2

Flux Cored Wires

Flux Cored Wires

- **Mild Steel & 50kgf/mm² Class High Tensile Strength Steel**
- **55kgf/mm² Class High Tensile Strength Steel**

WELDING
CONSUMABLES
GUIDE BOOK

ESAB SeAH Welding Wires

Dual Shield-Gas Shielded Flux Cored Wires
DUAL SHIELD Wires are availabe for welding a wide variety of carbon and low alloy steels. The required shielding gas may be either straight CO_2 or a mixture of Argon and CO_2 as specified in the listings that follow.

Coreshield-Self Shielded Flux Cored Wires
CORESHIELD Wires require no extemal shielding gas. The shielding gas is generated from the core ingredients making these wires more suitable for outdoor operation.
They are available for welding carbon steels and galvanized steels.

Coreweld-Gas Shielded Metal Cored Wires
COREWELD Wires have metal powders in the core which gives them the high deposition rates of flux cored wires and the high efficiency of solid wires. The only slag produced by these wires are small silicon islands similar to those produced by solid wires. Argon-CO_2 gas mixtures with a minimum of 75% Argon is the recommended shielding gas.

Shield-Bright All Position-Gas Shielded
Flux Cored Stainless Steel Wires
SHIELD-BRIGHT Wires feature a new concept in slag systems which produces superior welding performance and a desirable flat bead shape in all position.

Shield-Bright Xtra-Gas Shielded
Flux Cored Stainless Steel Wires
SHIELD-BRIGHT XTRA Wires were developed for flat and horizontal position welding. The smooth weld metal transfer and easy slag removal eliminates unnecessary cleaning. The flat equal leg length weld beads minimize overwelding while producing a fine appearance.

Arcaloy-Special Flux Cored Stainless Steel Wires

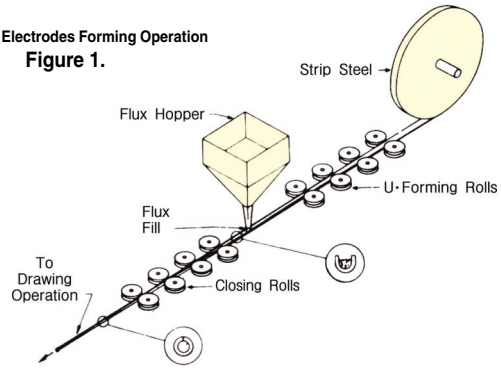
Alloy Shield-Submerged Arc Composite Wires
ALLOY SHIELD Wires are tubular submerged arc electrodes designed to satisfy a variety of strength, impact and hardness requirements for welding or surfacing of a variety of the alloy steels

Wear-O-Matic-Semiautomatic Open Arc Wires
WEAR-O-MATIC open arc wires for semiautomatic welding and hardfacing process are fabricated tubular wire internally stabilized for good arc characteristics without the use of shielding gas or submerged arc granular flux.

Manufacturing
The fabrication of a flux cored electrode (included metal cored electrode.) (Fig. 1) begins

with slitting coiled sheet steel into strips.
These strips are then passed through rollers that form it into a U-shaped cross-section.
In the same operation, the formed strip is filled with a measured amount of core ingredients. The U-spaped strip is then passed through closing rolls, forming it into a tube and tightly compressing the granular core material.

Flux Cored Electrodes Forming Operation
Figure 1.



The round tube is then passed through drawing dies that further reduce the diameter and at the same time, compress the core ingredients to prevent any movement within the tube. The tube configuration is illustrated in Figure 2.

Cross Section

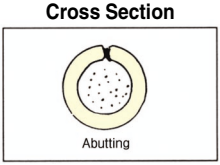


Figure 2.

In this design, the sheath comprises about 85% of the total weight and 65% of the cross-sectional area of the electrode.

A notable advantage of a fabricated wire is it can be adapted to meet many different welding requirements.
Since the alloys are introduced into the core of the electrode as it is manufactured, a wide selection of alloy wires can be developed by varying the fill ingredients.

The Process
The Dual Shield (and Coreweld) arc welding process involves welding with a fabricated electrode in an atmosphere of carbon dioxide or in a mixture of carbon dioxide and argon. In addition to the externally supplied gas, the molten weld metal is protected from the

atmosphere by a flux contained within the electrode.
This dual protection of the molten weld metal is one of the reasons why the Dual Shield flux cored process produces one of the highest quality weldments available.

Any gas metal arc welding process which incorporates a power source, a wire feeder, a gun, and a system for supplying shielding gas (Fig. 3) can utilize the Dual Shield process. The power source used with this process is the direct current, constant potential (voltage) type. The power source should be capable of operating at maximum rated capacity of 100% duty cycle if automatic applications are intended.

Welding guns may either be air-cooled or water-cooled.
Generally, when welding current exceeds 500 amps. water-cooled guns are used. In semi-automatic applications, welders generally prefer air-cooled guns because of the handing comfort and ease of manipulation.

Contact tips are subject to wear and should be changed periodically to insure correct size and reliable pickup. The inside diameter tolerance of the contact tip is important to assure reliability of the process.

The purpose of the wire feed control is to supply the continuous electrode to the welding arc at a preset constant rate. The electrode feed speed controls the welding amperage from the power source. Flux cored electrodes require V-grooved feed rolls of correct size so that the electrode is not flattened or distorted. An approximate relationship of current to wire feed speed is illustrated in Figure 4.

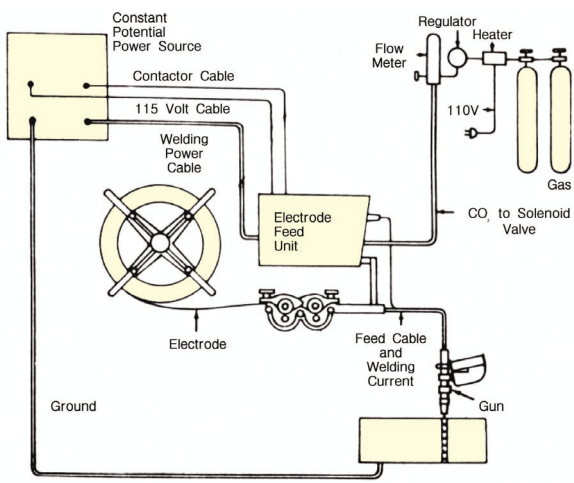


Figure 3.

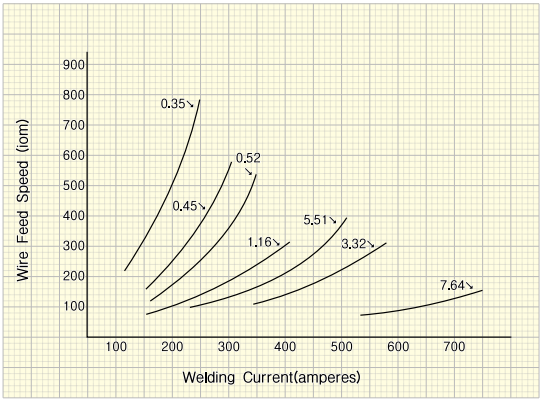


Figure 4.

Productivity

The Dual Shield process offers many advantages, the greatest of which are excellent weld metal quality, high deposition rates, and ease of operation. Labor and overhead are the most expensive factors in a welding operation, usually comprising 80 to 85 percent of the total cost.

Weld with high deposition Dual Shield electrodes provides an immediate means of cost reduction without an exorbitant investment in equipment. Savings with Dual Shield range as high as 60% of the total cost of depositing one lb. of weld metal when compared to coated electrodes.

High Deposition Rates

The Dual Shield process is capable of high deposition rates because of the relatively high current density. The ratio of current (amperes) to the cross-sectional area of an electrode is known as the current density. The current density within a conductor will increase as the cross-sectional area of a conductor is reduced. Resistance to current flow through a conductor also increases as the cross-sectional area of the conductor decreases. Since the thin metal sheath provides the primary current path in a flux cored electrode, the resistance heating is concen-trated in a very small area and the flux cored electrode reaches its melting point very quickly, even more quickly than a solid wire of comparable diameter. High deposition rates are the result.

Deep Penetration

Dual Shield electrodes small cross-sectional current path makes the arc stream assume a more columnar pattern, which contributes to their deep penetration. The deepest penetration occurs when straight CO_2 gas shielding is used. The deep penetration experienced with this process results in an increase in the effective throat of a fillet joint.

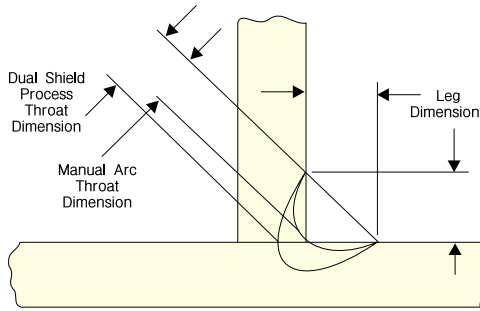
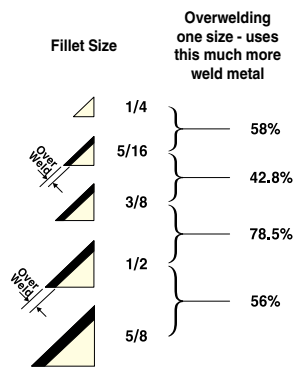


Figure 5.

A fillet weld made with the manual coated electrode has shallow root penetration. When the effective throat of the fillet is increased because of deep penetration, the strength of the joint does not depend as much on the exterior size of the weld. Often times, the leg dimensions can be reduced and decreasing the fillet size by as little as 1/16 of an inch can reduce the total required weld metal by as much as 50 to 60 percent.



(Dark areas show amount of additional metal deposited when overwelding to next size)

The deep penetration of the flux cored electrode also has advantages compared to solid wires. Penetration is substantially reduced with solid wires in out-of-position work due to the low current used with short circuit transfer. Reduced penetration means extra care must be taken to prevent lack of sidewall fusion. In general, flux cored electrodes can operate at higher welding currents in out-of-position work, making sidewall fusion much better with flux cored electrodes. This increased weld integrity minimizes expensive rework.

Rapid Operator Training

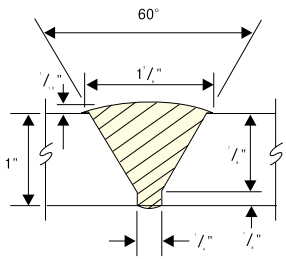
Welding with Dual Shield flux cored electrodes requires a minimum of training. It is much easier to train an inexperienced welder to weld in all positions with flux cored electrodes than with other welding processes, because the fast freezing slag holds the weld puddle in place, permitting greater control. Subsequently, time spent in training weldors is greatly reduced and the chance that they will produce high quality weldments in a short time is increased.

Better Bead Appearance

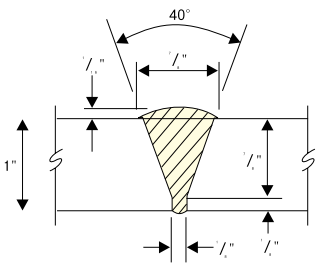
Welds produced with flux cored electrodes are smooth with almost no ripple. The metal transfer of Dual Shield electrodes produces very little spatter which significantly reduces cleanup time.

Joint Design

The included angle and/or the root opening of a joint may be decreased with Dual Shield electrodes because of their small diameter and deep penetration. This tighter joint design significantly reduces the volume of weld metal needed to fill the joint as seen in Figures 6 and 7.



2,546# of Weld Metal per 1,000 ft
Joint Design Covered Electrode
Figure 6.



1,469# of Weld Metal per 1,000 ft
Joint Design Dual Shield Electrode
Figure 7.

All-Position Versatility

ESAB SeAH produces the greatest variety of all-position flux cored electrodes on the market today. With all-position electrodes, the set up time and expense of fixturing is eliminated.

MAG welding

1) Use CO_2 gas equivalent to JIS K1106(Liquefied CO_2 gas) Grade 3 or CO_2 gas purified for shielding in welding.
2) It is very important to control mixture ratio mixture gas of Ar+CO_2 is used because the fluctuation of mixture ratio may affect adversely on usability.
3) It is suitable to use shielding gas of 20 to 25ℓ/min.
4) Wind screen must be set at the welding in the place with strong wind because blowhole may occur.
5) It is necessary to facilitate proper ventilation according to the circumstances.
6) Distance between a base plate and the contact tip in the nozzle must be kept at around 15mm with current less than 250A and at around 20 to 25mm with current over than 250A.
7) In case of spray transfer arc welding with mixture gas of Ar+CO_2, strong short circuiting sound generates, if arc voltage is too lowered, and blowholes may occur in this condition.
8) Pressurizing roller of wire feeding device must not be tighened too mush as a flux cored wire is rather soft as compared with a solid wire.
9) The proper welding conditions must be adopted according to the purpose as the bead appearance and penetration are varied widely depending on the welding condition as shown in Fig. 1.

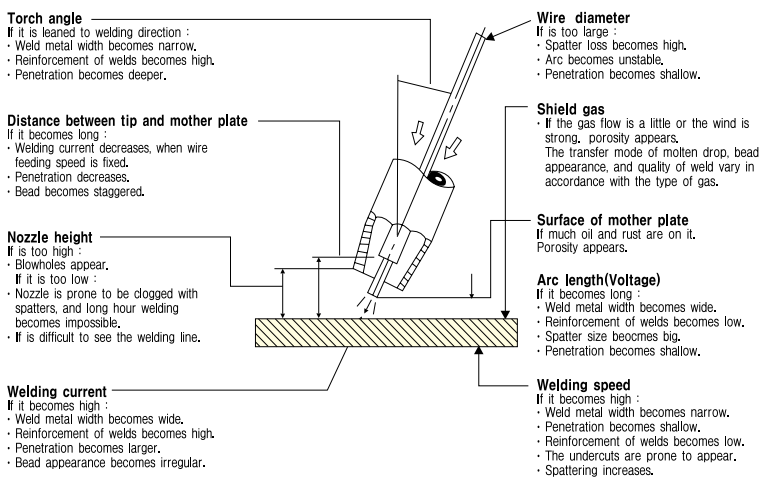


Fig 1. Welding conditions and their effects

Dual Shield 7100

AWS A5.20 E71T-1C / JIS Z3313 T49J0T1-1CA-U

Description

- Dual Shield 7100 is an all position flux-cored electrode designed for optimum performance when using 100%CO_2 shielding. The smooth metal transfer facilitates easy deposition of vertical-up stringer beads. Fillet contour is flat to slightly convex with equal leg lengths and uniform sidewall wetting. The slag coverage is complete and designed for easy removal. Weld metal is consistently free of inclusions and porosity for X-ray soundness.

Shielding Gas : 100%CO_2

Application

- The Dual Shield 7100 electrode is designed for all position single and multipass welding of low and medium carbon steels.
  Performs well over normal rust and mill scale.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			0℃	-20℃
520 {53}	580 {59}	29	100 {10.2}	64 {6.5}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.04	1.27	0.57	0.015	0.005

Approvals

ABS, LR, DNV, BV, GL, RINA, NK, KR, KS, JIS

Dual Shield 7100S

AWS A5.20 E71T-1C / JIS Z3313 T49J0T1-1CA-U

Description

- Dual Shield 7100S is an all-position wire with a bright surface finish that is uniquely designed to provide high deposition rates, high efficiency, and lower fume emission rates than other flux cored wires. It is optimized for use with 100%CO_2 shielding.
- Among the outstanding features of Dual Shield 7100S are a very wide operating window, excellent feedability and arc starting characteristics, attractive weld appearance, a thin easily removed slag, and welds that are virtually spatter free.

Shielding Gas : 100%CO_2

Application

- Dual Shield 7100S has been designed for general purpose use but has particular applications in shipyard welding where high efficiency and versatile operation are most important. It may be used in a variety of other applications including railcar, automotive, heavy equipment, and general structural steel fabrication. It is especially recommended in applications where reduction of welding fume is important.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			0℃	-20℃
500 {51}	570 {58}	30	118 {12.0}	72 {7.3}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.04	1.41	0.58	0.011	0.009

Approvals

ABS, LR, DNV, BV, GL, CCS, NK, KR, KS, JIS

Dual Shield II 70 Ultra

AWS A5.20 E71T-1C/1M/12M / JIS Z3313 T492T1-1MA-U / EN ISO 17632-A T463 P M1 H10

Description

- Dual Shield II 70 Ultra is an all-position flux cored wire that dispalys exceptional impact properties in both the as welded and stress relieved conditions when used with 75%Ar/25%CO_2, The improved properties quality this wire to the Navy's "HY" classification. The "Ultra" series produces smoother arc characteristics and lower welding fumes.

Shielding Gas : 75%Ar/25%CO_2

Application

- Dual Shield II 70 Ultra was developed to join low and medium carbon steel. The Military classification allows Dual Shield II 70 Ultra to be used for attaching steels of less than 80ksi(552MPa) yield to HY-80 and HY-100. Commercial applications include construction, shipbuilding, railcar, and heavy equipment industries. Weld metal analysis is similar to an E7018 low hydrogen electrode.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-20℃	-30℃
500 {51}	565 {58}	34	130 {13}	66 {7}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.05	1.05	0.41	0.010	0.010

Approvals

ABS, LR, DNV, BV, GL, TUV, JIS

Dual Shield 70 Ultra Plus

AWS A5.20 E71T-9C/9M / JIS Z3313 T493T1-1C(M)A

Description

- Dual Shield 70 Ultra Plus is an all-position wire that is uniquely designed to provide high deposition, outstanding all position performance and a fume emission rate approaching that of solid wires. It is optimized for use with 90%Ar/10%CO_2 shielding but works well with mixes ranging from 75%Ar/25%CO_2 to 95%Ar/5%CO_2. Among the outstanding features of Dual Shield 70 Ultra Plus are a very wide operating window, very high out of position deposition rates(vertical up and overhead at over 12lb/hr), and welds that are virtually spatter free.
- Dual Shield 70 Ultra Plus may be used in a variety of applications including railcar, automotive, heavy equipment, and general structural steel fabrication. It is especially recommended in applications where reduction of welding fume is a priority.

Shielding Gas : 100%CO_2 or Ar/CO_2 mixtures between 75-95%Ar

Typical Mechanical Properties of All Weld Metal

Shielding gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		
				-0℃	-20℃	-30℃
100%CO_2	498 {50.8}	534 {54.5}	31	132 {13.5}	122 {12.4}	105 {10.7}
75%Ar/25%CO_2	505 {51.5}	562 {57.3}	31	143 {14.6}	124 {12.6}	112 {11.4}

Typical Undiluted Weld Metal Analysis %

Shielding gas	C	Mn	Si	P	S
100%CO_2	0.053	1.02	0.64	0.013	0.008
75%Ar/25%CO_2	0.051	1.11	0.72	0.013	0.009

Approvals

ABS, LR, DNV, BV, GL, JIS

Dual Shield II 71 Ultra

AWS A5.20 E71T-1C/12C / JIS Z3313 T492T1-1CA-U

Description

- Dual Shield II 71 Ultra is an all-position flux cored wire that is designed to exhibit exceptional low temperature impact toughness with 100%CO_2 shielding. Normally, the Impact toughness of E71T-1 flux cored electrodes diminshed when straight CO_2 shielding is used, but the patented formulation of Dual Shield II 71 Ultra reverses that situation. As a result of these improved properties, this electrode is qualified to the Navy's "HY"classification. To be approved to this classification, the weld metal must have higher CVN values and lower diffusible hydrogen than standard E71T-1 electrodes.

Shielding Gas : 100%CO_2

Application

- Dual Shield II 71 Ultra is designed to join low and medium carbon steel. In many instances it can be used as a replacement for E7018 low hydrogen electrodes. Although it is not qualified to join HY-80 and HY-100 to themselves, the military classification allows Dual Shield II 71 Ultra to be used for attaching steels of less than 80 ksi yield strength to HY-80 and HY-100.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-20℃	-30℃	
517 {53}	602 {61}	28	84 {8.5}	68 {6.9}	As-Welded
503 {51}	592 {60}	30	49 {5.0}	35 {3.6}	620℃×8hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.05	1.15	0.36	0.013	0.012

Approvals

ABS, LR, DNV, GL, JIS

Dual Shield R-70

AWS A5.20 E70T-1C/9C / JIS Z3313 T492T1-0CA-U

Description

- Dual Shield R-70 is a flux cored wire with a chemistry balance that allows for a greater tolerance of mill scale and surface oxides than is normally associated with an E70T-1 class of electrode. Notch toughness in the as welded condition is also improved with this balance. Bead contour is flat to slightly convex and slag coverage is complete.

Shielding Gas : 100%CO_2

Application

- Dual Shield R-70 is a flux cored wire for single or multipass applications on low or medium carbon steels. It is intended for use in the flat and horizontal positions with CO_2 shielding only. Areas of application include railcar, heavy equipment, and general fabrication.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			0℃	-20℃
480 {49}	550 {56}	28	88 {8.9}	52 {5.3}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.06	1.60	0.65	0.014	0.003

Approvals

ABS, DNV, BV, GL, NK, KR, LR, RINA, JIS, KS

Dual Shield R-70 Ultra

AWS A5.20 E70T 1C/1M/9C/9M / JIS Z3313 T493T1-0CA

Description

- Dual Shield R-70 Ultra is a low fuming flux cored wire with a balanced chemistry that allows for a greater tolerance of mill scale and surface oxides than is normally associated with an E70T-1 class of wire. The “Ultra” series produces smoother arc characteristics and lower welding fumes than other non-ultra types. Notch toughness in the as welded condition is also improved with this wire. Bead contour is flat to slightly convex and slag coverage is complete.

Shielding Gas : 100%CO_2

Application

- Dual Shield R-70 Ultra wire is designed for single or multipass applications on low or medium carbon steels. It is intended for use in the flat and horizontal positions with CO_2 shielding only. Areas of application include railcar, heavy equipment, and general fabrication.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-20℃	-30℃
483 {49}	555 {57}	26	74 {7.5}	60 {6.1}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.040	1.36	0.51	0.011	0.012	0.39

Approvals

JIS

Dual Shield T-5

AWS A5.20 E71T-5M-J / JIS Z3313 T490T5-1C(M)A-U

Description

- Dual Shield T-5 is a basic slag flux cored wire witch-produces weld deposits comparable to those of E7018 electrodes in terms of crack-resistance, ductility, and toughness. Small diameter wires, such as 0.045”(1.2mm) and 1/16”(1.6mm) can be used in all positions.

Shielding Gas : 75%Ar/25%CO_2

Application

- Dual Shield T-5 is especially recommended for medium to heavy fabrication of a number of mild steels where superior toughness and crack resistance are required. It is very attractive in situations where mild steel is being joined to quenched and tempered low alloy high strength steels because the basic slag gives extremely low diffusible hydrogen levels.

Welding Procedure

- This product should be run using a constant speed wire feeder and a constant potential power source. Straight polarity(electrode negative) operation should be employed when welding out-of-position. This reduces penetration and minimzes weld puddle size. Reverse polarity(electrode positive) can be used in the flat and horizontal position in order to increase weld penetration. Either carbon dioxide or argoncarbon dioxide mixtures may be used as a shielding gas. Spatter will decrease as the percentage of argon in the shielding gas increases.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}			PWHT
			-20℃	-40℃	-50℃	
440 {45}	560 {57}	31	130 {13.3}	95 {9.7}	80 {8.2}	As-Welded
355 {36}	510 {52}	34	167 {16.3}	126 {12.3}	121 {11.8}	620℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.13	1.40	0.65	0.012	0.004

Approvals

ABS, LR, DNV, BV, GL, JIS

Coreweld 70

AWS A5.18 E70C-6C/6M / JIS Z3313 T490T15-0C(M)A-U

Description

- Coreweld 70 is a tubular electrode that combines the high deposition rates of a flux cored electrode with the high efficiencies of a solid wire. The fluxing ingredients have been virtually eliminated from the core of this wire, and replaced with metal powder, placing deposition rates consistently within the 11 to 20lbs./hr. range. The high (90 to 97%) efficiencies reflect the smooth spray transfer and the very low levels of spatter and fumes. The only slag formed by this wire consists of small islands of silicates, andmultiple pass deposits can be made without deslagging. Other distinguishing features include excellent wetting action that surpasses that of solid wires at high amperages, and a very good bead profile.
- Coreweld 70 electrodes are designed to weld low and medium carbon steels in the flat and horizontal positions, although the small diameters (.035", .045") (0.9mm, 1.2mm) are capable of operating in all positions. With its low slag and high efficiencies, Coreweld 70 is especially suited for robotic welding.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		
				0℃	-20℃	-30℃
100%CO_2	469 {48}	552 {56}	27	80 {8.2}	65 {6.6}	55 {5.6}
75%Ar/25%CO_2	545 {56}	587 {60}	26	98 {10.1}	78 {8.0}	68 {7.0}

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S
75%Ar/25%CO_2	0.07	1.61	0.63	0.011	0.011

Approvals

ABS, LR, DNV, BV, GL, JIS

Coreweld Ultra

AWS A5.18 E70C-6C/6M / JIS Z3313 T490T15-0C(M)A-U

Description

- Coreweld Ultra is a low fume, metal cored wire. This wire produces 40% less fume than the conventional metal cored products. The use of higher argon shielding gas further reduces fume, spatter and slag islands. The higher deposition efficiency and improved welder appeal minimizes post weld clean-up.
- Coreweld Ultra was developed for carbon steels having tensile strength up to 70ksi (483Mpa). This metal cored wire is intended for single or multipass welding in the flat and horizontal positions.

Shielding Gas : 100%CO_2, 75%Ar/25%CO_2 or 92%Ar/8%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
				0℃	-30℃
100%CO_2	440 {45}	531 {54}	29	51 {5.2}	39 {4.0}
75%Ar/25%CO_2	449 {46}	545 {56}	28	58 {5.9}	42 {4.3}

Typical Undiluted Weld Metal Analysis %

Shielding gas	C	Mn	Si	P	S
100%CO_2	0.030	1.36	0.54	0.008	0.019
75%Ar/25%CO_2	0.038	1.53	0.61	0.010	0.017

Approvals

ABS, LR, DNV, NK, BV, GL, KR, KS, JIS

Coreweld 111 RB

AWS A5.20 E70T-1C / JIS Z3313 T49J0T1-0CA-U

Description

- Coreweld 111 RB is a semi-metal cored wire with superior pit resistance in welding of primer coated steels. This wire shows good usability similar to conventional flux cored wires but provides deposition efficiencies approaching those of solid wires but with higher deposition rates.

Shielding Gas : 100%CO_2

Application

- Coreweld 111 RB is most suitable for fillet welding of inorganic zinc-rich primer coated steels, often used in the shipbuilding and bridge construction industries.It is also well suited to any application requiring the highest productivity welding in flat position.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			0℃	-20℃
510 {52}	570 {58}	27	93 {9.5}	62 {6.3}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.05	1.34	0.63	0.014	0.011

Approvals

ABS, LR, DNV, BV, RINA, GL, NK, KR, JIS, KS

Coreweld 111 Ultra

AWS A5.20 E70T-1C/9C / JIS Z3313 T492T1-0CA-U

Description

- ESAB SeAH Coreweld 111 Ultra is a high efficiency, low slag type cored wire with a bright surface finish that is specially designed to provide very high deposition rates, high deposition efficiency approaching that of solid wires, and low fume emission rates. It is optimized for use with 100%CO_2 shielding. Coreweld 111 Ultra is capable of operating with a very wide current range and has the ability to sustain good arc stability at higher current levels than are typically associated with small diameter cored wires. The bright surface finish provides excellent feedability and arc starting characteristics.
- The weld surface is smooth with virtually no spatter and a very thin easily removed slag. Fillet welds are flat to slightly convex. A unique advantage of this product is its ability to produce clean porosity free welds over primer painted surfaces.
- Coreweld 111 Ultra has been designed for general purpose use in the flat and horizontal welding positions. However in diameters of 1.4mm and less it is capable of producing good welding characteristics in the vertical up and down positions also. It has particular applications in shipyard welding where high efficiency and versatile operation are most important and is widely used on panel line applications. It may be used in a variety of other applications including railcar, automotive, heavy equipment, and general structural steel fabrication. It is especially recommended in applications where reduction of welding fume and high welding speed is important.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-20℃	-30℃
510 {52}	570 {58}	27	67 {6.8}	43 {4.4}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Ni	P	S
0.06	1.61	0.64	0.38	0.011	0.011

Approvals

ABS, LR, DNV, BV, GL, CCS, RINA, KR, JIS, NK

Dual Shield 8100

AWS A5.29 E81T1-GC / JIS Z3313 T552T1-1CA-G

Description

- Dual Shield 8100 is an all position flux cored wire designed to give 55kgf/mm² minimum tensile strength with charpy V-notch impacts of 80J at 0℃ minimum Arc is stable, spatter is low, and bead is smooth with good shape and appearance.
  The sasily removed slag covers the bead evenly.
  In addition, Dual Shield 8100 provide a stable arc with low spatter levels when using CO_2 shielding gas

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}
			0℃
580 {59}	620 {63}	28	80 {8.2}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.043	1.42	0.54	0.010	0.020

Special Information

- Preheating at 50-150℃ is required depending on plate thickness, restraint and heat input

Approvals

JIS

Dual Shield 8100SR

AWS A5.29 E81T1-GC

Description

- Dual Shield 8100SR is an all position flux cored wire with a uniquely balanced formulation to provide greater deposition and improved welding productivity. The low spatter levels and easy slag removal minimizes post weld cleanup.

Shielding Gas : 100%CO_2

Application

- Welding for Nuclear Power Plant(CLP), off-shore and shipbuilding because of Dual Shield 8100SR is good impact value after PWHT at low temperature down to -20˚F(-29℃)

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-30℃	-46℃	
489 {49}	570 {58}	30	115 {11.7}	98 {9.9}	As-Welded
470 {48}	550 {56}	31	107 {10.9}	89 {9.0}	620℃×8hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Ni	P	S
0.047	1.40	0.38	0.012	0.008	0.45

Approvals

ABS, LR, DNV, BV

Flux Cored Wires

- 60~100kgf/mm² Class High Tensile Strength Steel
- Sulfuric Acid Corrosion Resistant Steel
- Weathering Grade Steel
- Low Temperature Service Steel
- Heat Resistant Low-Alloy Steel
- Mild Steel & 50kgf/mm² Class High Tensile Strength Steel

WELDING
CONSUMABLES
GUIDE BOOK

Dual Shield 9100

AWS A5.29 E91T1-GC / JIS Z3313 T622T1-1CA-G

Description

- Dual Shield 9100 is an all position flux cored wire designed to give 60kgf/mm^2 minimum tensile strength with charpy V-notch impacts of 20ft-lbs at -40˚F minimum.
- In addition, Dual Shield 9100 provides a stable arc with low spatter levels when using CO_2 shielding gas.

Shielding Gas : 100%CO_2

Application

- Welding of 60kgf/mm^2 high tensile strength steels for steel frames, bridges, pressure vessels and penstocks. It can replace E8018-C3 electrodes.

Benefits

- Arc is stable, spatter is low, and bead is smooth with good shape and appearance. The easily removed slag covers the bead evenly. The diffusible hydrogen content is typically less than 5ml/100gr weld metal.
- It assures high welding efficiency since deposition rate is high and all-position welding is easily performed without the need to adjust current settings.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}	Impact Value J{kgf · m}
			-20℃
590 {60}	650 {66}	26	65 {6.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni	Mo
0.05	1.25	0.48	0.013	0.008	0.95	0.22

Special Information

- Preheating at 50-150℃ is required depending on plate thickness, restraint and heat input.

Approvals

ABS, KS, JIS

Dual Shield II 101-TC

AWS A5.29 E91T1-K2C / JIS Z3313 T62T1-1CA-N3M1

Description

- Dual Shield II 101TC is a second generation series high strength flux cored electrode that produces low hydrogen deposits in all positions. The low fume, reduced spatter and flat weld bead produces enhanced welder appeal. Mechanical properties include improved low temperature notch toughness.

Shielding Gas : 100%CO_2

Application

- Dual Shield II 101TC, like its companion Dual Shield II 101TM(for 75%Ar/25%CO_2), was developed to meet the stringent Millitary Specification MIL-E-24403/2. It is intended for use on HY-80, ASTM A710, A514, and A517 or other similar high strength low alloy steels.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		
			-20℃	-30℃	-40℃
604 {62}	649 {74}	23	128 {13.0}	112 {11.4}	80 {8.2}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.04	1.42	0.43	0.011	0.006	1.67

Approvals

ABS, LR, DNV, BV, JIS, KS

Dual Shield T-95-K2

AWS A5.29 E90T5-GC / JIS Z3313 T623T5-0CAP-G

Description

• Dual Shield T-95-K2 is a flux cored wire with a basic type slag designed for applications requiring a high strength weld deposit of excellent quality.

Shielding Gas : 100%CO_2

Application

• Dual Shield T-95-K2 deposits weld metal which has as high resistance to cracking in heavy sections and in weldments under high restraint. It can be used for welding steels such as; St E500, W St E460, W St E500, T St E460, T St E500 and Fine grain, X65, X70 series.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	PWHT
			-20℃	
735 {75}	833 {85}	24.7	90 {9.1}	As-Welded
706 {72}	804 {82}	26	82 {8.3}	620℃ × 8hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni	Mo	Cr
0.06	1.25	0.55	0.012	0.011	1.56	0.40	0.02

Special Information

• Preheating at 100-250℃ is required depending on plate thickness, restraint and heat input.

Approvals

KS, JIS

Dual Shield 4130N

AWS A5.29 E101T1-GC

Description

- Dual Shield 4130N is am all-position flux cored wire that displays exceptional impact properties and strenth higher than 70kgf/mm^2 in both the as welded and post weld heat treatment conditions.
- Dual Shield 4130N was designed titania based slag system with excellent slag removal and low spatter. It can be used for welding steels such as: ASTM A519 Gr.4130, KD D 3574 SCM430TK and JIS G-3441 SCM430TK.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}	Impact Value J{kgf · m}			PWHT
			-10℃	-30℃	-40℃	
680 {69}	770 {78}	22	90	68	52	As-Welded
656 {67}	712 {73}	26	80	54	30	625℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Mo	Ni
0.07	1.52	0.35	0.014	0.008	0.40	0.20	0.85

Approvals

ABS, DNV, BV

Dual Shield II 110

AWS A5.29 E111T1-K3C/M

Description

- Dual Shield II 110 electrodes are a breakthrough in all position flux-cored technology. Prior to the development of the patented Dual Shield II series, no all-position flux-cored electrode combined tensile strengths in excess of 100,000psi with good low temperature impact properties. Dual Shield II 110 combines both strength and toughness with all position versatility.This balance of physical properties is coupled with operator appeal. Smooth spray type transfer, low spatter levels, easy slag removal and good arc drive are all incorporated into Dual shield II 110 electrodes, a constant potential power source operating on DC reverse polarity is needed for proper operation. To retain the exellent arc characteristics and physical properties of the weld metal, a 75%Argon/25%CO_2 shielding mixture must be used. The standard preheat, interpass, and postheat procedures that are used in welding high strength steel with low hydrogen coated electrodes also apply to Dual Shield II 110 electrodes.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Application

- Dual Shield II 110 is designed to join high strength steel such as HY-100 and T-1 in the “as welded” or “stress relieved” condition. It is well suited for joining high tensile steels that will be used in a low temperature environment.

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
				-20℃	-30℃	
100%CO_2	735 {75}	830 {85}	21	54 {5.5}	49 {5.0}	As-Welded

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo
100%CO_2	0.05	1.63	0.30	0.014	0.006	0.02	1.66	0.35

Approvals

ABS

Dual Shield T-115

AWS A5.29 E110T5-K4M

Description

- Dual Shield T-115 is a flux cored multipass electrode with a basic type slag designed for applications requiring a high strength weld deposit of excellent quality. The weld metal chemistry and mechanical properties are similar to the E11018-M covered electrodes.

Shielding Gas : 75%Ar/25%CO_2

Application

- Dual Shield T-115 deposits weld metal which has a high resistance to cracking in heavy sections and in weldments under high restraint. It has good usability with a minimum amount of spatter and easy slag removal. It can be used for welding steels such as: T-1, HY-80, HY-90, N-A-XTRA 90, 100 and 110, and the SSS 100 series.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-30℃	-50℃	
755 {77}	813 {83}	20	68 {6.9}	66 {6.7}	As-Welded
686 {70}	774 {79}	23	49 {5.0}	43 {4.4}	565℃ × 1hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Ni	Mo	P	S	Cr
0.07	1.72	0.45	2.16	0.47	0.018	0.006	0.22

Approvals

ABS

Dual Shield 71-AC

AWS A5.29 E71T1-GC

Description

- Dual Shield 71-AC is an all-position flux cored wire for welding advanced environmentally-friendly steel with sulphuric acid corrosion resisting steel. Spatters are few and weldability is excellent.
- Dual Shield 71-AC has high-crack resisting property by controlling H, S and P contents.

Shielding Gas : 100%CO_2

Application

- It can be used for joining sulphuric acid atmosphere service at carbon or low alloy steel.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Corrosion-resistance in sulphuric acid atmosphere (50%/70℃)
530 {54}	600 {61}	28	19

* Tensile strength at high temperature(500℃): 446N/mm²

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ni	Cu
0.03	0.80	0.52	0.013	0.005	0.45	0.02	0.56

Dual Shield 7100-W

JIS Z3320 YFA-50W

Description

- Dual Shield 7100-W is an all-position electrode developed specifically to meet the demand for weld deposits that color match the low alloy, high strength weathering grade steels.
- Dual Shield 7100-W is a smooth arc action, attractive weld appearance, easily removed slag, and low spatter.
- This electrode displays good operator appeal and produces high strength deposits. It is an ideal choice for structural applications where the architectural “weathering look” is of importance.

Shielding Gas : 100%CO_2

Application

- Dual Shield 7100-W is designed to operate in the flat, vertical and overhead positions. It is intended for use on low alloy weathering grade steels such as A588, A242, Cor-Ten® and Mayari R®. This electrode is designed to be shielded with CO_2 gas only.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			0℃	-5℃
520 {53}	580 {59}	28	55 {5.5}	35 {3.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ni	Cu
0.04	1.85	0.45	0.017	0.011	0.50	0.35	0.40

Dual Shield 8100-W

AWS A5.29 E81T1-W2C / JIS Z3320 YFA-58W

Description

- Dual Shield 8100-W is an all-position electrode developed specifically to meet the demand for weld deposits that color match the low alloy, high strength weathering grade steels.
- Field testing on U.S.S. Cor-Ten® showed that, after atmospheric exposure, there was no discemible difference between the color of the weld metal and the base metal. This electrode displays good operator appeal and produces high strength deposits. It is an ideal choice for structural applications where the architectural “weathering look” is of importance.

Shielding Gas : 100%CO_2

Application

- Dual Shield 8000-W is designed to operate in the flat, vertical and overhead positions. It is intended for use on low alloy weathering grade steels such as A588, A242, Cor-Ten® and Mayari R®. This electrode is designed to be shielded with CO_2 gas only.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-5℃	-30℃
550 {56}	620 {63}	26	80 {8.1}	35 {3.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ni	Cu
0.04	1.01	0.59	0.015	0.011	0.54	0.58	0.47

Approvals

ABS

Dual Shield 7100SM

AWS A5.20 E71T-9M / JIS Z3313 T493T1-1MA

Description

- Dual Shield 7100SM is an all-position flux cored wire designed for optimum performance when using 75%Ar/25%CO_2 shielding.
- Dual Shield 7100SM is a smooth arc action, attractive weld appearance, easily removed slag, and low spatter.

Shielding Gas : 75%Ar/25%CO_2

Application

- Welding of 50kgf/mm^2 high tensile strength steels for steel frames, bridges, pressure vessels and penstocks.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}	Impact Value J{kgf · m}		
			0℃	-20℃	-30℃
441 {45}	582 {60}	30	120 {12.2}	100 {10.}	65 {6.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S
0.04	1.18	0.51	0.013	0.009

Approvals

JIS

Dual Shield 7100 Ultra

AWS A5.20 E71T-1C/1M/9C/9C-J/9M / JIS Z3313 T492 T1-1CAP-U

Description and Application :

- Dual Shield 7100 Ultra is an all-position flux cored electrode designed for optimum performance when using 100%CO_2 shielding but works well 75%Argon/25%CO_2 and 80%Argon/20%CO_2 Mixes. The smooth metal transfer facilitates easy deposition of vertical-up stringer beads.
- Fillet contour is flat slightly convex with equal leg lengths and uniform sidewall welling. The slag coverage is complete and designed for easy removal. Weld metal is consistently free of inclusions and porosity for X-ray soundness.

Shielding Gas : 100%CO_2 or Ar/CO_2

Application

- Dual Shield 7100 Ultra has been designed for general purpose use but has particular applications in shipyard welding where high efficiency and versatile operation are most important. It may be used in a variety of other applications including railcar, automotive, heavy equipment, and general structural steel fabrication. It is especially recommended in applications where reduction of welding fume is important.

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
				-20℃	-30℃	
100%CO_2	520 {53}	580 {59}	28	127 {13.0}	85 {8.6}	As-Welded
	500 {51}	560 {57}	30	116 {11.9}	66 {6.7}	620℃ × 8hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S
100%CO_2	0.04	1.35	0.57	0.013	0.005

Approvals

ABS, LR, DNV, BV, GL, NK, KR, CCS, TUV, JIS

Dual Shield 7100SR

AWS A5.20 E71T-1C/9C/9C-J/9M/12C-J / JIS Z3313 T492T1-1CAP-U

Description

- Dual Shield 7100SR is an all-position wire with a uniquely balanced formulation to provide greater deposition and improved welding productivity. The low spatter levels and easy slag removal minimizes post weld cleanup.

Shielding Gas : 100%CO_2

Application

- Welding for Nuclear Power Plant(CLP), off-shore and shipbuilding because of Dual Shield 7100SR is good impact value after PWHT at low temperature down to -20℉(-29℃)

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}			PWHT
			-30℃	-40℃	-46℃	
476 {49}	559 {60}	30	120 {12.3}	105 {10.7}	85 {8.7}	As-Welded
458 {48}	530 {56}	31	118 {12.0}	103 {10.5}	79 {8.0}	620℃ × 8hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.047	1.40	0.55	0.012	0.008	0.44

Approvals

ABS, BV, DNV, GL, KR, LR, NK, CCS, JIS

Dual Shield 7100SRM

AWS A5.20 E71T-9M-J/12M-J / JIS Z3313 T493T1-1MAP

Description

- Dual Shield 7100SRM is an all-position flux cored wire that displays exceptional impact properties in both the as welded and stress relieved condition when used with 75%Ar/25%CO_2 shielding.

Shielding Gas : 75%Ar/25%CO_2

Application

- Welding for Nuclear Power Plant(CLP), off-shore and shipbuilding because of Dual Shield 7100SRM is good impact value after PWHT at low temperature down to -20˚F (-29˚C)

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-30˚C	-46˚C	
500 {51}	575 {58}	31	132 {13.5}	100 {10.2}	As-Welded
441 {45}	542 {55}	33	90 {9.2}	67 {6.8}	620˚C × 8hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.035	1.4	0.39	0.010	0.005	0.45

Approvals

JIS

Dual Shield II 71-HI

AWS A5.20 E71T-9C-J / JIS Z3313 T494T1-1CA-U

Description

• Dual Shield II 71-HI is an all-position flux cored wire designed for optimum performance when using 100%CO_2 Shielding. The smooth metal transfer facilitates easy deposition of vertical –up stringer beads.

Shielding Gas : 100%CO_2

Application

• Welding of 50kgf/mm^2 high tensile strength steels for steel frames, bridges, pressure vessels and penstocks.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-30℃	-40℃	
476 {49}	543 {56}	32	120 {12.2}	90 {9.2}	As-Welded
472 {48}	538 {55}	31	79 {8}	51 {5.2}	620℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.031	1.250	0.328	0.012	0.005	0.350

Approvals

ABS, LR, DNV, NK, BV, GL, JIS, KR

Dual Shield II 80-Ni1

AWS A5.29 E81T1-Ni1C / JIS Z3313 T553T1-1CA-N2

Description

- Dual Shield II 80-Ni1 is an all-position wire which exhibits a smooth, easily controlled arc that produces a spray-like transfer. The slag firmly holds the molten puddle for out-of position work and is easily removed. The alloying elements in the core are finely tuned to provide excellent low temperature impact toughness.

Shielding Gas : 100%CO_2

Application

- Dual Shield II 80-Ni1 is used on petrochemical equipment, offshore oil construction, ship fabrication, and heavy machinery. The weld metal analysis is similar to an E8018-C3 low hydrogen covered electrode.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	PWHT
			-30℃	
552 {56}	604 {62}	26	60 {6.1}	As-Welded

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.048	1.16	0.40	0.015	0.004	1.04

Approvals

JIS

Dual Shield II 81-K2

AWS A5.29 E81T1-K2C / JIS Z3313 T556T1-1CA-N3

Description

• Dual Shield II 81-K2 is a high strength all-position flux cored electrode designed to provide excellent low temperature impact toughness. In addition, Dual Shield II 81-K2 is designed to provide a stable arc with low spatter levels when using CO_2 for shielding.

Shielding Gas : 100%CO_2

Application

• Dual Shield II 81-K2 should be used to weld 80,000psi (550MPa) tensile steels where good low temperature toughness is specified. Such steels include ASTM A302, A533 Class 1, and A537, DC reverse polarity (electrode positive) should be used.

Benefits

• Good operability and low spatter with CO_2 shielding, along with excellent mechanical properties.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		
			-20℃	-40℃	-60℃
560 {57}	620 {63}	29	118 {12.0}	83 {8.5}	54 {5.5}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.04	1.20	0.38	0.012	0.010	1.58

Approvals

LR, ABS, DNV, BV, GL, RINA, NK, KR, JIS

Dual Shield II 81-K2LT

AWS A5.29 E81T1-K2C / JIS Z3313 T496T1-1CP-N3

Description

• Dual Shield II 81-K2LT is high strength all position flux cored wire design to provide excellent low temperature impact toughness. In addition, Dual Shield II 81-K2LT provides stable fracture at -20℃ or higher when testing CTOD

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-30℃	-60℃	
495 {50}	590 {60}	27	95 {9.6}	85 {8.6}	As-Welded
435 {44}	520 {63}	31	90 {9.1}	78 {7.9}	620℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.04	1.10	0.25	0.010	0.009	1.45

Typical CTOD Value

Test Temperature	-10℃	-20℃
CTOD Value	δ > 0.80mm	δ > 0.65mm

Approvals

KR, ABS, LR, DNV, NK, BV, GL, JIS

Dual Shield II 91-LT

AWS A5.29 E91T1-Ni2C

Description

- Dual Shield II 91-LT is high strength all position flux cored wire design to provide excellent low temperature impact toughness. In addition, Dual Shield II 91-LT provides stable fracture at -40℃ or higher when testing CTOD

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-30℃	-60℃
570 {58}	650 {66}	27	98 {9.9}	75 {7.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.05	1.12	0.23	0.011	0.010	2.46

Typical CTOD Value

Test Temperature	-40℃
CTOD Value	δ > 0.33mm

Coreweld 80-K2

AWS A5.29 E80T1-K2C / JIS Z3313 T556T1-0CA-N3

Description

- Coreweld 80-K2 is a metal cored wire with superior pit resistance in welding of inorganic zinc-rich primer coated steel.
- Coreweld 80-K2 is a rutile slag flux cored wine designed to produce welds with impact toughness at temperature as low as -76℉(-60℃).
- The impact value of weld metal is reduced if heat input is much high.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		
			-20℃	-40℃	-60℃
578 {59}	637 {65}	26	89 {9.1}	68 {6.9}	48 {4.9}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni
0.05	1.52	0.55	0.011	0.012	1.38

Approvals

ABS, LR, BV, GL, KR, DNV, NK, JIS

Dual Shield T-85-Ni3

AWS A5.29 E80T5-Ni3M

Description

- Dual Shield T-85-Ni3 is a member of ESAB SeAH family of outstanding small diameter, basic slag, flux cored wires. The basic slag system assures optimum weld quality and resistance to cracking. The small diameters, with their favorable high current density, display deep penetration and high deposition rates.
- When the recommended welding parameters and shielding gas are used, a very smooth, low spatter, spray-type arc is attained. The deposited weld metal achieves as welded and stress relieved properties equal to or better than the corresponding low hydrogen electrodes.

Shielding Gas : 75%Ar/25%CO_2 (CO_2 is available for a small diameter.)

Application

- To obtain a smooth spray transfer, minimal spatter and good wetting action, a mixture of 75%Argon/25%CO_2 shielding gas is recommended.
- Dual Shield T-85-Ni3 is designed for single and multi-pass welds in the flat and horizontal positions. It is alloyed to weld the 3%Ni steels which are used for low temperature applications.

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	PWHT
				-73℃	
75%Ar/25%CO_2	620 {63}	710 {72}	23	80 {8.1}	As-Welded
	539 {55}	620 {63}	26	95 {9.7}	620℃ × 1hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Ni	Cr
75%Ar/25%CO_2	0.032	0.50	0.30	0.009	0.001	3.65	0.016

Dual Shield 7000-A1

AWS A5.29 E81T1-A1C / JIS Z3318 YFM-C

Description and Application

- Dual Shied 7000-A1 is an all-position flux cored electrode recommended for 0.5% Mo steels. It is used in the fabrication and erection of boilers, pressure piping and tubing and other pressure vessel applications. Shielding gas of 100%CO_2 and 75%Ar, remainder CO_2 may be used. 75%Ar/25%CO_2 shielding gas mixture is recommended to improve arc characteristics, increase wetting action, decrease penetration, and provide easier arc control for out-of-position welding. The weld metal analysis is similar to an E7018-A1 low hydrogen electrode.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
560 {57}	630 {64}	23	As-Welded
540 {55}	610 {62}	26	620℃ × 1hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Mo
0.05	1.02	0.57	0.51

Dual Shield 7000-A1Ni

Description

• Dual Shield 7000-A1Ni is an all-position flux cored electrode recommended for Mn-0.5%Mo-0.5%Ni steels. It is used in the fabrication and erection of boilers, pressure piping and tubing and other pressure vessel applications.

Shielding Gas : 100%CO_2

Application

• ASTM A533 type A, B, C, D

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	PWHT
			-20℃	
563 {57}	653 {67}	24	80 {8.2}	690℃ × 1hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ni	Mo
0.067	0.87	0.55	0.009	0.007	0.49	0.51

Special Information

Preheating at 100-250℃ and post heating at 650-700℃ are required.

Dual Shield 8000-B2(L)

AWS A5.29 E81T1-B2C / JIS Z3318 YF1CM-C

Description and Application

- Dual Shied 8000-B2 is an all-position flux cored electrode which contains 1.25% Cr-0.5% Mo. The analysis is very similar to Dual Shield 88 CM, except 8000-B2 is for out-of-position welding. The weld metal analysis is similar to an E8018-B2 low hydrogen electrode.
- Dual Dual Shield 8000-B2 wire is used for the welding of such steel as 0.5%Cr-0.5% Mo, 1%Cr-0.5%Mo, and 1.25%Cr-0.5%Mo. The wire is designed for single or multiple pass welding.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
640 {65}	720 {73}	20	As-Welded
600 {61}	680 {69}	21	620℃ × 1hr

Typical Undiluted Weld Metal Analysis %

	C	Mn	Si	Cr	Mo
Dual Shield 8000-B2	0.058	0.65	0.58	1.30	0.55
Dual Shield 8000-B2L	0.03				

Preheat & Interpass, PWHT Temperature

Base Metal	Preheat & Interpass Temp.	PWHT Temp
0~1%Cr-0.5%Mo Steel	212~392℉(100~200℃)	1.202~1.292℉(650~700℃)
1~25%Cr-0.5%Mo Steel	302~572℉(150~300℃)	1.202~1.292℉(650~700℃)
2~25%Cr-1.0%Mo Steel	392~662℉(220~350℃)	1.224~1.350℉(680~730℃)

Dual Shield T-85-B2

AWS A5.29 E80T5-B2M / JIS Z3318 YF1CM-G

Description

- Dual Shield T-85-B2 is a member of ESAB SeAH family of outstanding small diameter, basic slag, flux cored wires. The basic slag system assures optimum weld quality and resistance to cracking. The small diameters, with their favorable high current density, display deep penetration and high deposition rates.
- When the recommended welding parameters and shielding gas are used, a very smooth low spatter, spray-type arc is attained. The deposited weld metal achieves as welded and stress relieved properties equal to or better than the corresponding low hydrogen electrodes.

Shielding Gas : 75%Ar/25%CO_2

Application

- To obtain a smooth spray transfer, minimal spatter and good wetting action, a mixture of 75%Argon/25%CO_2 shielding gas is recommended.
- Dual Shield T-85-B2 is engineered for single and multi-pass welds in the flat and horizontal positions. It is alloyed to weld the chrome-moly steels in the categories of 1/2%Cr-1/2%Mo, 1%Cr-1/2%Mo. and 1 · 1/4%Cr-1/2%Mo.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			-20℃	-46℃	
600 {61}	710 {72}	23	77 {7.9}	52 {5.3}	As-Welded
530 {54}	634 {65}	24	121 {12.3}	78 {8.0}	690℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Mo
0.07	0.86	0.49	0.014	0.012	1.15	0.53

Coreweld 80-B2

AWS A5.28 E80C-B2C/M

Description

- Coreweld 80-B2 is a metal cored electrode designed for single and multipass welding of steels as 1/2%Cr-1/2%Mo, 1%Cr-1/2%Mo and 1-1/4%Cr-1/2%Mo. This electrode has a high percentage of iron powder resulting in a high percentage of iron powder resulting in a high efficiency wire with only small islands of slag on the weld deposit.

Shielding Gas : 75%Ar/25%CO_2, 98%Ar/2%CO_2, 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
75%Ar/25%CO_2	640 {62}	687 {70}	25	As-Welded
	593 {61}	662 {68}	26	620℃×1hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Mo
75%Ar/25%CO_2	0.035	1.10	0.57	0.010	0.013	1.23	0.51

Dual Shield 9000-B3(L)

AWS A5.29 E91T1-B3C / JIS Z3318 YF2CM-C

Description and Application

- Dual Shied 9000-B3 is an all-position flux cored electrode which deposits a 2.25%Cr-1%Mo weld metal. The weld metal analysis is similar to an E9018-B3 low hydrogen electrode.
- Dual Shield 9000-B3 is recommended for welding 2.25%Cr-1%Mo steels. This wire is designed for single or multiple pass welding. Shielding gas of 100%CO_2 and 75%Ar-remainder CO_2 may be used.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
715 {73}	825 {84}	13	As-Welded
590 {60}	660 {67}	20	690℃ × 1hr

Typical Undiluted Weld Metal Analysis %(100%CO_2)

구분	C	Mn	Si	Cr	Mo
Dual Shield 9000-B3	0.06	0.70	0.40	2.21	1.04
Dual Shield 9000-B3L	0.03				

Dual Shield T-95-B3

AWS A5.29 E90T5-B3M / JIS Z3318 YF2CM-G

Description

- Dual Shield T-95-B3 joins the ESAB SeAH family of outstanding small diameter, basic slag, flux cored electrodes. Optimum weld quality and resistance to cracking are assured with the basic slag system. The high current density capabilities of the small diameters promotes deep penetration and high deposition rates.
- With the recommended shielding mixture and welding parameters, a very smooth, minimum spatter, spray-type arc is realized.

Shielding Gas : 75%Ar/25%CO_2

Application

- To obtain the excellent arc characteristics and to retain the physical properties, a mixture of 75%Argon/25%CO_2 is recommended.
- Dual Shield T-95-B3 is designed for single and multi-pass welding in the flat position and for horizontal fillets. It is formulated to weld the 2 · 1/4%Cr-1%Mo steels.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}		PWHT
			0℃	-20℃	
730 {63}	854 {87}	20	34 {3.5}	22 {2.2}	As-Welded
565 {58}	676 {69}	22	75 {7.7}	42 {4.3}	690℃ × 1hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Mo
0.07	0.90	0.54	0.015	0.012	2.32	1.05

Dual Shield 8000-B6

AWS A5.29 E81T1-B6C

Description and Application

- Dual Shield 8000-B6 is an all-position flux cored electrode which deposits a 5%Cr-0.5%Mo weld metal. The weld analysis is similar to an AWS E8016-B6 and DT2516(KS D 7022, JIS Z 3223) covered electrode.
- This wire is designed for single or multiple pass welding. These steels are typically used in process pipe, tube in the A213-T5, A335-P5

Wire Dia.	Amprees(A)	Volts(V)	Stick-out(mm)
0.045″	160~300	18~31	19~25
0.052″	180~350	20~33	19~25

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
582 {59}	678 {69}	19	As-Welded
585 {59}	682 {69}	21	750℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Mo
0.05	0.69	0.49	0.01	0.01	5.20	0.50

Dual Shield B9

AWS A5.29 E91T1-B9C/9M

Description and Application

- Dual Shied B9 is an all-position flux cored electrode designed for the welding of modified 9% chromium creep resisting steels, such as ASTM A335 Grade P91 or ASTM A213 T91. This product formulated with a combined Mn & Ni <1.20% to meet stringent customer specifications.

Shielding Gas : 100%CO_2, 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}	PWHT
100%CO_2	682 {69}	748 {76}	21	750℃×3hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Ni	Cr	Mo	V
100%CO_2	0.081	0.69	0.25	0.008	0.008	0.61	9.01	1.02	0.210

Dual Shield B92W

Description and Application

- Dual Shield B92W is an all-position flux cored electrode which deposits a 9%Cr-0.5%Mo-2%W weld metal. It can be used for welding steels such as: ASME SA213 T91, T92, SA335 P91.
- Dual Shield B92W is typically used heat exchanger, boiler, steam turbine in thermal power plant and jet engine

Shielding Gas : 100%CO_2, 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
75%Ar/25%CO_2	695 {71}	793 {81}	19	750℃×3hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Ni	Cr	Mo	V	W	Nb
75%Ar/25%CO_2	0.104	0.423	0.312	0.009	0.007	0.653	8.271	0.443	0.179	1.635	0.052

Dual Shield B122

Description and Application

- Dual Shield B112 is an all-position flux cored electrode which deposits a 12%Cr-0.5%Mo-2%W weld metal. It can be used for welding steels such as: ASME SA213 T122, SA335 P122.
- Dual Shield B112 is typically used heat exchanger, boiler, steam turbine in thermal power plant and jet engine

Shielding Gas : 100%CO_2, 98%Ar/2%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
98%Ar/2%CO_2	730 {74}	817 {83}	18.9	750℃×3hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Ni	Cr	Mo	V	W	Cu	Nb
98%Ar/2%CO_2	0.074	0.687	0.280	0.010	0.006	0.581	11.035	0.311	0.169	1.756	1.486	0.049

Coreweld 80-D2

AWS A5.28 E80C-GM / JIS Z3313 YFW-A602M

Description

- Coreweld 80-D2 is a metal cored wire equivalent to ER80S-D2 solid wires and is a direct substitute for them.
- Some of the benefits of Coreweld 80-D2 are higher depostion rates, better wetting action, and the absence of copper coating on the wire. Coreweld 80-D2 was developed for HSLA steels. This product is capable of single or multiple pass welding.

Shielding Gas : 75%Ar/25%CO_2 or 98%Ar/2%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm² {kgf/mm²}	Tensile Strength N/mm² {kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}			PWHT
				0℃	-30℃	-40℃	
75%Ar/25%CO_2	531 {54}	621 {63}	26	100 {10.2}	46 {4.7}	31 {3.2}	As-Welded
	531 {54}	627 {64}	26	80 {8.3}	34 {3.5}	-	635℃ × 8hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Mo
75%Ar/25%CO_2	0.09	1.20	0.25	0.010	0.018	0.49

Suggested Welding Parameters
Dual Shield-All Position Products

Diameter	Flat			Vertical-Up			Overhead		
	Volts(V)	Amperes(A)	Optimum(A)	Volts(V)	Amperes(A)	Optimum(A)	Volts(V)	Amperes(A)	Optimum(A)
.035"(0.9mm)	20-30	130-280	200-220	16-23	90-180	150-170	20-28	130-250	200-220
.045"(1.2mm)	23-33	130-280	150-320	22-27	90-180	150-250	22-27	130-250	150-280
.054"(1.4mm)	24-34	180-320	180-400	23-28	160-250	150-270	23-28	160-290	160-280
1/16"(1.6mm)	25-35	180-400	180-450	24-28	180-260	180-280	24-29	180-310	180-310

Suggested Welding Parameters
Dual Shield-Flat and Horizontal Products

Diameter	Volts(V)	Amperes(A)	Optimum(A)
5/64"(2.0mm)	28-35	250-400	320-340
3/32"(2.4mm)	28-36	350-550	360-400
1/64"(2.8mm)	30-36	500-600	400-440
1/8"(3.2mm)	31-36	600-650	460-500

A constant voltage power source operated on DC reverse polarity (electrode +) is needed for proper operation. Best results are obtained by using suggested settings and adjusting travel speed to obtain desired bead size.

Shielding gas with a low dew point(below -40℉.) at a flow rate of 30-40 CFH is recommended. When using 75%Argon/25%CO_2 shielding gas, voltages may be reduced by approximately 1 · 1/2volts. For fully automatic operations, amperages can be increased by approximately 25%.

Electrical stickout is the distance measured from the contact tip to the work piece.
The electrical stickout for all position(0.35" -1/16")(0.9mm-1.6mm) electrodes is 3/8"-3/4"(9.5mm-19mm). The electrical stickout for flat and horizontal (5/64"-1/8")(2.0mm-3.2mm) electrodes is 3/4"-1 · 1/4"(19mm-32mm).

Suggested Welding Parameters
Coreweld Wires-Flat and Horizontal

Diameter	Volts(V)	Amperes(A)	Optimum(V×A)
.035"(0.9mm)	23-29	130-260	25×200-220
.045"(1.2mm)	24-30	150-350	26×200-270
.054"(1.4mm)	26-32	200-400	28×280-320
1/16"(1.6mm)	26-33	250-420	29×300-340
5/64"(2.0mm)	27-34	300-450	30×340-360
3/32"(2.4mm)	28-34	330-500	32×380-420

Operation of Coreweld Wires

A constant voltage power source operating on DC reverse polarity is needed for proper operation. A variety of gas mixtures may be used for external shielding of Coreweld 70. Mixtures of 75%Argon/25%CO_2, or 90%Argon/10%CO_2 provide very good efficiencies and smoot operating characteristics.

A mix of 50%Argon/50%CO_2 may be used, but it should be noted that as the percentage of Argon decreases, spatter and fume levels increase and a change in mechanical properties may occur. A gas flow rate in the range of 40-60CFH is recommended. For optimum performance, the electrical stickout should not exceed 1 · 1/8" from the contact tip. Coreweld 71 is specifically designed for use with CO_2 as the shielding gas. Coreweld 111RB may be used with CO_2 or Argon/CO_2 mixtures with up to 80%Argon.

Coreshield 11

AWS A5.20 E71T-11

Description

- Coreshield 11 is a self-shielded all-position flux cored welding wire for single and multiple pass applications on mild steel.

Application

- Coreshield 11 is excellent for use on single or multiple pass, lap, fillet, and butt welds on mild steels in all welding positions.
- It meets the requirements for classification E71T-11 in AWS specification A5.20, and offers smooth arc action, full slag coverage, easy slag removal, and low spatter. Bead appearance and weld edges are smooth and no shielding gas is required.
- This product should find excellent acceptance in general purpose mild steel fabrication. The .045" diameter wire can be used on materials as thin as 1/16". For single pass welding on material as thin as .047", .030" diameter Coreshield 15(AWS E71T-GS) is recommended.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
450 {46}	570 {58}	23

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Al
0.1	1.1	0.3	0.010	0.004	1.2

Special Precautions

- Coreshield 11, like many other E71T-11 wires, contains fluoride compounds. The fume exposure limit for fluorides is 2.5mg/m³ as Fluoride (Permissible Exposure Limit per Occupational Safety and Health Administration 29 CFR 1910.1000). This limit may be reached before the general fume limit of 5mg/m³ is reached (Threshold Limit Value, per American Conference of Governmental Industrial Hygienists).

Coreshield 15

AWS A5.20 E71T-14 / JIS Z3313 T49T13-1NS-G

Description

- Coreshield 15 is a self-shielded all-position flux cored welding wire for single pass applications. It is excellent for use on thin gauges of galvanized and mild steels. Travel speed is high and weld edges are smooth. Coreshield 15 has a smooth arc action, full slag coverage, easy slag removal, and low spatter. No shielding gas is required. The use of DC straight polarity welding current minimizes the risk of burn through. Deposition efficiency is higher than that of shielded metal arc electrodes.

Application

- Coreshield 15 is excellent for use on lap and fillet welds on thin gauge galvanized and mild steels in all welding positions. The availability of .030" diameter wire makes it possible to use this product on materials as thin as 18 gauge.

Typical Mechanical Properties of All Weld Metal

Transverse Tension Test N/mm²{kgf/mm²}	Longitudinal Guided Bend Test
615 {63}	No Defects

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Al
0.25	0.7	0.4	0.010	0.006	2

Special Precautions

- Coreshield 15, like many other similar self-shielded electrodes, contains fluoride compounds. The fume exposure limit for fluorides is 2.5mg/m³ as Fluoride (Permissible Exposure Limit per Occupational Safety and Health Administration.) Coreshield 15, or any other welding electrode, requires extra attention to ventilation when being used to weld galvanized steel. Freshly formed zinc oxide, when inhaled, can cause metal fume fever. This ailment is unpleasant and is characterized by, chills, breathing difficulty, fever, cough, muscular pain, nausea, and vomiting. It resembles a bad case of influenza in symptoms. These symptoms will disappear within 48 hours of the time when exposure to freshly formed zinc oxide ceases.

Approvals

JIS

Coreshield 40

AWS A5.20 E70T-4

Description

- Coreshield 40 is designed to meet the needs of operations where external shielding equipment is impractical. Its use, either indoors or out-of-doors, in light to moderate drafts without loss of effective shielding atmosphere, complements its flexibility.
- The core ingredients are carefully balanced for stable operation, crack resistance, and easy slag removal. Coreshield wires are engineered for optimum efficiencies with longer stickout than are normally associated with externally shielded wires. Weld bead is smooth, flat and uniform in sidewall wash. Its resistance to porosity when welding over moderate rust and mill scale, and its ability to handle uneven fit up, make Coreshield 40 an excellent performer in less than ideal shop conditions.

Application

- Coreshield 40 wires are designed for single and multipass welding in the flat and horizontal positions on low and medium carbon steels in conditions which do not require high impact properties. Areas of application include frame, body and related components in the construction of farm machinery, automobiles, trucks, railcars and heavy construction equipment, as well as structural fabrication.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}
			0℃
420 {43}	595 {61}	29	29 {3.0}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Al
0.2	0.3	0.3	0.012	0.007	1.3

Coreshield 7

AWS A5.20 E70T-7

Description

- Coreshield 7 is a self-shielded flux cored wire designed for single and multipass welding of mild steel base plate. It should only be run on straight polarity (Electrode Negative). Sheet as thin as 10 gauge can be welded with 1/16" Coreshield 7. Welding in the flat, horizontal, and vertical-down positions is possible with the 1/16" diameter. The larger diameters are for use in the flat and horizontal positions.

Application

- Coreshield 7 should be used for general structural steel welding where self-shield provides an advantage. If it is to be used indoors, some provision for fume removal will normally be necessary. Coreshield 7 is not recommended for weldments where impact toughness testing is specified.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
460 {47}	625 {64}	26

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Al
0.26	0.50	0.14	0.012	0.007	1.6

Special Precautions

- Coreshield 7, like many other E70T-7 wires, contains fluoride compounds. The fume exposure limit for fluorides is 2.5mg/m³ as Fluoide (Permissible Exposure Limit per Occupational Safety and Health Administration 29 CFR 1910.1000). This limit may be reached before the general fume limit of 5mg/m³ is reached (The shold Limit Value, per American Conference of Governmental Industrial Hygienists.)

Coreshield 8-Ni1

AWS A5.29 E71T8-Ni1 / JIS Z3313 T492TG-1NA-N2

Description

- Coreshield 8-Ni1 is a self-shielded flux cored wire designed to produce welds with outstanding impact toughness at temperatures as low as -60˚F(-51℃). It is suitable for all position welding and is especially suited for making root passes or handling poor fit up. It should only be run on DCEN (electrode negative).

Application

- Coreshield 8-Ni1 should be used for welding offshore structures, bridges, storage tanks, and other applications where excellent impact toughness is specified and where self-shielding provides an advantage.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-30℃	-50℃
447 {46}	539 {55}	29	122 {12.4}	89 {9.1}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Ni	P	S	Al
0.05	1.4	0.30	1.0	0.010	0.002	0.80

Approvals

JIS

Suggested Welding Parameters

Coreshield 40

	5/64”(2.0mm)			3/32”(2.4mm)			.120”(3.0mm)		
Amperes	230	280*	330	300	350*	400	450	500*	550
Volts	25	27*	29	27	30*	32	29	32*	33
	2 1/4” Stickout			2 1/2” Stickout			2 3/4” Stickout		

Note : DC Reverse Polarity (Electrode Positive) Only.

Coreshield 7 & 8-Ni1

	1/16”(1.6mm)			3/32”(2.4mm)			7/64”(2.8mm)		
Amperes	225	300*	375	250	325*	400	400	455*	550
Volts	23	28*	30	25	28*	31	27	30*	32
	1” Stickout			1 1/4” Stickout			1 1/2” Stickout		

Note : DC Straight Polarity (Electrode Negative) Only.

Coreshield 11 & 15

	.030”(0.8mm)			.035”(0.9mm)			.045”(1.2mm)		
Amperes	40	100*	160	70	130	200	80	160	225
Volts	15	16*	16	15	17	18	13	18	19
	3/8”~1/2” Stickout			1/2” Stickout			1/2” Stickout		

	1/16”(1.6mm)			5/64”(0.2mm)		
Amperes	115	210	275	130	250*	300
Volts	14	19	20	17	20*	21
	5/8” Stickout			3/4” Stickout		

Note : DC Straight Polarity (Electrode Negative) Only.

* Denotes Optimum

Coreshield 8 Plus

AWS A5.29 E71T8-G

Description

- Coreshield 8 Plus is an all-position self-shielded flux cored wire designed to weld critical demand structural applications while maintaining excellent arc characteristics and high welder appeal. With its fast-freezing slag that supports the molten metal during welding, Coreshield 8 Plus is ideal for out-of-position welding in structural fabrication and other heavy duty applications.

Application

- Applications include bridge and building fabrication, plate and tubular welding, hull and stiffener welding in ship construcation.

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}	
			-40℃	-60℃
448 {46}	521 {53}	24	97 {9.9}	75 {7.6}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Ai	Ni
0.08	0.33	0.1	0.007	0.003	0.50	1.10

Special Precautions

- The recommended conditions are temperatures below 24℃ and atmospheric humidity levels below 60%. Recondition spools at 50℃ for 24 hours. Storage temperatures should not exceed the reconditioning temperatures.

Approvals

ABS, DNV

Flux Cored Wires

- **Stainless Steel**
- **Hardfacing**

WELDING
CONSUMABLES
GUIDE BOOK

The Effects of Welding Heat

The most important point to consider in the welding of any metal, including stainless steel, is the change in the basic structure of the metal caused by the heat of the welding arc. The effects of temperature change on the three main types of stainless steels follows :

Austenitic stainless steel

Austenitic stainless steel differs from other steels in its response to heat. It has much lower thermal conductivity than carbon steel, causing the weld areas to remain hot longer. Its thermal expansion is much greater than carbon steel. If this difference is not taken into account, welding heat may distort the stainless steel or create high stresses. The electrical resistance of austenitic stainless is several times greater than carbon steel which limits the amount of welding current usable with a stainless steel electrode without overheating the electrode.

Heat of welding causes carbide precipitation.

When austenitic stainless steel containing more than 0.02% carbon is heated to a temperature between 800˚F(427˚C) to 1500˚F(816˚C), the carbon in excess of 0.02% migrates to the austenitic grain boundaries where it combines with chromium to form chromium carbide.

(The first 0.02% carbon remains in solution in the austenite and does not react to form chromium carbide.)

A zone in the heat affected portion of an austenitic stainless steel weldment is subjected to the time and temperature which forms chromium carbide at the grain boundaries. The corrosion resistance of stainless steel is dependent on the chromium content. The chromium, which has joined with the excess carbon at the grain boundaries to form chromium carbide, offers no corrosion resistance. For this reason, when the steel containing chromium carbide formed by the welding heat is exposed to strongly corrosive conditions, the corrodant attacks the grain boundaries (See Figure 1). It is this intergranular corrosion which results from the formation of the chromium carbides that causes premature failure of the stainless steel. Until the weldment is exposed to the corrosive attack, there is no change in any of the properties of the steel. No property of the steel, other than the corrosion resistance, is affected by the precipitation of chromium carbides at the grain boundaries.

Methods to Control Carbide Precipitation

1. The carbon in the steel may be stabilized by the addition of columbium or titanium to the steel. These alloying elements form more stable carbides than chromium, thereby preventing the formation of chromium carbide. (Columbium can be more readily transferred across the arc of a covered electrode than titanium and is therefore the common element used for the stabilization of the weld metal.) E347 is an example of columbium stabilized austenitic stainless steel weld metal which does not allow the formation of chromium carbides and as a result is not subject to intergranular corrosion.

2. Chromium carbide is formed by the carbon in excess of 0.02%. Therefore, if the carbon content of the steel were no more than 0.02%, there would be no carbide formed. With this low level of carbon, there is not enough chromium carbide formed to allow intergranular corrosion to occur (See Figure 2). Weld metal is a special case and 0.04%C is considered sufficiently low to prevent intergranular corrosion in the standard grades.

3. The chromium carbide, which is formed in the heat affected zone, can be taken into solution if the weldment is heated to at least 1950°F (1066°C) and rapidly cooled. This is the least practical method of controlled carbide precipitation because it is rare that weldments can withstand being heated to this high temperature without experiencing sagging, loss of dimension control and excessive scaling. These three methods should be considered the only truly dependable ways to control carbide precipitation.
Others have been attempted but all have been proven unreliable.

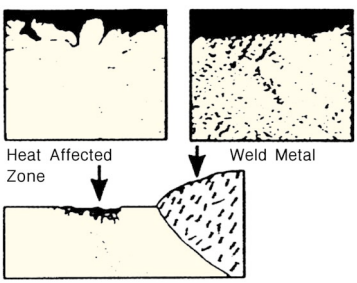


Figure 1 - Chromium Carbides are formed in the heat affected zone of a weld by the combining of excess carbon with chromium. Note the corrosive attack at the grain boundaries.

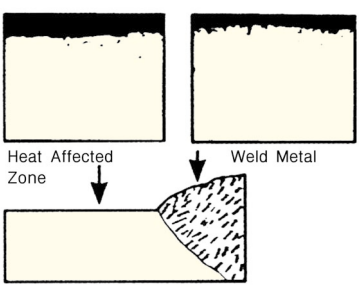


Figure 2 - The use of extra low carbon plate and E308L electrodes eliminates the formation of chromium carbides in the heat affected zone. The chromium content remains effective to resist corrosion.

Martensitic Stainless Steel

Martensitic stainless steels contain alloys which cause martensite to form during cooling from the temperatures reached while welding. The martensitic structure may be excessively hard, brittle and crack sensitive. When these steels are welded with similar

weld metal, it is necessary that the steel be preheated and postweld heat treated. If it is impossible to use preheat, a weld made with E309L should not be postweld heat treated in the welding of martensitic steels. The weld must be made with tough ductile weld metal which stretches and does not overload the hardened heat affected zone of the steel. E309L stainless steel electrodes provide this tough and elastic weld metal, but should not be used in circumstances where sulfur is present in service or where creep resistance and/or resistance to stress corrosion cracking is required.

Ferritic Stainless Steel

All steels experience grain growth at temperatures above 1700˚F (927˚C) by the larger grains absorbing the smaller grains and becoming larger. The larger the grain, the weaker and more crack sensitive the steel becomes.

Ferritic stainless steel is exceptionally sensitive to grain growth. At welding temperature, it occurs very rapidly.

The only way to control grain growth is to use the lowest practical welding heat for the shortest possible time. This is accomplished by using as low preheat and interpass temperature as possible, small size electrodes and lowest practical welding current. Thick sections may require preheat and postweld heat treatment is used in some cases to restore the corrosion resistance.

The Selection of Stainless Steel Filler Metal

The choice of electrode to use in welding stainless steel depends upon three factors : The first is the composition of the stainless steel or of both steels in the case of a dissimilar joint to be welded. The second is the service conditions the weldment will see after fabrication. The third is the need for crack resistant weld metal. This can be controlled by the presence of ferrite (3 to 8 FN is the normal amount) in an austenitic weld metal. Fabrication code, e.g. ASME, will specify which electrode to use and what ferrite level is required. In this case, a special formulation can be provided by ESAB SeAH.

Stainless steels are used in many applications, namely, corrosion resisting, creep resisting, heat resisting, impact resisting at cryogenic temperatures, and magnetic resistance. Stainless steel electrodes can also be used to weld crack resistant joints in armor and high carbon steels. Ideally, the weld metal selected should be capable of a matching service performance to that of the base material.

Stain resistant applications are those where the corrosion rate must be virtually nil. Examples can be found in the dairy, food, brewery and pharmaceutical industries, where corrosion of the smallest amount could contaminate the product. Architecture is another area where a stain free surface is required for aesthetic reasons. In these applications, electrodes which give a weld metal to match the base metal are normally used. In more aggressive environments, some care should be taken to ensure the ferrite level is compatible with the service conditions. In such cases, ferrite levels of about 5 FN are often used.

Corrosion resisting applications are those where corrosion is a factor, but the rate of corrosion has been considered in the design. The majority of chemical plants fall into this

category. In applications where the service temperature is below about 600˚F (316˚C), the low carbon grade stainless steels are normally used and should be welded with low carbon grade electrodes of matching composition - not with columbium or titanium stabilized electrodes. Some environments are more aggressive than others, and the weld metal can be attacked preferentially if the wrong electrode is used. In these circumstances, care should be taken that the actual molybdenum level in the weld metal is not less than that in the parent metal, and in some cases, overalloying with molybdenum is a common practice. Ferrite level can be important also. For example, acetic acid and urea plant applications require a maximum of 2 FN or less to prevent corrosion.

Creep resisting applications are those where the mechanical properties of stainless steels become significant. Creep occurs at temperatures of 1000˚F (538˚C) and above. Corrosion may not be an important factor as with steam generating plant or it may be significant as with chemical and petrochemical plants operating at temperatures of 1400˚F (760˚C) and above. At these temperatures, the use of high carbon grade electrodes ensures the maximum creep strength in the 308 or 316 categories, and they must be used to weld the high carbon grade steels. Types 347 and 321 should not be used as they can have poor ductility at these tempera-tures. If type 347 or 321 parent material has been used, it would be prudent to weld it with an E316H, E16-8-2(steam plant only), or even an E308H electrode if the presence of molybdenum is detrimental. For steam plant applications, the E16-8-2 electrode is often used to weld type 304 plate. Ferrite levels that are very low or very high can be detrimental to the creep ductility and the optimum range is about 5 FN.

Heat resisting applications are those where a resistance to scaling from hot gases at temperatures around 2000˚F is necessary. In such applications, there is greater use of types 309, 310, 446 and higher alloyed metals. Matching electrodes are normally used with the exception of E347 and ER321 as stated earlier, and molybdenum bearing weld metal in oxidizing environments. Stainless steel castings used for these high temperature applications are designated the H grades by ACI. Examples are the HK and HT grades and these must be welded with electrodes that deposit about 0.40% carbon, i.e., E310H and E330H electrodes, respectively.

Impact resisting applications are normally those at the cryogenic temperatures of liquid nitrogen/oxygen or even liquid helium. Here corrosion is not a problem and non-matching electrodes are acceptable provided they give good mechanical electrodes with a crack free joint.
Normally, impact toughness as measured by the Charpy V-notch test is the criteria.
It has been shown that carbon, nitrogen content is a usual choice, even for the welding of type 304, E316L gives a more crack resistant deposit than E308L and so does a -15 coating compared to a -16 coating.

Non-magnetic steel is often required in electrical genera-tion equipment, super-conducting installation (which may also require cryogenic properties) and mine sweepers.

The magnetic permeability, m, is the measure of the ability of a material to be affected by magnetic fields. A figure of 1.00 is fully non-magnetic and 1.10 max. is often specified for weld metal to be used in these non-magnetic applications. Corrosion resistance is generally not required. Fully austenitic stainless steels are non-magnetic, but even the standard levels of ferrite found in many austenitic weld metals gives a magnetic permeabil-ity greater than 1.10. Which electrode to use is usually governed by the fabrication standards and is often MIL 308HC, E310, or E316L with a 2 FN maximum. The low ferrite can cause cracking problems and this should be considered when choosing the electrode, with E316L-15 probably the most crack resistant.

The welding of low alloy steel to stainless steel is also an area where service conditions and postweld heat treatments should be considered when choosing an electrode. Normally, one of the high ferrite E309 series of electrodes, E312 or an E307 electrode should be chosen. Here, the high alloy and ferrite contents are diluted by the low alloy steel and ideally give a weld metal of 5-10 FN.
Consultation of the Schaeffler diagram to predict the weld metal ferrite content can be helpful. If the service temperature is to be above 600˚F (316˚C) or below-75˚F (-59˚C), or if a postweld heat treatment is contemplated, a high nickel electrode should be used. Where high dilution may occur or a high carbon low alloy steel is to be welded, an E312 electrode with the highest ferrite content is often the answer. The MIL 307 and MIL 308Mo electrodes are designed to weld high carbon steels such as armor plate. The surfacing of low alloy steels for corrosion resistance is usually accomplished by the appropriate 309 electrode to overcome the dilution of the base material. Then, a second and even a third layer of the required analysis is welded on top. If the application requires wear and impact resistance, ESAB's Wear-Arc or Wear-O-Matic R electrodes should be considered.

One example of the effect of service on the choice of a welding electrode can be seen with the martensitic type 410 steels. These steels can be used for high tempera-ture creep, corrosion or even wear resisting or used for resistance to stress corrosion cracking with low tempera-ture mechanical property requirements. High carbon levels in the weld metal are favored in the former case while lower levels are best suited to the latter. Unless special requirements apply, the standard E410 elec-trodes are normally suitable. These 410 steels require preheating and post weld heat treating. If the service environment of the weld would allow reduced corrosion resistance and mechanical properties, these steels can be welded with E309 and E310 electrodes without preheat or post weld heat treatment, ideal for field erection where heat treating can be a problem.

Shield-Bright® Flux Cored Stainless Steel Electrodes Gas Shielded

Description

- Shield-Bright wires feature a new concept in slag systems which produces superior welding performance and a desirable flat bead shape in all positions : horizontal, vertical-up, vertical-down, and overhead. First time users are amazed at the ease of operation.

All-Position Capabilities-Including Overhead

- Shield-Bright wires were specially developed for out-of-position welding. They are unsurpassed for vertical-up joints and work equally well in the overhead position. These electrodes will deposit out-of-position welds at substantially higher welding currents than other stainless steel flux cored, all-position electrodes, resulting in a higher deposition rate.
- The 0.35”(0.09mm), 0.45”(1.2mm), the 1/16”(1.6mm) diameters perform equally well on out-of-position joints.

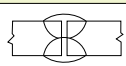
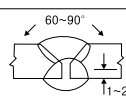
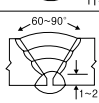
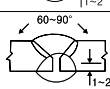
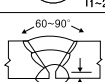
Shielding Gases

- Shield-Bright wires were formulated for use with 75%Ar/25%CO_2 shielding gas : however, straight CO_2 may used. The 75%Ar/25%CO_2 mixture will produce a smoother arc with virtually no spatter and slightly higher yield and tensile strengths than straight CO_2. The mechanical properties and deposit analyses will meet AWS A5.22 specifications with either gas.

Stainless Flux-Cored Wire

1) Welding power source :
   Use DC power source with constant voltage characteristics. Polarity is DC-EP
2) Shielding gas :
   Usually, use CO_2 gas for welding, Ar+20~50%CO_2 can be used, too.
   The flow rate of shielding gas should 20~25ℓ/min.
3) Wire extension :
   Keep the distance between tip and base metal at 15~20mm for 0.45"(1.2mm) and 1/16"(1.6mm) diameters.
4) Welding conditions :
   (a) Butt welding
   Applicable plate thickness is more than 2mm for 0.45"(1.2mm) dia. and more than 5mm for 1.6mm dia. in case of flat position, and is more than 5mm for 1.2mm dia. in case of vertical position. Groove shape is square for less than 4mm thick, and single V groove or double V groove for more than 5mm thick plate. One-side welding can be applied with the same groove shape in case of flat, horizontal and vertical positions by using backing material of FBB-3. Refer to Table 1 and Fig 1.

Table 1. Typical welding conditions for butt joint

WP	Dia. (mm)	PT (mm)	GD & passes	RG (mm)	Amp	Speed (cm/min)	Note
F	1.2	2		<0.5	120~140	40~50	SPBS. No back-gouging
		3		<0.5	150~200	35~55	
		4		0~1.5	180~250	25~50	
	1.2	5		0~2	150~220	25~40	Back-Gouging
	1.6				200~250	25~60	
	1.2	12		0~2	180~250	20~60	
	1.6				200~300	20~60	
V	1.2	5		0~2	110~140	7~12	Back-Gouging
		12					

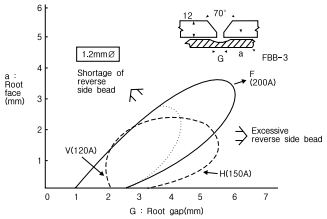


Fig 1. Proper groove shape for one-side welding with FBB-3

(b) Horizontal fillet welding

Proper welding speed is 30~70cm/min in horizontal fillet welding.

By using 309 type wire, welding of stainless steel to carbon steel can be done in the same welding condition as stainless steels. Refer to Fig 2.

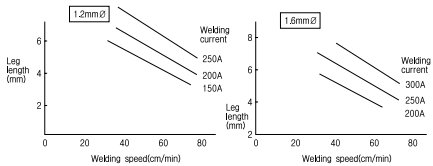


Fig 2. Relation between leg length and welding conditions in horizontal fillet welding

(c) Overlaying

1st layer of overlaying onto carbon steel is welded with 309 type wire by a half lapping method. In order to obtain the proper diluted ratio, Welding current is 200~250A for 1/16”(1.6mm) dia. and 150~200A for 0.45”(1.2mm) dia.. And welding speed is 20~30cm/min for 1/16”(1.6mm) dia. and 20~40cm/min for 0.45”(1.2mm) dia.. Refer to Fig 3.

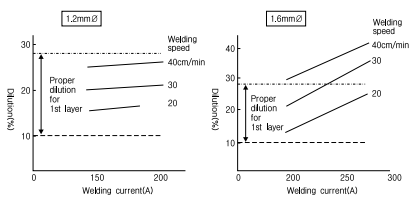


Fig 3. Dilution ratio in overlaying

5) Protection against wind

When wind velocity near an arc is more than 1m/sec, blowhole is apt to occur and the ferrite content weld metal reduces on account of nitrogen from the air. As this result, there is a danger of occuring hot crack. Therefore, protect a weld from wind.

6) Weld fumes

As the amount of generated fumes is more than that of covered electrodes, wear a protection mask and make sufficient ventilation.

Shield-Bright 308 / 308BF

AWS A 5.22 E308T1-1(4) / JIS Z3323 TS308-FB1

Description and Application

- Shield-Bright 308/308BF were developed for the welding of type 304 stainless steel and can also be used for welding types 301, 302, 305, and 308 steels. It may also be used for welding types 321 and 347 if the service conditions do not exceed an approximate of 500℉(260℃).
- Shield-Bright 308/308BF were designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.
- Shield-Bright 308/308BF have Bi contents less than 20ppm and give greater high temperature strength.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
Shield-Bright 308	395 {40.2}	580 {59}	55
Shield-Bright 308BF	391 {39.8}	580 {59}	51

Typical Undiluted Weld Metal Analysis %

	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
Shield-Bright 308	0.055	1.10	0.80	0.020	0.003	19.2	9.8	8~15
Shield-Bright 308BF	0.046	1.21	0.76	0.022	0.008	19.4	9.9	8~15

Approvals

JIS

Shield-Bright 308 X-tra

AWS A 5.22 E308T0-1(4) / JIS Z3323 TS308-FB0

Description and Application

- Shield-Bright 308 X-tra was developed for the welding of type 304 stainless steel and can also be used for welding types 301, 302, 305, and 308 steels. It may also be used for welding types 321 and 347 if the service conditions do not exceed an approximate of 500˚F (260˚C).
- Shield-Bright 308 X-tra was developed for welding in the flat position and for horizontal fillet welds with beautiful beads with with excellent slag removal.
- Shield-Bright 308 X-tra has better cracking resistance and mechanical properties.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	402 {41}	569 {58}	51

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.055	1.42	0.50	0.020	0.003	19.8	9.9	3~8

Approvals

JIS

Shield-Bright 308H

AWS A5.22 E308HT1-1(4) / JIS Z3323 TS308H-FB1

Description and Application

- Shield-Bright 308H was developed for welding type 304H stainless steel and can also be used for welding type 301, 302, and 304 steels. It contains a higher carbon level than 308L filler metals to give greater high temperature strength. The ferrite content is also lower for high temperature service. It has greater ductility than 347 types at high temperatures and for that reason it is sometimes used to weld types 321 and 347 for service above 750˚F (399˚C).coupled with high stress.
  Shield-Bright 308H was designed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	392 {40}	578 {59}	44
75%Ar/25%CO_2	430 {44}	600 {61}	42

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.050	1.10	0.80	0.020	0.007	19.3	9.5	3~8
75%Ar/25%CO_2	0.060	1.20	0.90	0.020	0.070	19.5	9.8	3~8

Approvals

JIS

Shield-Bright 308L

AWS A5.22 E308LT1-1(4) / JIS Z3323 TS308L-FB1

Description and Application

- Shield-Bright 308L was developed for welding type 304L stainless steel and can also be used for welding types 301, 302, and 304 steels. It may also be used for welding types 321 and 347 if the service conditions do not exceed an approximate of 750˚F (399˚C). Carbon content 0.04% maximum.
  Shield-Bright 308L was designed for welding in all position and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	372 {38}	568 {58}	61
75%Ar/25%CO_2	410 {42}	580 {59}	44

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.025	1.10	0.70	0.025	0.007	19.1	10.0	8~15
75%Ar/25%CO_2	0.030	1.20	0.90	0.025	0.007	19.3	10.1	8~15

Approvals

ABS, BV, DNV, KR, LR, NK, CCS, JIS

Shield-Bright 308L X-tra

AWS A5.22 E308LT0-1{4} / EN ISO 17633-A T 19 9 L R M C 3 / JIS Z3323 TS308L-FB0

Description and Application

- Shield-Bright 308L X-tra was designed for welding type 304L stainless steel but can be used for types 301, 302,and 304 steels. It may also be used successfully for welding of types 321 and 347 stainless steel. Service conditions should not exceed an approximate of 750℉ (399℃).
  Shield-Bright 308L X-tra was designed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	409 {41}	549 {56}	55
75%Ar/25%CO_2	410 {42}	580 {59}	40

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.030	1.30	0.48	0.020	0.004	19.4	9.8	8~15
75%Ar/25%CO_2	0.022	1.40	0.90	0.020	0.004	19.6	9.9	8~15

Approvals

ABS, DNV, KR, LR, BV, TUV

Shield-Bright 309 / 309BF

AWS A 5.22 E309T1-1(4) / JIS Z3323 TS309-FB1

Description and Application

- Shield-Bright 309/309BF were designed for the welding of type stainless clad steels, AISI 309, 13Cr steel and 18Cr steel or for welding dissimilar metals such as stainless steels to carbon steels. It used in heat resisting steels such as the oil industry, chemical industry and jet engine.
- Shield-Bright 309/309BF were designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.
- Shield-Bright 309/309BF have Bi contents less than 20ppm and give greater high temperature strength.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
Shield-Bright 309	403 {41}	545 {55}	48
Shield-Bright 309BF	403 {41}	545 {55}	48

Typical Undiluted Weld Metal Analysis %

	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
Shield-Bright 309	0.055	1.10	0.70	0.022	0.013	22.7	12.5	6~13
Shield-Bright 309BF	0.048	1.10	0.81	0.022	0.008	22.7	12.5	6~13

Approvals

JIS

Shield-Bright 309H

AWS A5.22 E309T1-1(4) / JIS Z3323 TS309-FB1

Description and Application

- Shield-Bright 309H was developed for the welding of type 309 and similar stainless steels. Its ferrite content, which is lower than Shield-Bright 309L, allows for joining carbon and low alloy steels provided the dilution is not too great and the service temperature is above 750˚F (399˚C) where creep strength properties are necessary. Shield-Bright 309H was designed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	450 {46}	590 {60}	35
75%Ar/25%CO_2	480 {49}	620 {63}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.060	1.20	0.70	0.019	0.010	23.4	12.1	8~15
75%Ar/25%CO_2	0.060	1.30	0.90	0.019	0.010	24.0	12.5	8~15

Approvals

JIS

Shield-Bright 309L

AWS A5.22 E309LT1-1(4) / JIS Z3323 TS309L-FB1

Description and Application

- Shield-Bright 309L was developed for welding stainless steel to carbon or low alloy steels and for the first layer cladding of carbon and low alloy steels. It was designed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.
  For joining thick sections, it is preferred the non-stainless steel be buttered with a layer of Shield-Bright 309L and the joint completed with Shield-Bright 316L or 308L. The service temperature should not exceed approximately 750˚F (399˚C).

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	392 {40}	539 {55}	51
75%Ar/25%CO_2	480 {49}	600 {61}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.029	1.10	0.80	0.024	0.007	23.1	12.4	15~25
75%Ar/25%CO_2	0.030	1.30	0.90	0.024	0.007	23.5	12.5	15~25

Approvals

ABS, BV, DNV, GL, KR, LR, NK, CCS, JIS

Shield-Bright 309L X-tra

AWS A5.22 E309LT0-1(4) / JIS Z3323 TS309L-FB0 / EN ISO 17633-A T 23 L R M C 3

Description and Application

- Shield-Bright 309L X-tra was developed for the welding of stainless steels to carbon or low alloy steels and for the first layer cladding of carbon and low alloy steels.
  Shield-Bright 309L X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.
  For joining thick sections, it is preferred the non-stainless steel be buttered with a layer of Shield-Bright 309L X-tra and the joint completed with Shield-Bright 316L X-tra or 308L X-tra.
  The service temperature should not exceed approximately 750˚F (399℃).

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	410 {42}	546 {55}	38
75%Ar/25%CO_2	480 {49}	600 {61}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.032	1.46	0.66	0.021	0.004	24.50	12.8	20~30
75%Ar/25%CO_2	0.030	1.44	0.80	0.020	0.004	24.50	13.0	20~30

Approvals

ABS, DNV, BV, TUV, CCS, JIS

Shield-Bright 309LCb

AWS A5.22 E309LCbT1-1(4) / JIS Z3323 TS309LNb-FB1

Description and Application

- Shield-Bright 309LCb was designed for welding dissimilar metals such as austenitic stainless steels with Nb to carbon steels or for welding clad steels on the first pass in cladding steels. It used in power plants.
- Shield-Bright 309LCb were designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	441 {45}	617 {63}	39

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Nb	Ferrite No.
100%CO_2	0.025	1.09	0.70	0.028	0.008	23.5	12.6	0.77	15~25

Approvals

JIS

Shield-Bright 309Mo

AWS A 5.22 E309MoT1-1(4) / JIS Z3323 TS309Mo-FB1

Description and Application

- Shield-Bright 309Mo was designed for the welding of type 316, 316L clad steels on first pass in cladding steels or for welding dissimilar metals such as 316, 316L austenitic stainless steels to carbon steels. It is used in heat resisting steels and 309S stainless steels.
- Shield-Bright 309Mo were designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	570 {58}	730 {74}	32

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Nb	Ferrite No.
100%CO_2	0.075	0.98	0.71	0.026	0.009	22.6	12.6	2.5	6~13

Approvals

JIS

Shield-Bright 309MoL

AWS A5.22 E309LMoT1-1(4) / JIS Z3323 TS309LMo-FB1

Description and Application

- Shield-Bright 309MoL was designed for welding type 316 clad steels on the first pass in cladding steels or for welding dissimilar metals such as molybdenum-containing austenitic stainless steels to carbon steels. It is used in paper mills and in power plants to give greater corrosion resistance. This wire performs best when used out-of-position shielded with either Ar/CO_2 or 100%CO_2.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	550 {56}	715 {73}	35
75%Ar/25%CO_2	570 {58}	750 {76}	30

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.029	1.0	0.70	0.024	0.008	22.90	12.7	2.60	17~27
75%Ar/25%CO_2	0.030	1.2	0.75	0.024	0.008	23.5	13.0	2.60	17~27

Approvals

DNV, KR, JIS

Shield-Bright 309MoL X-tra

AWS A5.22 E309LMoT0-1(4) / JIS Z3323 TS309LMo-FB0

Description and Application

- Shield-Bright 309MoL X-tra was developed for the welding of stainless steels to carbon or low alloy steels. For thick sections it is often preferable that the non-stainless steel should be buttered with a layer of Shield-Bright 309L X-tra and the joint made with Shield-Bright 316L X-tra or 308L X-tra. It was also developed for the first layer cladding of carbon and low alloy steels prior to subsequent layers from Shield-Bright 316L X-tra or 317L X-tra.
  The service temperature of all the resulting weldments should not exceed about 700℉ (370℃).
  Multiple layer cladding with Shield-Bright 309MoL X-tra can be used for additional corrosion resistance in some applications in the pulp and paper industry. Shield-Bright 309MoL X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal. It can be used with either 75%Ar / 25%CO_2 or 100%CO_2 gases.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	527 {54}	662 {68}	33
75%Ar/25%CO_2	550 {49}	690 {70}	30

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	M0	Ferrite No.
100%CO_2	0.024	1.53	0.58	0.021	0.008	24.0	13.4	2.30	15~25
75%Ar/25%CO_2	0.030	1.60	0.60	0.020	0.008	23.5	13.5	2.50	15~25

Approvals
JIS

Shield-Bright 310 X-tra

AWS A5.22 E310T0-4 / JIS Z3323 TS310-FB0

Description and Application

- Shield-Bright 310 X-tra was developed for the welding of type 310S fully austenitic stainless steel. It can be got deposit metal of 25%Cr-20%Ni and for welding in the flat position and for horizontal fillet welds with beautiful beads with with excellent slag removal.
- Shield-Bright 310 X-tra can substitute covered arc welding electrode of AWS A5.4 E310 and solid wire of AWS A5.9 ER310.
- Shield-Bright 310 X-tra has better cracking resistance and mechanical properties

Shielding Gas : 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
75%Ar/25%CO_2	412 {42}	627 {64}	42

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni
75%Ar/25%CO_2	0.170	2.21	0.62	0.022	0.007	25.3	20.6

Approvals

JIS

Shield-Bright 312

AWS A5.22 E312T1-1(4) / JIS Z3323 TS312-FB1

Description and Application

- Shield-Bright 312 was developed for welding of high carbon steels and for the first layer cladding of carbon and low alloy steels. The best results are obtainable when the "buttering" technique is used. Shield-Bright 312 can be used as a clad layer with superior corrosion resistance or as a buffer layer. It was also designed for welding out-of-position and performs well with minimal slag and easy clean-up.
  Shield-Bright 312 has limited success on lead-free free-machining steels (example:AISI 11XX, 12XX), 303, 416, and 430F stainless steels. Preheating is only necessary at carbon levels over 0.2% for carbon steels.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	620 {63}	810 {83}	24
75%Ar/25%CO_2	630 {64}	830 {85}	24

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni
100%CO_2	0.10	1.20	0.70	0.025	0.006	28.3	9.5
75%Ar/25%CO_2	0.10	1.30	0.75	0.025	0.006	29.0	9.6

Approvals

JIS

Shield-Bright 316 / 316BF

AWS A 5.22 E316T1-1(4) / JIS Z3323 TS316-FB1

Description and Application

- Shield-Bright 316/316BF were designed for the welding of type 316, 316L austenitic stainless steels. they have Bi contents less than 20ppm and give greater high temperature strength.
- Shield-Bright 316/316BF were designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
Shield-Bright 316	390 {40}	560 {57}	55
Shield-Bright 316BF	395 {40}	570 {58}	54

Typical Undiluted Weld Metal Analysis %

	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
Shield-Bright 316	0.060	1.16	0.77	0.020	0.006	18.9	11.8	2.40	5~15
Shield-Bright 316BF	0.055	1.21	0.81	0.022	0.008	18.9	11.7	2.50	5~15

Approvals

JIS

Shield-Bright 316 X-tra

AWS A 5.22 E316T0-1(4) / JIS Z3323 TS316-FB0

Description and Application

- Shield-Bright 316 X-tra was developed for the welding of type 316, 316L austenitic stainless steels. It can be got deposit metal of 18%Cr-12%Ni-2%Mo and for welding in the flat position and for horizontal fillet welds with beautiful beads with with excellent slag removal.
- Shield-Bright 316 X-tra has better cracking resistance and mechanical properties at as weld.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	445 {45}	573 {58}	36

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.049	1.45	0.50	0.020	0.006	19.0	11.7	2.50	3~8

Approvals

JIS

Shield-Bright 316H

AWS A5.22 E316T1-1(4) / JIS Z3323 TS316-FB1

Description and Application

- Shield-Bright 316H was developed for welding of type 316H stainless steel and can also be used for type 316. It contains a higher carbon level(0.04% min.) than 316L filler metals to give greater high temperature strength. The ferrite content is also lower for high temperature service.
  Typically these are found in applications where the service temperature is above 750˚F (400˚C).
  Shield-Bright 316H was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	452 {46}	595 {61}	35
75%Ar/25%CO_2	460 {67}	620 {63}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.062	1.51	0.52	0.020	0.006	18.9	11.9	2.60	3~8
75%Ar/25%CO_2	0.055	1.10	0.70	0.020	0.006	19.0	12.0	2.60	3~8

Approvals

JIS

Shield-Bright 316L

AWS A5.22 E316LT1-1(4) / JIS Z3323 TS316L-FB1

Description and Application

- Shield-Bright 316L was developed for the welding of type 316L stainless steel but can be used for other stainless steels including types 316 and 304L. In a few cases, e.g. nitric acid service, Shield-Bright 316L should not be used to weld 304L. It contains molybdenum which resists pitting corrosion induced by sulphuric and sulphurous acids, chlorides and cellulose solutions.
  Used widely in the rayon, dye and paper making industries.
  Shield-Bright 316L was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	442 {45}	570 {58}	53
75%Ar/25%CO_2	450 {46}	580 {59}	40

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.028	1.10	0.80	0.027	0.010	18.50	11.8	2.60	8~15
75%Ar/25%CO_2	0.030	1.20	0.90	0.027	0.010	18.5	12.0	2.70	8~15

Approvals

ABS, BV, DNV, KR, LR, NK, JIS

Shield-Bright 316L X-tra

AWS A5.22 E316LT0-1(4) / JIS Z3323 TS316L-FB0 / EN ISO 17633-A T 19 12 3 L R M C 3

Description and Application

- Shield-Bright 316L X-tra was developed for the welding type 316L stainless steel and also can be used for the other stainless steels including types 316 and 304L. In a few cases, e.g. nitric acid service, Shield-Bright 316L X-tra should not be used to weld 304L. It was designed specifically for applications where the service environment can produce pitting corrosion.
  Shield-Bright 316L X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	431 {44}	565 {58}	37
75%Ar/25%CO_2	450 {46}	580 {59}	36

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.026	1.47	0.46	0.024	0.006	18.5	12.0	2.70	8~15
75%Ar/25%CO_2	0.030	1.30	0.60	0.020	0.008	19.0	12.0	2.70	8~15

Approvals

ABS, DNV, KR, LR, TUV, JIS

Shield-Bright 317L

AWS A5.22 E317LT1-1(4) / JIS Z3323 TS317L-FB1

Description and Application

- Shield-Bright 317L is recommended for welding type 317 and 317L stainless steel. It can also be used for type 316L where additional weld metal corrosion resistance, including pitting resistance, is required. This is used in industries where there is severe corrosion applications involving sulfuric and sulfurous acids and their salts.
  Shield-Bright 317L was developed for welding in all position.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	460 {47}	600 {61}	34
75%Ar/25%CO_2	480 {49}	620 {63}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.032	1.20	0.80	0.021	0.009	18.4	12.5	3.40	8~15
75%Ar/25%CO_2	0.032	1.20	0.85	0.021	0.009	19.50	13.0	3.50	8~15

Approvals

JIS

Shield-Bright 317L X-tra

AWS A5.22 E317LT0-1(4) / JIS Z3323 TS317L-FB0

Description and Application

- Shield-Bright 317L X-tra was developed for welding type 317 and 317L stainless where additional corrosion resistance that type 316L cannot provide. Carbon content 0.04% maximum.
  Shield-Bright 317L X-tra was designed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	472 {48}	624 {63}	33
75%Ar/25%CO_2	480 {49}	580 {59}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	M0	Ferrite No.
100%CO_2	0.028	1.50	0.54	0.018	0.006	19.3	13.5	3.15	8~15
75%Ar/25%CO_2	0.030	1.50	0.65	0.018	0.006	19.0	12.5	3.50	8~15

Approvals
JIS

Shield-Bright 347

AWS A5.22 E347T1-1(4) / JIS Z3323 TS347-FB1

Description and Application

- Shield-Bright 347 was developed for the welding of stainless steel types 321 and 347. As with all 347 weld metals, for service at temperatures greater than 1000℉(550℃) it can be used in circumstances of lower stress and not under creep conditions.
  Shield-Bright 347 can also be used for the welding of types 302, 304 and sometimes 304L stainless steels.
  Shield-Bright 347 was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	433 {44}	622 {63}	47
75%Ar/25%CO_2	520 {53}	650 {66}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.045	1.10	0.80	0.027	0.010	18.7	10.0	0.40	3~8
75%Ar/25%CO_2	0.030	1.20	0.90	0.020	0.007	19.5	10.0	0.45	3~8

Approvals

JIS

Shield-Bright 347H

AWS A5.22 E347T1-1(4) / JIS Z3323 TS347-FB1

Description and Application

- Shield-Bright 347H was developed for the welding of stainless steel types 321 and 347 where a minimum of 0.04% carbon is required. As with all 347 weld metals, for service at temperatures greater than 1000˚F (550˚C) it can be used in circumstances of lower stress and advisedly under creep conditions.
  Shield-Bright 347H can also be used for the welding of types 302 and 304 stainless steels.
  Shield-Bright 347H was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	450 {46}	650 {66}	40
75%Ar/25%CO_2	520 {53}	650 {66}	35

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Nb	Ferrite No.
100%CO_2	0.060	1.00	0.50	0.020	0.010	18.5	9.8	0.55	3~8
75%Ar/25%CO_2	0.060	1.10	0.85	0.020	0.010	19.5	9.7	0.60	3~8

Approvals

JIS

Shield-Bright 410

AWS A5.22 E410T1-1(4) / JIS Z3323 TS410-FB1

Description and Application

- Shield-Bright 410 is 13%Cr martensitic stainless steel flux cored wire. It is used for overlay welding on valve sheet surface because of its martensite structure in as welded condition which shows high hardness and wear resisting properties. It will be showed good ductility and excellent corrosion resistance after post-weld heat treatment at 600~850℃, and it is suitable for welding of AISI 410, 403, 420J1, and 420J2. Recommended for welding remove dirts such as oil and dust from the groove. Normally, pre-heat is necessary at 200~400℃.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
100%CO_2	430 {44}	580 {59}	26	750℃ × 1hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr
100%CO_2	0.021	0.35	0.35	0.020	0.002	11.55

Approvals

JIS

Shield-Bright 410NiMo

AWS A5.22 E410NiMoT1-1(4) / JIS Z3323 TS410NiMo-FB1

Description and Application

- Shield-Bright 410NiMo is an all-positional gas shielded flux cored wire for fabrication and repair of hydroelectric turbine “runners” and other similar applications. Its spray-like transfer enhances the arc characteristics while minimizing post-weld clean up and rework.
  The ease of use and “use-friendly” characteristics minimize training while producing consistent quality welds. The self-peeling slag removal and easy post-weld clean up minimize the cost to deposit while improving performance efficiency. This electrode is designed for use with Ar/CO_2 shielding gas (75 to 80%Argon, balance CO_2). All product is packaged in a “vacuum sealed” foil bag to prevent moisture absorption.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
100%CO_2	938 {94}	970 {99}	19	600℃ × 1hr
75%Ar/25%CO_2	767 {78}	927 {94}	17	600℃ × 1hr

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo
100%CO_2	0.025	0.34	0.40	0.020	0.004	11.60	4.75	0.45
75%Ar/25%CO_2	0.027	0.50	0.70	0.020	0.004	11.30	4.50	0.50

Approvals
JIS

Shield-Bright 2209

AWS A5.22 E2209T1-1(4) / JIS Z3323 TS2209-FB1

Description and Application

- Shield-Bright 2209 was developed for the welding of '2205' duplex stainless steels e.g. UNS S31803, S32205, and J92205. It can also be used for the welding of leaner grades of duplex stainless steels. It has been approved with a 25℃ critical pitting temperature and impact toughness at -40℉(-40℃). Shield-Bright 2209 was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	617 {63}	825 {84}	32
75%Ar/25%CO_2	650 {66}	820 {83}	25

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	N	Ferrite No.
100%CO_2	0.03	1.40	0.60	0.025	0.012	23.2	8.7	3.21	0.14	35~50
75%Ar/25%CO_2	0.03	0.90	0.35	0.025	0.012	22.5	9.2	3.2	0.16	35~50

Approvals

ABS, LR, DNV, BV, GL, CCS, JIS

Shield-Bright 2507

AWS A5.22 E2553T1-G

Description and Application

- Shield-Bright 2507 was designed for the welding of type of duplex stainless steel and for welding in all position with beautiful beads with excellent slag removal. It can be got deposit metal of 25%Cr-9%Ni-3.5%Mo-0.25%N.
- Shield-Bright 2507 is used in duplex stainless steels such as UNS S32520, S32550, S32750, S32760, S32900, JIS 329J4L.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
100%CO_2	628 {64}	863 {88}	28

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	N	Ferrite No.
100%CO_2	0.03	1.10	0.55	0.010	0.008	25.0	9.5	3.75	0.22	40~65

Shield-Bright®
Suggested Welding Parameters

	0.45”(1.2mm)				
	Optimum Parameters			Operating Range	
	Wire Feed Speed	Amps.	Volts.	Amps.	Volts.
Flat Volts	450”/min.(11.50m/min.)	180~200	25~27	135~250	24~32
	325”/min.(8.30m/min.)	150~170	24~26	135~200	24~26
	425”/min.(10.40m/min.)	175~195	25~27	155~200	25~28

	1/16”(1.6mm)				
	Optimum Parameters			Operating Range	
	Wire Feed Speed	Amps.	Volts.	Amps.	Volts.
Flat Vertical	246”/min.(6.70m/min.)	220~240	25~27	170~300	24~31
	220”/min.(5.60m/min.)	190~210	25~26	170~230	24~27
	235”/min.(5.90m/min.)	200~220	25~26	170~270	24~29

- For best results, set wire feed speed and adjust voltage for smoothest operation.
- Electrode extension range is from 1/2” to 1” (12.5mm to 25mm), with an optimum range of 5/8” to 3/4” (15mm to 20mm). Weld using reverse polarity DC(+)

Shield-Bright® Deposition and Efficiency Date

	0.45”(1.2mm)			
Amperes	130	165	190	220
Volts	25	26	28	30
Wire Feed Speed				
in./min.	227	341	445	567
m/min.	5.80	8.70	11.30	14.40
Deposition Rate				
lbs./hr.	4.25	6.14	8.08	10.24
kg/hr.	1.93	2.78	3.66	4.64
% Efficiency	84	83	84	84

	1/16”(1.6mm)			
Amperes	170	210	250	300
Volts	25	27	28	29
Wire Feed Speed				
in./min.	154	193	243	321
m/min.	3.90	4.90	6.17	8.15
Deposition Rate				
lbs./hr.	5.34	6.89	8.57	11.43
kg/hr.	2.42	3.12	3.89	5.18
% Efficiency	83	82.5	83	83

Shield-Bright X-tra Flux Cored Stainless Steel Electrodes Gas Shielded

Description

- Shield-Bright X-tra flux cored wires were developed for flat and horizontal positions welding.
- The smooth weld metal transfer and easy slag removal eliminates unnecessary cleanup.
- The flat equal leg weld beads minimize over welding while producing a fime appearance.

Shielding Gas

- Shield-Bright X-tra wires were formulated for use with 100%CO_2 shielding gas ; however, 75%Ar/25%CO_2 may also be used.
- The 75%Ar/25%CO_2 mixture will produce a smoother arc with virtually no spatter and slightly higher yield and tensile strengths than CO_2, The mechanical properties and deposit analysis will meet AWS A5.22 specification with either gas.

Shield-Bright X-tra Deposition and Efficiency Date

	0.045"(1.2mm)		
Amperes	150	200	300
Volts	25	29	33
Wire Feed Speed			
in./min.	259	410	860
m/min.	6.58	10.41	21.84
Deposition Rate			
lbs./hr.	5.0	7.7	16.9
kg/hr.	2.28	3.50	7.68
% Efficiency	84	84	87

	1/16"(1.6mm)		
Amperes	200	240	240
Volts	25	28	33
Wire Feed Speed			
in./min.	172	250	495
m/min.	4.37	5.71	12.57
Deposition Rate			
lbs./hr.	6.7	8.1	18.9
kg/hr.	3.05	3.68	8.59
% Efficiency	84	84	86

- For best results, set wire feed speed and adjust voltage for smoothest operation. Electrode extension is 1/2" to 5/8"(12.7mm to 15.9mm). Weld on DC reverse polarity.
- These parameters assume CO_2 shielding. If using Ar-CO_2 mixture, the voltage may need to decreased by up to 2 volts.

Cryo-Shield 308L

AWS A5.22 E308LT1-1(4) / JIS Z3323 TS308L-FB1

Description and Application

- Cryo-Shield 308L is an all-position flux cored wire adaptable to a variety of shop and field erection applications. Designed for cryogenic applications where good weld metal toughness is required. Applications include cryogenic vessel fabrication and process piping repair.
  Cryo-Shield 308L was developed for the welding of types 304 & 304L stainless steels for the low temperature service, even down to liquid helium temperatures. This is done by controlling the composition and the ferrite content to give good toughness at temperatures of -320˚F (-196˚C) and lower.
  Cryo-Shield 308L was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

Shielding Gas : 100%CO_2 or 75%Ar/25%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}
				-196˚C
100%CO_2	363 {37}	552 {56}	59	41 {4.2}

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Ferrite No.
100%CO_2	0.024	1.43	0.67	0.027	0.010	18.50	10.0	Max 8

Approvals

BV, DNV, KR, LR, NK, JIS

Cryo-Shield 316L

AWS A5.22 E316LT1-1(4) / JIS Z3323 TS316L-FB1

Description and Application

- Cryo-Shield 316L is all position flux cored wire adaptable to a variety of shop and field erection applications. Designed for cryogenic applications where good weld metal toughness is required.
- Cryo-Shield 316L was developed for the welding of type 316, 316L austenitic stainless steels for the low temperatures. It contains molybdenum which resists pitting corrosion induced by sulphuric and sulphurous acids, chlorides and cellulose solutions.
- Cryo-Shield 316L was designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.

Shielding Gas : 100%CO_2

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	Impact Value J{kgf · m}
				-196℃
100%CO_2	392 {40}	529 {54}	50	39.7 {4 }

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni	Mo	Ferrite No.
100%CO_2	0.026	1.50	0.70	0.025	0.008	17.5	12.4	2.20	3~8

Approvals

KR, DNV, BV, LR, NK, JIS

Arcaloy 309L

AWS A5.29 EC309L / JIS Z3323 TS309L-FA1

Description and Application

- Arcaloy 309L is a composite metal cored stainless steel wire which has a stainless steel sheath. Arcaloy 309L is designed for welding type 309 wrought or for welding type 304 to mild carbon steel. Also recommended for cladding 304 when welded to carbon steel. It is also used for dissimilar welding between the 300 and 400 series stainless steels and mild and low alloys steels. Its higher deposition rate and less penetration compared to solid wire make it very suitable for making butt, fillet and lap welds on gauge material. Higher speeds are also possible compared to solid wire. The low spatter and slag-free welds make this electrode ideal for automatic and robotic welding. The pushing technique can be used to further minimize the penetration and oxide film formed on the surface of the weld. Typical applications include automobile catalytic converters, manifolds, mufflers, exhaust systems. For welding in the spray mode of metal transfer, the shielding gas should be argon with 1 or 2% oxygen or carbon dioxide. pulse welding can also be used to further minimize penetration in thin gauge steels.

Shielding Gas : 98%Ar/2%O_2

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
450 {46}	560 {56}	40

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ni
0.031	1.523	0.475	0.0015	0.017	23.3	12.35

Arcaloy 310

AWS A5.22 E310T0-G / JIS Z3323 TS310-MA0

Description and Application

- Arcaloy 310 is a composite with 15%Cr-20%Ni and has excellent weldability. Because of the presence of these arc stabilizers, the wire will exhibit smoother operation and lower spatter at a given amperage and voltage than will be seen with a comparable solid wire. The low spatter and slag-free welds make this electrode ideal for automatic and robotic welding

Shielding Gas : 98%Ar/2%O_2, 100%Ar

Typical Mechanical Properties of All Weld Metal

Shielding Gas	Yield Point N/mm²{kgf/mm²}	Tensile Strength N/mm²{kgf/mm²}	Elongation {%}
98%Ar/2%O_2	400 {41}	580 {59}	40

Typical Undiluted Weld Metal Analysis %

Shielding Gas	C	Mn	Si	P	S	Cr	Ni
98%Ar/2%O_2	0.05	2.312	0.554	0.014	0.008	26.5	20.151

Arcaloy T-409Ti

AWS A5.22 E409T0-G

Application

- Arcaloy T-409Ti is a composite wire designed to match the corrosion resistance and mechanical properties of type 409Ti stainless steel. This material is widely used in automotive exhaust systems.

Shielding Gas : 98%Ar/2%O_2

Benefits

- Since Arcaloy T-409Ti is a composite wire rather than a solid wire, small additions of easily ionized materials can be added to the wire core to act as arc stabilizers. Because of the presence of these arc stabilizers, the wire will exhibit smoother operation and lower spatter at a given amperage and voltage than will be seen with a comparable solid wire. Deposition efficiency will essentially match the solid wire, but at a given amperage and voltage, the composite wire will give a somewhat higher deposition rate.

	Optimum Parameters		Operating Range	
Wire Dia.	Amperes	Volts	Amperes	Volts
0.045”	230	24	200~260	22~28
0.052”	250	25	220~280	23~29

- For best results, set wire feed speed and adjust voltage to get the smoothest operation. Run DC+(reverse polarity) and a 1/2” to 5/8”(12.7mm to 15.9mm) stickout. Weld using 98% argon 2% oxygen shielding gas at 35 CFH(16.5ℓ/ min).

Typical Mechanical Properties of All Weld Metal

Yield Point N/mm^2{kgf/mm^2}	Tensile Strength N/mm^2{kgf/mm^2}
410 {42}	530 {54}

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ti
0.02	0.41	0.56	0.009	0.006	11.8	0.90

Arcaloy 430Nb

JIS Z3323 TS430Nb-MA0

Application

- Arcaloy 430Nb is a composite wire designed to match the corrosion resistance and mechanical properties of ferritic stainless steel (STS 409, 410, 430 etc) Actually it has a strong point of the corrosion resistance by 17%Cr content in the weld metal and of the mechanical properties by a fine ferrite crystal structure in the weld metal. So it is very useful to welding of automotive exhaust systems. The 98%Ar/2%O_2 shielding gas is recommended for the good weldability.

Shielding Gas : 98%Ar/2%O_2

Typical Mechanical Properties of All Weld Metal

Tensile Strength N/mm^2{kgf/mm^2}	Elongation {%}
510 {52}	25

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Nb
0.024	0.307	0.180	0.009	0.007	17.0	0.52

Arcaloy 436

Application

- Arcaloy 436 is composed with 17%Cr and more excellent resistance to intergranular corrosion than Arcaloy T-409Ti. So that, it is very useful to welding of front pipe, flexible pipe, center pipe, tail pipe in car muffler stainless steel.
- It has excellent weldability, and good slag removal.

Shielding Gas : 98%Ar/2%O_2

	Optimum Parameters		Operating Range	
Wire Dia.	Amperes	Volts	Amperes	Volts
0.045”	240	27~28	200~275	24~30
0.052”	270	29~30	225~300	26~32

Typical Mechanical Properties of All Weld Metal

Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
392 {40}	15	850℃×2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Mo	Cu	Ti
0.023	0.45	0.32	0.011	0.007	16.7	0.92	0.02	0.62

Arcaloy 439

Application

• Arcaloy 439 is composed with 17%Cr and more excellent resistance to intergranular corrosion than Arcaloy T-409Ti. So that, it is very useful to welding of front pipe, flexible pipe, center pipe, tail pipe in car muffler stainless steel.
The 98%Ar/2%O_2 shielding gas is recommended for the good weldability

Shielding Gas : 98%Ar/2%O_2

Typical Mechanical Properties of All Weld Metal

Tensile Strength N/mm²{kgf/mm²}	Elongation {%}	PWHT
512 {52}	35	850℃ × 2hr

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	P	S	Cr	Ni
0.022	0.459	0.36	0.012	0.005	17.37	0.05

Wear-O-Matic C1

Description and Application

- Wear-O-Matic series provide excellent resistance to wear caused by heavy impact and compressive loads. Wear-O-Matic series have good welding characteristics and provide sound overlays on many abrasion-resistant steels.
- Wear-O-Matic C1 has a surface hardness of over 56 Rockwell C, crack-resistant, and excellent welding characteristics.
- Wear-O-Matic C1 has a characteristic without the use of shielding gas.

Shielding Gas : Non-Shielding

Typical Mechanical Properties of All Weld Metal

Hardness(HRC)	56.5

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Cr	V
4.32	0.76	0.19	18.18	0.10

Wear-O-Matic C2

Description and Application

- Wear-O-Matic series provide excellent resistance to wear caused by heavy impact and compressive loads. Wear-O-Matic series have good welding characteristics and provide sound overlays on many abrasion-resistant steels.
- Wear-O-Matic C2 has a surface hardness of over 58 Rockwell C and excellent welding characteristics.
- Wear-O-Matic C2 has a characteristic without the use of shielding gas.

Shielding Gas : Non-Shielding

Typical Mechanical Properties of All Weld Metal

Hardness(HRC)	60.1

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Cr	V
4.68	0.97	0.41	21.24	0.01

Wear-O-Matic C3

Description and Application

- Wear-O-Matic series provide excellent resistance to wear caused by heavy impact and compressive loads. Wear-O-Matic series have good welding characteristics and provide sound overlays on many abrasion-resistant steels.
- Wear-O-Matic C3 has a surface hardness of over 63 Rockwell C and excellent welding characteristics.
- Wear-O-Matic C3 has a characteristic without the use of shielding gas.

Shielding Gas : Non-Shielding

Typical Mechanical Properties of All Weld Metal

Hardness(HRC)	63

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Cr
5.3	1.1	0.6	26.0

Wear-O-Matic C4

Description and Application

- Wear-O-Matic series provide excellent resistance to wear caused by heavy impact and compressive loads. Wear-O-Matic series have good welding characteristics and provide sound overlays on many abrasion-resistant steels.
- Wear-O-Matic C4 has a surface hardness of over 63 Rockwell C and excellent welding characteristics.
- Wear-O-Matic C4 has a characteristic without the use of shielding gas.

Shielding Gas : Non-Shielding

Typical Mechanical Properties of All Weld Metal

Hardness(HRC)	63

Typical Undiluted Weld Metal Analysis %

C	Mn	Si	Cr	Mo
5.3	1.0	0.6	28.1	0.3