabilised with niobium), MIG filler wires stabilised with titanium such as UGIWELD™ 439M requires properly controlled welding conditions (mainly welding energy and shielding gas) to ensure that the WM zones are properly stabilised and thus avoid any risk of intergranular corrosion in these zones.

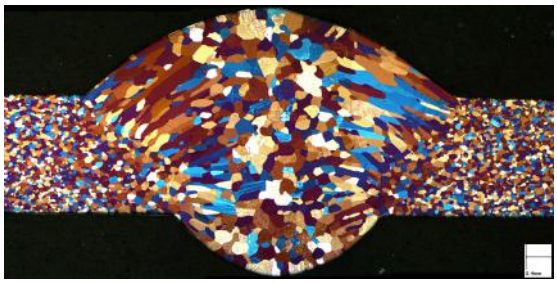
Microstructure

Edge-to-edge welding of bi-stabilised ferritic stainless steel sheets (1.4509) under argon + 2% CO_2 with UGIWELD™ 439M MIG filler wire ∅ 1 mm



1.4 mm thick sheets

(U = 23 V; Vf = 9 m/min; Vs = 1.5 m/min)



2.0 mm thick sheets

(U = 26 V; Vf = 12 m/min; Vs = 1.2 m/min)

UGIWELD™ 439M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	0.8 – 1.0	≤ 0.8	≤ 0.5	17.0 – 19.0	≤ 0.5	≤ 0.5	10xC – 1.1

16/04/2016 – REV01

Mechanical properties

Tensile test data for ∅ 1 mm MIG wire

Temperature T (°C)	Tensile strength Rm (MPa)	Yield strength Rp0.2% (MPa)	Elongation A (%)
20	1150	1010	4.0

Values given for information only

Physical properties

Temperature (°C)	Density (kg/dm^3)	Elasticity modulus (N/mm^2)	Thermal conductivity (W/m.°C)	Expansion coefficient (/°C)	Electrical resistivity (µΩ.mm)	Specific heat (J/kg.°C)
20	7.7	220	25	-	60	460
100		215		10.0		
200		210		10.0		
300		205		10.5		
400		195		10.5		
500				11.0		

Welding

UGIWELD™ 439M filler wire is designed for welding stabilised ferritic stainless steel sheets, whatever their stabilising element (1.4509, 1.4510, 1.4511, 1.4512, etc.). It can, however, also be used in certain cases for heterogeneous welding of ferritic stainless steel/austenitic stainless steel or austenitic stainless steel/austenitic stainless steel.

The titanium present in the filler grade ensures its stabilisation (essential for preventing intergranular corrosion phenomena in the WM during use). However, unlike EXHAUST® F1 and EXHAUST® F1 Evo (ferritic stainless steel filler wires stabilised with Nb), MIG filler wires stabilised with titanium, such as UGIWELD™ 439M, require well controlled welding conditions to ensure that the WM zones are properly stabilised and thus avoid any risk of intergranular corrosion in these zones.

In particular, it is important to use very slightly oxidising shielding gases (Ar [possibly partly substituted by He] + 1 to 2.5% CO_2 or O_2; H_2 and N_2 are prohibited) and, as far as possible, minimise welding input by preferring "short-circuit", rather than "spray" transfers in the welding arc.

UGIWELD™ 439M

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Ti
	≤ 0.03	0.8 – 1.0	≤ 0.8	≤ 0.5	17.0 – 19.0	≤ 0.5	≤ 0.5	10xC – 1.1

16/04/2016 – REV01

Heat treatment

Homogeneous welds (stabilised ferritic sheet metal welds) must not be subjected to heat treatment above 900°C as this may cause grain growth in the heat-treated zone and weaken the resilience of these welds.

Applications

Developed for MIG/TIG welding on automotive exhaust lines, UGIWELD™ 439M is most suitable for welding the following grades:

» Stabilised ferritic stainless steels

» Austenitic stainless steels

and in both homogeneous and heterogeneous sheet metal configurations (sheets of different grades welded together).

DUPLEX

UGIWELD™ 312

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.15	0.30 – 0.65	1.0 – 2.5	8.0 – 10.5	28.0 – 32.0	≤ 0.75	≤ 0.75

14-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Duplex stainless steel.

Standards

- EN ISO 14343 - A 29 9
- AWS - A 5.9 : ER312
- W.Nr 1.4337

Approvals

	SAW
TÜV (Germany)	X
CE	X

Corrosion resistance

- This grade is essentially used for heterogeneous welding. So, corrosion resistance is not a specific requirement.
- However, its high Chromium content gives to UGIWELD™ 312 a very high temperature oxidation resistance up to 1150°.

Applications

Thanks to high ferrite level, UGIWELD™ 312 is very adapted to heterogeneous welding, especially when one of the components is fully austenitic. Its high Chromium content gives the possibility to keep an adequate ferrite level in the austenitic matrix

In the same way, its chemical composition allows a deep dilution with austenitising elements, keeping in the same time a two-phase structure and so keeping a very high hot cracking resistance.

Due to its high chromium content (risk of sigma phase formation) multipass welding is not recommanded.

UGIWELD™ 312

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu
	≤ 0.15	0.30 – 0.65	1.0 – 2.5	8.0 – 10.5	28.0 – 32.0	≤ 0.75	≤ 0.75

14-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon and/or Helium.

» **Welding parameters:**
Follow the recommendations of the torch producer:
Current 50 - 250 A
Voltage 10 - 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Recommended shielding gases are:
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)

» **Welding parameters:**

Ø Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	25/28	26/29	26/29	27/30
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current above 250 A.

Interpass must be controlled to less than 150°C.

UGIWELD™ 312 is suited for pulsed arc welding.

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196° C	20° C	400°C	-196°C	20°C	400°C
Tensile (MPa)		750			720	
Yield (MPa)		530			510	
Elongation (5Ø) (%)		25			25	
Striction (%)		32			28	
Impact ISO V (J/cm²)		100			80	

UGIWELD™ 45N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	≤ 0.9	0.5 – 2.0	7.5 – 9.5	21.5 – 23.5	2.5 – 3.5	≤ 0.5	0.1 - 0.2

ESPY FERRITE = 20/40 %

16-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Duplex grade

Standards

» EN ISO 14343 – A 22 9 2 N L

» AWS A5.9 ER2209

Approvals

	MIG	TIG
TÜV (Germany)	X	X
CE	X	X
DB	X	X

Corrosion resistance

» Corrosion resistance is higher than for 316L.

» Pitting corrosion resistance is the same as for 904L

» Stress corrosion resistance is far higher than for austenitic stainless steels in medias with chlorides, and for temperatures between 50°C and 300°C.

Applications

UGIWELD™ 45N is suited for joining austenitic-ferritic stainless steels such as UNS S32205 and all other Lean Duplex stainless steels.

» Acid gas industry and « offshore »

» Chemical products transportation

» Medias with chlorides

» Urea production

» Other industries: depollution, pulp and paper industry…

UGIWELD™ 45N is also suited for heterogeneous welding of Duplex stainless steels and stainless steels with unalloyed and low alloyed grades.

UGIWELD™ 45N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	≤ 0.9	0.5 – 2.0	7.5 – 9.5	21.5 – 23.5	2.5 – 3.5	≤ 0.5	0.1 - 0.2

ESPY FERRITE = 20/40 %

16-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**

Pure Argon

» **Welding parameters:**

Current	100 - 200 A
Voltage	10 - 20 V

Interpass must be controlled to less than 150°C.

Heat input must be controlled to less than 2 kJ/mm

MIG welding

» **Shielding gas:**

Recommended shielding gases are

Argon + Oxygen (1 to 3 %)

Argon + CO_2 (1 to 2.5 %)

Under no circumstances should hydrogen be added to the shielding gas.

» **Welding parameters:**

Short-Arc:

Current (A)	60 - 150 A
Voltage (V)	15 - 20 V

Spray-Arc:

Current (A)	140 - 350 A
Voltage (V)	26 - 30 V

Interpass must be controlled to less than 150°C.

Heat input must be controlled to less than 2 kJ/mm

UGIWELD™ 45N is suited for pulsed arc welding

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-60° C	20° C	300°C	-60°C	20°C	300°C
Tensile (MPa)		800			750	
Yield (MPa)		600			600	
Elongation (5Ø) (%)		27			24	
Striction (%)		60			50	
Impact ISO V (J/cm^2)	80	100		50	80	

UGIWELD™ 25.9.4

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N	W
	≤ 0.03	≤ 1.0	≤ 2.5	8.0 – 10.5	24.0 – 27.0	2.5 – 4.5	≤ 1.5	0.2 - 0.3	≤ 1.0

16-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Super Duplex grade

Standards

» EN ISO 14343 – A 25 9 4 N L

» AWS A5.9 ER2594

Approvals

	MIG	TIG
TÜV (Germany)	X	X
CE	X	X
DB	X	X

Corrosion resistance

UGIWELD™ 25.9.4 is a high alloy duplex stainless steel (austenitic-ferritic) which shows:

» Outstanding resistance to a wide range of highly corrosive media under oxidizing and reducing conductions.

» High resistance to erosion corrosion and corrosion fatigue.

» Excellent resistance to pitting and crevice corrosion and to stress corrosion cracking in chloride environment.

» Very high mechanical strength.

Applications

Welding of plates, sheets, and tubes in the chemical and petrochemical process industry (chloride environment), in the pulp and paper industry, pollution control equipment for environmental protection.

Recommended welding conditions

UGIWELD™ 25.9.4 is used for welding of duplex, super-austenitic stainless steels and suitable for cladding a wide range of steels in particularly aggressive environments.

UGIWELD™ 25.9.4

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N	W
	≤ 0.03	≤ 1.0	≤ 2.5	8.0 – 10.5	24.0 – 27.0	2.5 – 4.5	≤ 1.5	0.2 - 0.3	≤ 1.0

16-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG	
Temperature	-40°C	20°C
Tensile (MPa)		800
Yield (MPa)		650
Elongation (5Ø) (%)		30
Impact ISO V (J/cm^2)	150	

UGIWELD™ 52N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	≤ 1.0	≤ 1.5	4.5 – 6.5	24.0 – 27.0	2.9 – 3.9	1.5 – 2.5	0.1 – 0.25

ESPY FERRITE = 20/45 %

16-04-2016 – REV04

Category

Stainless steel welding wire

Classification

Super Duplex grade

Standards

» EN ISO 14343 – A Z 25 5 3 Cu N L

» AWS A5.9 ER2553

Applications

UGIWELD™ 52N is suited for joining austenitic-ferritic stainless steels such as UNS S32550 and all other Super Duplex stainless steels.

» Sea water systems.

» Phosphoric acid production and transportation.

» Pulp and paper industry.

» Scrubbers for depollution.

» Strippers and reactors for urea production.

» Acid gas industry and offshore.

UGIWELD™ 52N is also suitable for joining all Duplex stainless steels, unalloyed and low alloyed grades

UGIWELD™ 52N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	≤ 1.0	≤ 1.5	4.5 – 6.5	24.0 – 27.0	2.9 – 3.9	1.5 – 2.5	0.1 – 0.25

ESPY FERRITE = 20/45 %

16-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas**

UGIWELD™ 52N must be used with a small amount Nitrogen (3 to 5 %) in Argon gas for over-alloying.
Hydrogen should not be added to the shielding gas.

» **Welding parameters:**

Current	100 - 200 A
Voltage	10 - 20 V

Interpass must be controlled to less than 150°C

Heat input 0.6 to 2.2 kJ/mm as indicated below.

MIG welding

» **Shielding gas:**

Recommanded shielding gas is:

Argon + CO_2 (1 to 2.5%) + Azote (3 to 5%)

This type of mixed gas gives the best ratio for smooth transfer, low porosity and over-alloying.

Hydrogen should not be added to the shielding gas.

Welding parameters:

» Short-Arc

Current	90 / 140 A
Voltage	19 / 22 V

Normal Spray-Arc is possible but no recommended.

Pulsed arc is recommended for a good transfer.

Interpass must be controlled to less than 150°C

UGIWELD™ 52N

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	N
	≤ 0.03	≤ 1.0	≤ 1.5	4.5 – 6.5	24.0 – 27.0	2.9 – 3.9	1.5 – 2.5	0.1 – 0.25

ESPY FERRITE = 20/45 %

16-04-2016 – REV04

Heat input must be controlled as follows:

	BUTT WELD				FILLET WELD			
Welding process	Pulsed GMAW		GTAW		Welding process		Pulsed GMAW	
Welding gaz	Ar 95,5% + CO_2 1,5% + N2 3%		Ar + N2 4%		Welding gaz		Ar 95,5% + CO_2 1,5% + N2 3%	
Plate thickness (mm)	**Mini Heat Input (kJ / mm)**	**Maxi Heat Input (kJ / mm)**	**Mini Heat Input (kJ / mm)**	**Maxi Heat Input (kJ / mm)**	**Mini Heat Input (kJ / mm)**	**Maxi Heat Input (kJ / mm)**	**Mini Heat Input (kJ / mm)**	**Maxi Heat Input (kJ / mm)**
4.76	0.38	0.47	0.60	0.80	0.60	0.77	1.00	1.30
6.35	0.55	0.65	0.90	1.10	0.73	1.05	1.24	1.73
7.93	0.65	0.87	1.10	1.45	0.80	1.22	1.60	2.05
9.50	0.73	1.05	1.24	1.75	0.85	1.30	1.60	2.15
12.00	0.94	1.15	1.60	1.95	0.97	1.35	1.60	2.20
16.00	0.95	1.30	1.60	2.20	0.97	1.35	1.60	2.20
19.00	0.97	1.32	1.60	2.20	0.97	1.35	1.60	2.20
26.00	0.97	1.35	1.60	2.20	0.97	1.35	1.60	2.20

Mechanical properties (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-50°C	20°C	200°C	-50°C	20°C	200°C
Tensile (MPa)		800	650		800	650
Yield (MPa)		600	450		600	450
Elongation (5Ø) (%)		30	30		30	30
Striction (%)		50	50		50	50
Impact ISO V (J/cm²)	50	160		40	80	

NICKEL BASE ALLOY

UGIALLOY® 55

Chemical analysis (%)	C	Si	Mn	Ni	Cu	Fe
	≤ 0.05	≤ 0.3	≤ 1.0	54.0 – 56.0	≤ 0.5	(Bal.)

16-04-2016 – REV 01

Category

Nickel base welding wire

Classification

Nickel iron grade

Standards

» EN ISO 1071 NiFe-1 & NiFe-C1

» AWS A5.15 ENiFe-C1 - UNS W82002

General presentation

UGIALLOY®55 filler wire is mainly used for welding and repairing grey cast-iron components (containing graphite). It can be used on most grey cast iron, but is particularly suitable for welding and repairing GS (spheroidal graphite) grey cast-iron components. It makes it possible to obtain Weld Metal Zones (WMZ) that are sufficiently ductile to compensate for the low tenacity of Heat-Affected Zones (HAZ) in cast iron that has been welded or repaired by this method. The welded areas then offer a good compromise between mechanical properties / ductility / tenacity.

UGIALLOY®55 filler wire can also be used to weld austenitic cast iron (with Nickel). FG (flake graphite) austenitic cast iron is generally welded with preheating at 300 – 350°C, whereas GS austenitic cast iron is welded without preheating and at low welding energy to avoid the problems of thermal cracking in Heat-Affected Zones.

Martensitic cast iron (with Nickel) and white cast iron (without graphite) are, in fact, considered to be unweldable, as they are not sufficiently ductile and are too sensitive to cracking during post-weld cooling.

UGIALLOY®55 filler wire can also be used to obtain joints between cast iron and cast steel or between cast iron and low or medium-alloy steel.

Mechanical properties:

Traction data on undiluted deposited metal

Temperature T (°C)	Tensile strength Rp0.2% (MPa)	Yield strength Rm (MPa)	Elongation A4D (%)	Hardness Vickers (HV)
20	230	400	24	150

UGIALLOY® 55

Chemical analysis (%)	C	Si	Mn	Ni	Cu	Fe
	≤ 0.05	≤ 0.3	≤ 1.0	54.0 – 56.0	≤ 0.5	(Bal.)

16-04-2016 – REV 01

Welding

UGIALLOY® 55 filler wire can be used for conventional MIG welding or submerged arc welding. In MIG welding, a neutral shielding gas (for example 100%Ar or 75%Ar/25%He) will be used. Direct current reverse-polarity welding generally gives the best results, but a pulsed current can also be used.

As grey cast iron contains large quantities of graphite, the welds produced contain large quantities of carbon that are liable to make them brittle. That is why it is recommended to use a high base metal dilution with UGIALLOY® 55 filler wire. As shrinkage stresses during post-weld cooling are often significant, the use of UGIALLOY® 55, which is highly ductile, prevents the weld from cracking during cooling without too greatly compromising the mechanical properties of the welded areas thus obtained.

Grey cast iron is often susceptible to the formation of porosity in Weld Metal Zones. This disadvantage can be limited by maximizing the dilution rate of the cast iron through the use of UGIALLOY® 55 and by reducing the welding cooling rates (high linear welding energy) to allow the gases formed to escape before solidification. Preheating at a minimum temperature of 200°C (315°C / 600°F commonly used) generally tends to reduce the formation of porosities and the appearance of cracks during cooling.

Applications

Repairing and welding parts in grey cast iron and austenitic cast iron (with Nickel)

Making welded joints between cast iron and cast steel or between cast iron and low or medium-alloy steel.

UGIALLOY® 82

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Cu	Fe	(Nb+Ta)	Ti
	≤ 0.05	≤ 0.1	2.5 – 3.5	≥ 67.0	18.0 – 22.0	≤ 0.5	≤ 3.0	2.0 – 3.0	≤ 0.7

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium grade

Standards

» EN ISO 18274	Ni 6082 – NiCr20Mn3Nb
» AWS A 5.14	ERNiCr-3
» W.Nr	2.4806

Approvals

	SAW
TÜV (Germany)	X
CE	
DB	

Corrosion resistance

» Very good general corrosion resistance.

» Good stress corrosion resistance.

» Very good intergranular corrosion resistance.

Applications

Because of its chemical characteristics and its corrosion resistance, UGIALLOY® 82 is perfectly suited to the following operations:

» Welding of Nickel - Chromium - Iron alloys.

» Welding of 9% Nickel steels (cryo-industry).

» Heterogeneous welding when used at high temperatures.

» Cladding of exchanger tube-sheets.

UGIALLOY® 82

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Cu	Fe	(Nb+Ta)	Ti
	≤ 0.05	≤ 0.1	2.5 – 3.5	≥ 67.0	18.0 – 22.0	≤ 0.5	≤ 3.0	2.0 – 3.0	≤ 0.7

16-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Pure Argon

» **Welding parameters:**
Look at the recommendations of the torch producer.
Current 100 – 200 A
Voltage 10 – 20 V
Interpass must be controlled to less than 150°C.

MIG welding

» **Shielding gas:**
Argon + Oxygen (1 to 3%)
Argon + CO_2 (1 to 2.5%)
Argon + Helium

» **Welding parameters**

∅ Filler metal (mm)	0.8	1.0	1.2	1.6
Short-Arc				
Current (A)	60/80	80/120	100/150	
Voltage (V)	15/17	15/17	17/19	
Spray-Arc				
Current (A)	140/210	180/250	200/290	250/350
Voltage (V)	26/29	26/29	26/29	27/29
Gas flow (l/min)	15	20	20	20

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

MIG cladding

» **Shielding gas**:
Helium (70 %) + Argon (30 %)

» **Welding parameters:**
The best solution is to use the pulsed arc welding with the following parameters: (wire 1.2 mm)
Current: background 100 - 150 A
Pulse peak 300 – 400 A
Voltage: background 25 V
Pulse peak 35 V
Water-cooled torch is recommended for high current, above 250 A.
Interpass must be controlled to less than 150°C.

UGIALLOY® 82

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Cu	Fe	(Nb+Ta)	Ti
	≤ 0.05	≤ 0.1	2.5 – 3.5	≥ 67.0	18.0 – 22.0	≤ 0.5	≤ 3.0	2.0 – 3.0	≤ 0.7

16-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

Using the recommended above mentioned welding parameters, the mechanical properties will be as follows:

	TIG			MIG		
Temperature	-196°C	20°C	400°C	-50°C	-196°C	20°C
Tensile (MPa)		670			660	
Yield (MPa)		420			400	
Elongation (5Ø) (%)		40			35	
Striction (%)		60			60	
Impact ISO V (J/cm^2)	80	160		60	150	

UGIALLOY® 182

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Cu	Fe	(Nb+Ta)	Ti
	≤ 0.02	≤ 0.5	2.5 – 3.5	≥ 61.0	15.0 – 18.0	≤ 0.3	5.0 – 6.0	1.5 – 2.5	≤ 0.5

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Iron grade

Standards

» AWS A 5.11 ** ENiCrFe- 3

» W.Nr 2.4620

*** Usual naming not referenced in the standard AWS A5.11*

Applications

UGIALLOY® 182 is a core wire grade for coated electrodes used for the following applications:

» Welding of nickel alloys type 600-601.

» Welding of 9 % nickel steels for low temperature;

» Dissimilar welding applications joining MONEL Type 400 with carbon steel and INCONEL type alloy 600 to Nickel 200.

» Heterogeneous welding for high temperature.

» Anti-corrosion cladding.

UGIALLOY® 276

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	W	Co	V
	≤ 0.02	≤ 0.08	≤ 1.0	≥ 50.0	15.0 – 16.5	15.0 – 17.0	≤ 0.5	4.0 – 7.0	3.2 – 4.2	≤ 1.0	≤ 0.35

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Molybdenium grade

Standards

» EN ISO 18274 Ni 6276 – NiCr15Mo16Fe6W4

» AWS A5.14 : ERNiCrMo-4

» W.Nr 2.4886

Corrosion resistance

Excellent corrosion resistance to oxidizing or reducing agents, in acid, chloride and saline environments.

Applications

UGIALLOY® 276 is used for welding the 2.4819 (C276) alloy and according to the type of corrosion, for the 2.4602 (C22) and 2.4610 (C4) alloys.

It is also suited for repairing the coating of cladded plates.

Recommended welding conditions

Use pure Argon for both TIG and MIG, as well as on the back-side of the weld when carrying out the first pass.

The heat input must not exceed 1.5 kJ/mm and the interpass temperature should remain below 120°C.

Mechanical properties on as weld deposit (typical values)

Using the above mentioned recommended welding parameters, the mechanical properties will be as follows:

	TIG	MIG
Temperature	20°C	20°C
Tensile (MPa)	720	700
Yield (MPa)	410	400
Elongation (5Ø) (%)	27	25
Impact ISO V (J/cm^2)	100	90

UGIALLOY® 617

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	Co	Al	Ti
	≤ 0.01	≤ 0.5	≤ 0.5	≥ 44.0	21.0 – 24.0	8.5 – 9.5	≤ 0.5	≤ 1.0	11.0 – 13.0	1.0 – 1.5	≤ 0.6

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Cobalt grade

Standards

» EN ISO 18274	Ni 6617 – NiCr22Co12Mo9
» AWS A5.14	ERNiCrCoMo-1
» W.Nr	2.4627

Corrosion resistance

The composition of UGIALLOY® 617 includes substantial amounts of nickel, chromium and aluminium for a high degree of resistance to oxidation and carbonization at high temperature while alloy UGIALLOY® 617 exhibits excellent resistance to aqueous corrosion by many media.

Applications

UGIALLOY® 617 is an attractive material in such components as ducting, combustion cans, transition liners in both aircraft and land-based gas turbines.

Because of its resistance to high temperature corrosion, the alloy is used for catalyst-grid supports in the production of nitric acid, for heat-treating baskets. It also offers attractive properties for components of power-generating plants, both fossil-fueled and nuclear.

Recommended welding conditions

» UGIALLOY® 617 has excellent weldability

» UGIALLOY® 617 is used for TIG and for MIG

UGIALLOY® 625

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	(Nb + Ta)
	≤ 0.03	≤ 0.5	≤ 1.0	≥ 60.0	21.0 – 23.0	8.5 – 9.5	≤ 0.5	≤ 1.0	3.2 – 4.0

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Molybdenium grade

Standards

» EN ISO 18274	Ni 6625 – NiCr22Mo9Nb
» AWS A5.14	ERNiCrMo-3
» W.Nr	2.4831

Approvals

	MIG	TIG	SAW
TÜV (Germany)	X	X	

Corrosion resistance

» Very good corrosion resistance in acid, neutral or alkaline media, with or without chlorides.

» Very good resistance against pitting corrosion, crevice corrosion and intercrystalline corrosion.

» Very good resistance at high temperatures, especially against oxidation and carburization.

Applications

» UGIALLOY® 625 may be used for all applications in sea media, either for welding the same types of materials, or for cladding low alloyed steels.

» Because of its very good resistance at high temperatures, UGIALLOY® 625 may be used in all heat treatment installations.

» Because of its full austenitic structure, UGIALLOY® 625 may be used for cryogenic applications (welding of 9% nickel grade for example).

» UGIALLOY® 625 may be used for welding of all Nickel base type.

UGIALLOY® 625

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	(Nb + Ta)
	≤ 0.03	≤ 0.5	≤ 1.0	≥ 60.0	21.0 – 23.0	8.5 – 9.5	≤ 0.5	≤ 1.0	3.2 – 4.0

16-04-2016 – REV04

Recommended welding conditions

TIG welding

» **Shielding gas:**
Argon (+helium)

» **Welding parameters:**

Current	100 - 200 A
Voltage	10 - 20 V

MIG welding

» **Shielding gas:**
Recommended shielding gases are :
Argon (+helium)
A very slight amount of O_2 or CO_2 (≤0.5%) to stabilise the welding arc.

» **Welding parameters:**

Short-Arc

Current	60 / 150 A
Voltage	15 / 20 V

Spray-Arc

Current	140 / 350 A
Voltage	26 / 30 V

UGIALLOY® 625 is suited for pulsed arc welding.

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

MIG cladding

» **Shielding gas:**
Argon (+helium)

» **Welding parameters:**
The best solution is to used MIG pulsed device with the following parameters (wire 1.2mm)

Current:	base ....100-150 A
	Peak....300-400 A
Voltage:	base ....25 V
	Peak....35

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

UGIALLOY® 625

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	(Nb + Ta)
	≤ 0.03	≤ 0.5	≤ 1.0	≥ 60.0	21.0 – 23.0	8.5 – 9.5	≤ 0.5	≤ 1.0	3.2 – 4.0

16-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

Using the recommended above welding parameters, the mechanical properties will be as follows:

	TIG		MIG		
Temperature	-196°C	20°C	-40°C	-17°C	20°C
Tensile (MPa)		670			720
Yield (MPa)		420			450
Elongation (5Ø) (%)		40			35
Striction (%)		60			50
Impact ISO V (J/cm^2)	80	160	160	180	200

UGIALLOY® 825

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	Ti	Al
	≤ 0.01	≤ 0.5	≤ 1.0	38.0 – 46.0	19.5 – 23.5	2.5 – 3.5	1.5 – 3.0	≥ 22.0	0.6 – 1.2	≤ 0.2

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Iron grade

Standards

» EN ISO 18274	Ni 8065 – NiFe30Cr21Mo3
» AWS A 5.14	ERNiFeCr-1
» W.Nr	2.4858

Applications

Solid rod used to weld Nickel-Iron-Chromium which has a good resistance to oxidizing and reducing acids like sulphuric and phosphoric acid as well as sea water.

Base materials : type UNS N08825.

UGIALLOY® 825

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	Ti	Al
	≤ 0.01	≤ 0.5	≤ 1.0	38.0 – 46.0	19.5 – 23.5	2.5 – 3.5	1.5 – 3.0	≥ 22.0	0.6 – 1.2	≤ 0.2

16-04-2016 – REV04

Recommended welding conditions

» Argon (+helium)

» **Welding parameters:**

Current	100 - 200 A
Voltage	10 - 20 V

MIG welding

» **Shielding gas:**

Recommended shielding gases are :

Argon (+helium)

A very slight amount of O_2 or CO_2 (≤0.5%) to stabilise the welding arc.

» **Welding parameters:**

Short-Arc

Current	60 / 150 A
Voltage	15 / 20 V

Spray-Arc

Current	140 / 350 A
Voltage	26 / 30 V

UGIALLOY® 825 is suited for pulsed arc welding.

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

MIG cladding

» **Shielding gas:**

Argon (+helium)

» **Welding parameters:**

The best solution is to used MIG pulsed device with the following parameters (wire 1.2mm)

Current:	base ....100-150 A
	Peak....300-400 A
Voltage:	base ....25 V
	Peak....35

Water-cooled torch is recommended for high current, above 250 A.

Interpass must be controlled to less than 150°C.

UGIALLOY® NCW

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	W	Ti	Al
	≤ 0.01	≤ 0.5	≤ 1.0	≥ 58.0	21.5 – 22.5	9.5 – 10.5	≤ 0.3	≤ 1.0	2.5 – 3.5	≤ 0.4	≤ 0.4

16-04-2016 – REV04

Category

Nickel base welding wire

Classification

Nickel Chromium Molybdenium grade

Standards

» EN ISO 18274 Ni 6660 – NiCr22Mo10W3

» AWS A 5.14 ERNiCrMo-20

Corrosion resistance

UGIALLOY® NCW is a nickel base alloy.

It has a very good resistance to general corrosion, pitting corrosion and crevice corrosion in the most aggressive fields.

Applications

This alloy, close to UGIALLOY® 625, is free of niobium. For this reason, it has a good resistance to hot cracking and its structure is free of intermetallic phases.

These properties allow its use for welding superduplex stainless steel for low temperature applications with high impact toughness.

UGIALLOY® NCW is also suitable for:

» welding superaustenitic stainless steel (Uranus B6 - B26 - B28)

» welding 9% nickel steels for cryogenic applications

» anti-corrosion cladding of low alloy steels

Recommended welding conditions

Neither preheating nor post heating necessary

» Interpass temperature < 120°C
Heat input < 2,5 kJ/mm

» Shielding gas:
TIG Argon (+helium)
MIG Argon (+helium)

UGIALLOY® NCW

Filler metal chemical composition	C	Si	Mn	Ni	Cr	Mo	Cu	Fe	W	Ti	Al
	≤ 0.01	≤ 0.5	≤ 1.0	≥ 58.0	21.5 – 22.5	9.5 – 10.5	≤ 0.3	≤ 1.0	2.5 – 3.5	≤ 0.4	≤ 0.4

16-04-2016 – REV04

Mechanical properties on as weld deposit (typical values)

» parent metal URANUS B26 thickness 10 mm

» welding process TIG with pure argon

» heat input 1,2 to 2,4 kJ/mm

» microstructure investigation: no intermetallic phase

» bent test (4e) no defect

» transverse tensile strength: 751 MPa

» impact test ISO V:
+ 20°C: 138 J
- 50°C: 110 J

» pitting corrosion test G48A:
CPT in weld deposit > 95°C
CPT in HAZ = 55°C

UGIALLOY® 686

Chemical analysis (%)	C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti	P	S
	≤ 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	≤ 0.02	≤ 0.02

14-02-2018 – REV 01

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 designation	
International	USA
ISO 18274	AWS A5.14
Ni 6686	ER NiCrMo-14

Mechanical properties

Tension test on All-Weld metal

Temperature	Ultimate tensile strength	Yield strength	Elongation
(°C)	(MPa)	(MPa)	(%)
20	798	507	40

Impact test on All-Weld metal

Temperature	Absorbed energies	Mean
T	Kv	Kv
(°C)	(J)	(J)
- 40°c	90 – 80 – 86	85

UGIALLOY® 686

Chemical analysis (%)	C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti	P	S
	≤ 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	≤ 0.02	≤ 0.02

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Physical properties

Temperature	Density	Elasticity modulus	Thermal conductivity	Expansion coefficient Between 20°C and T°	Electrical resistivity	Specific heat	Magnetic permeability at 200 Oe (15.9 kA/m)
(°C)	(kg/dm^3)	(GPa)	(W/m.°C)	(10-6/°C)	(µΩ.mm)	(J/kg.°C)	
20	8.72	207	9.82	-	1237	373	1.0001
100		205	11.0	11.97	1246	389	
200		197	12.8	12.22	1257	410	
300		193	14.8	12.56	1263	431	
400		185	16.6	12.87	1272	456	
500		183	18.6	13.01	1289	477	
600		173	21.4	13.18	1295	498	
700		165	23.5		1279	519	

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 thick 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

UGIALLOY® 686

Chemical analysis (%)	C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti	P	S
	≤ 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	≤ 0.02	≤ 0.02

14-02-2018 – REV 01

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 dif-ferent assemblies made from UGIALLOY® 686 and other filler wires kept in an 11.9% H2SO4 + 1% CuCl2 environment at 103°C for 7 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	0.1 / 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

UGIALLOY® 686

Chemical analysis (%)	C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti	P	S
	≤ 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	≤ 0.02	≤ 0.02

14-02-2018 – REV 01

» 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

UGIALLOY® 686

Chemical analysis (%)	C	Si	Mn	Fe	Ni	Cr	Mo	W	Cu	Al	Ti	P	S
	≤ 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	≤ 0.02	≤ 0.02

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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:

Product	Dimensions
Welding rods	Ø 1.0 to 4.0 mm
Welding wire spools (BS300)	Ø 0.8 to 1.6 mm

For other dimensions or products, please contact us.

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.

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