SPECIAL METALS

Welding Products Company

A PCC Company

INCONEL®
INCOLOY®
INCOFLUX®
INCO-CORED®
INCO-WELD®
MONEL®
NI-ROD®
NIMONIC®
DURANICKEL®
686CPT®
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NICKEL ALLOY WELDING
PRODUCT CATALOGUE

www.specialmetalswelding.com

Special Metals Welding Products Company

is the world's leading developer and manufacturer of nickel based welding consumables for joining nickel alloys, high performance steels, cast irons and dissimilar metals as well as overlaying on steel for corrosion or erosion protection. It offers the industry the widest range of welding consumables, supported by over 100 years experience in nickel alloy technology. Product trademarks such as **MONEL, INCO-WELD, NI-ROD, INCONEL, INCOLOY, INCO-CORED,** and **INCOFLUX** have earned worldwide recognition as the standard for quality and product performance.

Special Metals Welding Products Company operates a fully integrated manufacturing facility that encompasses every step from acquisition of raw materials to packaging of the finished products. This melting-pot-to-weld-puddle control provides complete traceability and control of product quality. Rigorous quality control is applied at every production step with all products manufactured in accordance with the ISO 9001:2000 quality system. Manufacture to ASME III NCA 3800, TUV, military and other specifications is undertaken upon specific request.

Support of this comprehensive product line is provided through a tradition of first class technical service and customer support made available through our extensive global distribution network. Direct access to additional information is available through our websites www.specialmetalswelding.com and in Chinese www.smc-wpc.com.

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Nickel Welding Electrode 141

Nickel Welding Electrode 141

Nickel Welding Electrode 141 is used for shielded-metal-arc welding of Nickel 200 and Nickel 201, welding the clad side of nickel-clad steel, and surfacing of steel. The reaction of titanium with carbon in the weld metal holds free carbon to a low level so that the electrode can be used with low-carbon nickel (Nickel 201). The weld metal has good corrosion resistance, especially in alkalies. The electrode is also used for dissimilar welding, including joints between Nickel 200 or 201 and various iron-base and nickel-base alloys. Nickel Welding Electrode 141 can be operated in all welding positions.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications

AWS A5.11 ENi-1 (UNS W82141)
ASME II, Part C, SFA-5.11, ENi-1 (UNS W82141)
ASME IX, F-No.41
*DIN 1736 EL-NiTi3 (2.4156)
*(EN) ISO 14172 – ENi2061 (NiTi3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals

VdTUV 1286.02
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	92.0 min.	Cu	0.25 max.
C	0.10 max.	Al	1.0 max.
Mn	0.75 max.	Ti	1.0-4.0
Fe	0.75 max.	P	0.03 max.
S	0.02 max.	Others	0.50 max.
Si	1.25 max.		

Minimum Mechanical Properties

Tensile Strength, psi	60,000
MPa	414
Elongation, (4d) %	20

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** **in**	2.4 3/32	3.2 1/8	4.0 5/32	4.8 3/16
Length	**mm** **in**	305 12	356 14	356 14	356 14
Current (DC+)	**A**	65-85	90-125	125-170	170-225

Ni-Cu Welding Electrode

MONEL® Welding Electrode 190

MONEL Welding Electrode 190 is used for shielded-metal-arc welding of MONEL alloys 400, R-405, and K-500. It is also used for surfacing of steel. The weld metal is resistant to corrosion by sea water, salts, and reducing acids. The electrode is capable of producing weld deposits that meet stringent radiographic requirements. Although the electrode produces sound joints in MONEL alloy K-500, the weld metal has lower strength since, unlike the base metal, it is not age hardenable. Dissimilar-welding applications for MONEL Welding Electrode 190 include joints between MONEL nickel-copper alloys and carbon steel, low-alloy carbon steel, copper, and copper-nickel alloys.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCu-7 (UNS W84190)
ASME II, Part C, SFA-5.11, ENiCu-7 (UNS W84190)
ASME IX, F-No.42
*DIN 1736 EL-NiCu30Mn (2.4366)
*(EN) ISO 14172 – ENi4060 (NiCu30Mn3Ti)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 2106.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	62.0-68.0	Cu	Remainder
	C	0.15 max.	Al	0.75 max.
	Mn	4.0 max.	Ti	1.0 max.
	Fe	2.5 max.	P	0.02 max.
	S	0.015 max.	Others	0.50 max.
	Si	1.0 max.		

Minimum Mechanical Properties	Tensile Strength, psi	70,000
	MPa	483
	Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	305 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	**A**	55-75	75-110	110-150	150-190

Cu-Ni Welding Electrode

MONEL® Welding Electrode 187

MONEL Welding Electrode 187 is used for shielded-metal-arc welding of wrought or cast 70/30, 80/20, and 90/10 copper-nickel alloys. Like the base metals with which it is used, the weld metal resists fouling and corrosion in sea water and is useful for many marine and desalination applications. Dissimilar joints welded with the electrode include those between copper-nickel alloys and MONEL alloy 400 or Nickel 200.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.6 ECuNi (UNS W60715)
ASME II, Part C, SFA-5.6, ECuNi (UNS W60715)
ASME IX, F-No.34
*DIN 1733 S CuNi30Mn (2.0838)
*(EN) ISO ECu 7158 (CuNi30)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 4530.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	29.0 min.	Si	0.50 max.
	C	0.05 max.	Cu	Remainder
	Mn	1.0-2.50	Ti	0.50 max.
	Fe	0.40-0.75	P	0.020 max
	S	0.015 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	50,000
	MPa	345
	Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	305 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	**A**	60-85	70-120	100-145	130-190

INCO-WELD® A Welding Electrode

INCO-WELD A Welding Electrode is used for shielded-metal-arc welding of INCOLOY alloys 800 and 800HT, INCONEL alloys 600 and 601, and nickel steels. The weld metal has excellent strength and oxidation resistance at high temperatures and retains impact resistance at cryogenic temperatures. The electrode is an exceptionally versatile product for dissimilar welding. It can be used on a variety of austenitic and ferritic steels and nickel alloys. Examples are combinations of stainless steels, carbon steels, INCONEL alloys, INCOLOY alloys, MONEL alloys, and copper-nickel alloys. Because of its versatility, INCO-WELD A Welding Electrode is especially useful for general maintenance welding of equipment exposed to strenuous service conditions.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrFe-2 (UNS W86133)
ASME II, Part C, SFA-5.11, ENiCrFe-2 (UNS W86133)
ASME IX, F-No.43
*DIN 1736 EL-NiCr15FeNb (2.4805)
*(EN) ISO 14172 – ENi6092 (NiCr16Fe9NbMo)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 2104.00
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	62.0 min.	Cu	0.50 max.
	C	0.10 max.	Cr	13.0-17.0
	Mn	1.0-3.5	Nb+Ta	0.5-3.0
	Fe	12.0 max.	Mo	0.5-2.5
	S	0.02 max.	P	0.03 max.
	Si	0.75 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	80,000
	MPa	552
	Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	**A**	45-70	65-95	95-130	125-165

INCONEL® Welding Electrode 152

INCONEL Welding Electrode 152 is used for shielded-metal-arc welding of INCONEL alloy 690. It has a higher chromium content which improves resistance to stress-corrosion cracking in the nuclear, pure water environment. It was designed to produce high quality welds in all positions. This electrode also produces corrosion-resistant overlays on most low-alloy and stainless steels. Other uses include applications requiring INCONEL alloy 690 "glass melters" used for the disposal of nuclear waste. It is also useful for dissimilar joints involving INCONEL and INCOLOY alloys, and stainless, low-alloy and carbon steels.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrFe-7 (UNS W86152)
ASME II, Part C, SFA-5.11, ENiCrFe-7 (UNS W86152)
ASME IX, F-No.43
*(EN) ISO 14172 – ENi6152 (NiCr30Fe9Nb)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	Remainder	Cu	0.50 max.
	C	0.05 max.	Cr	28.0-31.5
	Mn	5.0 max.	Ti	0.50 max.
	Fe	7.0-12.0	Al	0.50 max.
	S	0.015 max.	P	0.03 max.
	Si	0.75 max.	Nb+Ta	1.0-2.5
	Mo	0.50 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	80,000
	MPa	552
	Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	**A**	45-65	75-100	95-130	125-165

INCONEL® Welding Electrode 152M

INCONEL Welding Electrode 152M is used for the shielded-metal-arc welding of INCONEL alloy 690, and the overlaying of carbon steels and stainless steels to provide a nickel-chromium alloy corrosion resistant surface. The high chromium level provides excellent resistance to stress corrosion cracking in the nuclear, pure water environment. The product can also be used in applications requiring resistance to oxidizing acids. It is useful for dissimilar joints involving INCONEL and INCOLOY alloys. This product contains Boron and Zirconium to minimize the tendency for ductility-dip cracking.

Specifications
AWS A5.11 ENiCrFe-7 (UNS W86152)
Other specifications to follow.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni	Remainder	Co	0.12 max.
C	0.05 max.	Nb	1.0 to 2.5
Mn	5.0 max.	P	0.03 max.
Fe	7.0 to 12.0	Zr	0.02 max.
S	0.015 max.	B	0.005 max.
Si	0.75 max.	Mo	0.50 max.
Cu	0.50 max.	Others	0.50 max.
Cr	28.0 to 31.5		

Minimum Mechanical Properties

Tensile Strength, psi	80,000
MPa	552
Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	mm / in	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	A	45-70	75-110	95-140	125-165

INCONEL® Welding Electrode 182

INCONEL Welding Electrode 182 is used for shielded-metal-arc welding of INCONEL alloys 600 and 601. The weld metal has excellent high-temperature strength and oxidation resistance and can meet stringent radiographic requirements.

Dissimilar welds for which the electrode are used include INCONEL alloys and INCOLOY alloys joined to carbon steels, stainless steels, nickel and MONEL alloys, MONEL alloys joined to carbon steels; nickel joined to stainless steels; and stainless steels joined to carbon steels.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrFe-3 (UNS W86182)
ASME II, Part C, SFA-5.11, ENiCrFe-3 (UNS W86182)
ASME IX, F-No.43
*DIN 1736 EL-NiCr15FeMn (2.4807)
*(EN) ISO 14172 – ENi6182 (NiCr15Fe6Mn)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL, and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
VdTUV 2105.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	59.0 min.	Cu	0.50 max.
C	0.10 max.	Cr	13.0-17.0
Mn	5.0-9.5	Ti	1.0 max.
Fe	10.0 max.	Nb+Ta	1.0-2.5
S	0.015 max.	P	0.030 max.
Si	1.0 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi	80,000
MPa	552
Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	mm / in	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	A	40-65	65-95	95-125	125-165

INCONEL® Welding Electrode 112

INCONEL Welding Electrode 112 is used for shielded-metal-arc welding of INCONEL alloy 625, INCOLOY alloy 825, INCOLOY alloy 25-6MO, and other molybdenum-containing stainless steels. It is also used for surfacing of steel and for welding various corrosion-resistant alloys such as alloy 20. The weld metal has high strength at room and elevated temperatures and has exceptional corrosion resistance, including resistance to pitting, crevice corrosion, and polythionic acid stress-corrosion cracking. INCONEL Welding Electrode 112 is useful for many dissimilar joints involving INCONEL alloys, INCOLOY alloys, stainless steels, low-alloy steels, and carbon steels.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrMo-3 (UNS W86112)
ASME II, Part C, SFA-5.11, ENiCrMo-3 (UNS W86112)
ASME IX, F-No.43
*DIN 1736 EL-NiCr20Mo9Nb (2.4621)
*(EN) ISO 14172 – ENi6625 (NiCr22Mo9Nb)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
VdTUV 4450.00
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	55.0 min.	Si	0.75 max.
	C	0.10 max.	Cr	20.0-23.0
	Mn	1.0 max.	Nb+Ta	3.15-4.15
	Fe	7.0 max.	Mo	8.0-10.0
	S	0.02 max.	P	0.03 max.
	Cu	0.50 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	110,000
	MPa	758
	Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	mm / in	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	A	40-65	65-90	90-125	125-160

INCONEL® Welding Electrode 122

INCONEL Welding Electrode 122 is used for shielded-metal-arc welding of INCONEL alloys 622 and 625, INCOLOY alloy 25-6MO, and INCOLOY alloy 825. This is an excellent dissimilar metal welding electrode that offers protection against preferential weld metal corrosion when used for joining molybdenum-containing stainless steels, INCONEL alloy C-276, and INCONEL alloy 625. It is a versatile welding product for the chemical, power, petroleum, and marine industries.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrMo-10 (UNS W86022)
ASME II, Part C, SFA-5.11, ENiCrMo-10 (UNS W86022)
ASME IX, F-No.43
*(EN) ISO 14172 – ENi6022 (NiCr21Mo13W3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni	Remainder	Cu	0.50 max.
	C	0.02 max.	Co	2.5 max.
	Mn	1.0 max.	Cr	20.0-22.5
	Fe	2.0-6.0	Mo	12.5-14.5
	P	0.03 max.	V	0.35 max.
	S	0.015 max.	W	2.5-3.5
	Si	0.20 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	100,000
	MPa	690
	Elongation, (4d) %	25

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	mm / in	229 / 12	356 / 14	356 / 14	356 / 14
Current (DC+)	A	50-70	75-100	80-140	125-150

INCO-WELD® C-276 Welding Electrode

INCO-WELD C-276 Welding Electrode is used for shielded-metal-arc welding of INCONEL alloy C-276 and other nickel-chromium-molybdenum alloys. It is also used for surfacing of steel. The weld metal has excellent corrosion resistance in many media and is especially resistant to pitting and crevice corrosion. INCO-WELD C-276 Welding Electrode is useful for various dissimilar joints involving nickel alloys, stainless steels, and low-alloy steels.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrMo-4 (UNS W80276)
ASME II, Part C, SFA-5.11, ENiCrMo-4 (UNS W80276)
ASME IX, F-No.43
*DIN 1736 EL-NiMo15Cr15W (2.4887)
*(EN) ISO 14172 – ENi6276 (NiCr15Mo15Fe6W)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	Remainder	Cu	0.50 max.
C	0.02 max.	Co	2.5 max.
Mn	1.0 max.	Cr	14.5-16.5
Fe	4.0-7.0	Mo	15.0-17.0
P	0.04 max.	V	0.35 max.
S	0.03 max.	W	3.0-4.5
Si	0.2 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi	100,000
MPa	690
Elongation, (4d) %	25

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in				
	mm	2.4	3.2	4.0	4.8
	in	3/32	1/8	5/32	3/16
Length	mm	229	356	356	356
	in	12	14	14	14
Current (DC+)	A	40-65	60-90	90-125	125-150

INCO-WELD® 686CPT® Welding Electrode

INCO-WELD 686CPT Welding Electrode is an all-position shielded-metal-arc welding electrode used to join duplex, super-duplex and super-austenitic stainless steels, as well as nickel alloys such as UNS N06059 and N06022, INCONEL alloy C-276, and INCONEL alloys 622, 625 and 686. INCO-WELD 686CPT Welding Electrode offers a level of corrosion-resistance attractive for welding operations in pollution control engineering as well as the chemical, process, petrochemical, oil and gas, and marine industries.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrMo-14 (UNS W86686)
ASME II, Part C, SFA-5.11, ENiCrMo-14 (UNS W86686)
ASME IX, F-No.43
*(EN) ISO 14172 – ENi6686 (NiCr21Mo16W4)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Nickel	Remainder	Si	0.25 max.
C	0.02 max.	Ti	0.25 max.
Mn	1.0 max.	Cr	19.0-23.0
Fe	5.0 max.	Mo	15.0-17.0
P	0.02 max.	W	3.0-4.4
S	0.02 max.	Others	0.50 max.
Cu	0.50 max.		

Typical Mechanical Properties

Tensile Strength, psi	110,000
MPa	690
Elongation, (4d) %	30

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm / in				
	mm	2.4	3.2	4.0	4.8
	in	3/32	1/8	5/32	3/16
Length	mm	229	356	356	356
	in	12	14	14	14
Current (DC+)	A	40-65	65-95	95-125	125-165

Ni-Cr-Co-Mo Welding Electrode

INCONEL® Welding Electrode 117

INCONEL Welding Electrode 117 is used for shielded-metal-arc welding of INCONEL alloy 617. The weld metal has high strength, good metallurgical stability and excellent resistance to corrosion and high-temperature oxidation. INCONEL Welding Electrode 117 also gives good results in welding many dissimilar materials, especially for high-temperature applications. Examples are INCONEL alloys 600 and 601, INCOLOY alloys 800HT and 803, and cast alloys such as HK-40, HP and HP-45 Modified.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive.

Specifications
AWS A5.11 ENiCrCoMo-1 (UNS W86117)
ASME II, Part C, SFA-5.11, ENiCrCoMo-1 (UNS W86117)
ASME IX, F-No.43
*DIN 1736 EL-NiCr21Co12Mo (2.4628)
*(EN) ISO 14172 – ENi6617 (NiCr22Co12Mo)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 926/012178
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni	Remainder	Nb+Ta	1.0 max.
Cr	21.0-26.0	S	0.015 max.
Co	9.0-15.0	Si	0.75 max.
Mo	8.0-10.0	Cu	0.50 max.
C	0.05-0.15	P	0.03 max.
Fe	5.0 max.	Others	0.50 max.
Mn	0.30-2.5		

Minimum Mechanical Properties

Tensile Strength, psi		90,000
	MPa	620
Elongation, (4d) %		25

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm in	2.4 3/32	3.2 1/8	4.0 5/32	4.8 3/16
Length	mm in	229 12	356 14	356 14	356 14
Current (DC+)	A	40-60	75-100	90-130	125-150

Cast Iron Nickel Welding Electrode

NI-ROD® Welding Electrode

NI-ROD Welding Electrode is used for shielded-metal-arc welding of gray, ductile, and malleable cast irons. It is also used for joints between cast irons and carbon steel or low-alloy steel. The electrode is particularly useful for thin sections and for joints to be machined.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive, or alternating current.

Specifications
AWS A5.15 ENi-CI (UNS W82001)
ASME II, Part C, SFA-5.15, ENi-CI (UNS W82001)
*(EN) ISO 1071 – E C Ni-CI
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Typical Chemical Composition

Ni+Co	95.0	S	0.005
C	1.0	Si	0.70
Mn	0.20	Cu	0.10
Fe	3.0		

Typical Mechanical Properties

Tensile Strength, psi	40,000
MPa	276
Elongation, (4d) %	4

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	mm in	2.4 3/32	3.2 1/8	4.0 5/32	4.8 3/16
Length	mm in	305 12	356 14	356 14	356 14
Current	A DC+ AC	50-80 60-90	80-130 90-140	100-170 140-190	120-190 150-200

Cast Iron Nickel Welding Electrode

NI-ROD® 99X Welding Electrode

NI-ROD 99X Welding Electrode is a premium quality consumable for cast iron, offering true out-of-position welding capability with an ease of operation rivalling carbon steel electrodes. 99X Electrode has a commercially pure nickel core, and is recommended for welding thin cast iron sections and for where optimum machinability of single-pass or single-layer weldments is required.

NI-ROD 99X Welding Electrode is used for joining gray iron, ductile iron, compacted graphite iron, malleable iron and various alloyed irons to themselves, to each other, to steels, to stainless steels, and to nickel alloys.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive, or alternating current.

Specifications
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni	85.0 min.	S	0.03 max.
	C	2.0 max.	Si	2.0 max.
	Mn	2.5 max.	Cu	2.5 max.
	Fe	8.0 max.		

Typical Mechanical Properties	Tensile Strength, psi	55,000
	MPa	378
	Elongation, (4d) %	8

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	305 / 12	356 / 14	356 / 14	356 / 14
Current	**A**				
	DC+	50-80	80-130	100-170	120-190
	AC	60-90	90-140	140-190	150-200

Cast Iron Ni-Fe Welding Electrode

NI-ROD® 55 Welding Electrode

NI-ROD 55 Welding Electrode is used for shielded-metal-arc welding of gray, ductile, malleable, and Ni-Resist cast irons. It is also used for welding cast irons to various wrought materials, including carbon steels, low-alloy steels, and nickel alloys. The electrode is especially useful for welding heavy sections and high-phosphorus irons.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive, or alternating current.

Specifications
AWS A5.15 ENiFe-C1 (UNS W82002)
ASME II, Part C, SFA-5.15, ENiFe-Cl (UNS W82002)
*(EN) ISO 1071 – E C NiFe-Cl
*Supply to these specifications available upon request

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Typical Chemical Composition	Ni+Co	53.0	S	0.005
	C	1.20	Si	0.70
	Mn	0.30	Cu	0.10
	Fe	45.0		

Typical Mechanical Properties	Tensile Strength, psi	57,000-84,000
	MPa	393-579
	Elongation, (4d) %	6-13

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm** / **in**	2.4 / 3/32	3.2 / 1/8	4.0 / 5/32	4.8 / 3/16
Length	**mm** / **in**	305 / 12	356 / 14	356 / 14	356 / 14
Current	**A**				
	DC+	50-70	75-95	110-130	135-170
	AC	55-65	70-85	110-125	135-150

NI-ROD® 55X Welding Electrode

NI-ROD 55X Welding Electrode is a premium quality consumable for cast iron, offering true out-of-position welding capability with an ease of operation rivalling carbon steel electrodes. NI-ROD 55X Electrode has a nickel-iron core wire to produce strong welds with low residual shrinkage stresses, and is well suited for welding thick sections. It has high tolerance for phosphorus and other contaminants in the base metal, so high strength, good ductile welds can be made in low-grade cast irons.

NI-ROD 55X Welding Electrode is used for joining gray iron, ductile iron, compacted graphite iron, malleable iron and various alloyed irons to themselves, to each other, to steels, to stainless steels, and to nickel alloys.

The electrodes provide excellent operability for groove and fillet welding in the downhand position and the smaller diameter electrodes are also suitable for all position welding. Power supply: direct current, electrode positive, or alternating current.

Specifications
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni	45-60	S	0.30 max.
	C	2.0 max.	Si	2.0 max.
	Mn	2.5 max.	Cu	2.5 max.
	Fe	Remainder		

Typical Mechanical Properties	Tensile Strength, psi	50,000-80,000
	MPa	517
	Elongation, (4d) %	15-20

Available Product Forms – Supplied in 10lbs (4.54kg) hermetically sealed containers

Diameter	**mm**	2.4	3.2	4.0	4.8
	in	3/32	1/8	5/32	3/16
Length	**mm**	305	356	356	356
	in	12	14	14	14
Current	**A**				
	DC+	50-70	75-95	110-130	135-170
	AC	55-65	70-85	110-125	135-150

Nickel Filler Metal 61

Nickel Filler Metal 61 is used for gas-tungsten-arc, gas-metal-arc, and submerged-arc welding of Nickel 200 and 201. It is also used for surfacing of steel. INCOFLUX NT100 Submerged Arc Flux is used with the submerged-arc process. The reaction of titanium with carbon maintains a low level of free carbon and enables the filler metal to be used with Nickel 201. The weld metal has good corrosion resistance, particularly in alkalies.

Dissimilar-welding applications for Nickel Filler Metal 61 include joining Nickel 200 and 201 to stainless steels, carbon steels, INCONEL alloys, INCOLOY alloys, copper-nickel alloys, and MONEL alloys. It is also used for joining MONEL alloys and copper-nickel alloys to carbon steels, and for joining copper-nickel alloys to INCONEL and INCOLOY alloys.

Specifications
AWS A5.14 ERNi-1 (UNS N02061)
ASME II, Part C, SFA-5.14, ERNi-1 (UNS N02061)
ASME IX, F-No.41
*BS 2901 Part 5 (NA32)
*DIN 1736 SG-NiTi4 (2.4155)
*(EN) ISO 18274 – SNi2061 (NiTi3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL, Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 1284: 2108.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	93.0 min.	Si	0.75 max.
	C	0.15 max.	Al	1.5 max.
	Mn	1.0 max.	Ti	2.0-3.5
	Fe	1.0 max.	P	0.030 max.
	S	0.015 max.	Others	0.50 max.
	Cu	0.25 max.		

Minimum Mechanical Properties	Tensile Strength, psi	60,000
	MPa	414
	Elongation, (4d) %	20

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm	0.8	0.9	1.0	1.14	1.2	1.6	2.4	3.2
in	0.030	0.035	0.040	0.045	0.047	0.062	0.093	0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

MONEL® Filler Metal 60

MONEL Filler Metal 60 is used for gas-tungsten-arc, gas-metal-arc, and submerged-arc welding of MONEL alloys 400, R404, and K-500. It is also used for surfacing of steel by the gas-metal-arc or submerged-arc processes. For certain gas-metal-arc conditions, a barrier layer of Nickel Filler Metal 61 is recommended. Submerged-arc welding with MONEL Filler Metal 60 is done with INCOFLUX 5 Submerged Arc Flux.

Weld metal deposited by MONEL Filler Metal 60 has properties similar to those of MONEL alloy 400. It has good strength and resists corrosion in many media, including sea water, salts, and reducing acids. The weld metal is not age hardenable and when used to join MONEL alloy K-500 has lower strength than the base metal.

Specifications
AWS A5.14 ERNiCu-7 (UNS N04060)
ASME II, Part C, SFA-5.14, ERNiCu-7 (UNS N04060)
ASME IX, F-No.42
*BS 2901 (NA33)
*DIN 1736 SG-NiCu30MnTi (2.4377)
*(EN) ISO 18274 – SNi4060 (NiCu30Mn3Ti)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 2114.01; 2165.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	62.0-69.0	Cu	Remainder
C	0.15 max.	Al	1.25 max.
Mn	4.0 max.	Ti	1.5-3.0
Fe	2.5 max.	P	0.020 max.
S	0.015 max.	Others	0.50 max.
Si	1.25 max.		

Minimum Mechanical Properties

Tensile Strength, psi		70,000
	MPa	483
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

MONEL® Filler Metal 67

MONEL Filler Metal 67 is used for oxyacetylene, gas-tungsten-arc, gas-metal-arc, and submerged-arc welding of MONEL alloy 450 (70/30 Copper-Nickel) and other copper-nickel alloys. It is used for surfacing of steel if a barrier layer of Nickel Filler Metal 61 is first applied. If applied by the submerged-arc process, MONEL Filler Metal 60 can be used for the barrier layer. Submerged-arc welding with MONEL Filler Metal 67 is done with INCOFLUX 8 Submerged Arc Flux.

The copper-nickel weld metal has excellent resistance to corrosion in sea water, and is widely used for marine and desalination applications.

Dissimilar-welding applications for MONEL Filler Metal 67 are joints between MONEL alloys or Nickel 200 and copper-nickel alloys.

Specifications
AWS A5.7 ERCuNi (UNS C71581)
ASME II, Part C, SFA-5.7, ERCuNi (UNS C71581)
ASME IX, F-No.34
*BS 2901 (C18)
*DIN 1733 SG-CuNi30Fe (2.0837)
*(EN) ISO SCu 7158 (CuNi30)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL, and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 4528.00; 4529.00
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	29.0-32.0	Si	0.25 max.
C	0.04 max.	Ti	0.20-0.50
Mn	1.0 max.	P	0.02 max.
Fe	0.40-0.75	Pb	0.02 max.
S	0.01 max.	Others	0.50 max.
Cu	Remainder		

Minimum Mechanical Properties

Tensile Strength, psi		50,000
	MPa	345
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 72M

INCONEL Filler Metal 72M is used for the overlay cladding of ferrous materials used in high temperature applications, and the welding of nickel-chromium-iron alloy (ASTM B163, B166, B167, and B168 having UNS number N06690) to itself , and to steels, and for welding IN657 and INCO clad 671/800H, using the GTAW, GMAW, and PAW processes. Welds made with this composition are particularly resistant to high temperature oxidation, carburization, and sulfidation, and to reducing-sulfidizing and metal dusting environments.

Specifications
AWS A5.14 ERNiCr-7 (UNS N06073)
ASME II, PART C, SFA5.14, ERNiCr-7 (UNS N06073)

Approvals
Please confirm details of current scope of approvals with the technical Department prior to order placement.

Typical Chemical Composition (%)

Ni	55	Ti	0.25 - 0.75
Cr	36.0 - 39.0	Nb + Ta	0.25 - 1.0
Co	1.0	B	0.003
Mn	0.50	C	0.03
Fe	1.0	P	0.02
Si	0.30	S	0.015
Mo	0.50	Cu	0.30
Al	0.75 - 1.20	Zr	0.02
Others	0.50		

Typical Mechanical Properties

Tensile Strength, psi		100,000
	MPa	690
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.) • Spool weight-13.6 kg (30lb)

NC 80/20 Filler Metal

NC 80/20 Filler Metal Wire is a nickel-chromium material used for the gas-tungsten-arc and gas-metal-arc welding of NIMONIC 75, and INCOLOY alloy DS, and the Brightray alloys to themselves and to each other. The shielding gas should be Argon, Helium, or a mixture of the two. It may also be used in many dissimilar metal applications, especially where carbon steels are joined to stainless steels and to Nickel-based alloys. Weld overlaying of carbon and low alloy steels is another popular application.

Specifications
BS 2901 (NA34)
*DIN 1736 SG-NiCr20 (2.4639)
*(EN) ISO 18274 – SNi6076 (NiCr20)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni	Balance	Fe	0.5 max.
Cr	18 to 21	Si	0.5 max.
Mn	1.2 max.	Cu	0.2 max.
Co	1.0 max.	C	0.26 max.

Minimum Mechanical Properties

Tensile Strength, psi		80,000
	MPa	552
Elongation, (4d) %		25

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Ni-Cr Filler Metal

INCONEL® Filler Metal 82

INCONEL Filler Metal 82 is used for gas-tungsten-arc, gas-metal-arc and submerged-arc welding of INCONEL alloys 600, 601 and 690, INCOLOY alloys 800 and 800HT, and INCOLOY alloy 330. It is also used for surfacing of steel. INCOFLUX NT100 is used for submerged arc groove welding with this wire. For submerged-arc surfacing INCOFLUX NT100 is suitable.

Weld metal deposited by INCONEL Filler Metal 82 has high strength and good corrosion resistance, including oxidation resistance and creep-rupture strength at elevated temperatures.

Dissimilar-welding applications include joining INCONEL alloys, INCOLOY alloys and INCOLOY alloy 330 to nickel, MONEL alloys, stainless steels, and carbon steels. It is also used to join stainless steels to nickel alloys and carbon steels.

Specifications
AWS A5.14 ERNiCr-3 (UNS N06082)
ASME II, Part C, SFA-5.14, ERNiCr-3 (UNS N06082)
ASME IX, F-No.43
*BS 2901 (NA35)
*DIN 1736 SG-NiCr20Nb (2.4806)
*(EN) ISO 18274 – S Ni6082 (NiCr20Mn3Nb)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), MIL, Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
VdTUV 2110.01; 2111.01; 2117.01; 2118.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition (%)

Ni+Co	67.0 min.	Si	0.50 max.
C	0.10 max.	Cr	18.0-22.0
Mn	2.5-3.5	Ti	0.75 max.
Fe	3.0 max.	Nb+Ta	2.0-3.0
S	0.015 max.	P	0.030 max.
Cu	0.50 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi		80,000
	MPa	552
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Ni-Cr-Mo Filler Metal

INCONEL® Filler Metal 622

INCONEL Filler Metal 622 is used for gas-tungsten-arc and gas-metal-arc welding of INCONEL alloys 22 and 625, INCOLOY alloy 25-6MO, and INCOLOY alloy 825. This is also an excellent dissimilar metal welding product that offers protection against preferential weld metal corrosion when used for joining molybdenum-containing stainless steels, INCONEL alloy C-276, and INCONEL alloy 625. The high chromium content, along with the tungsten and molybdenum, give good resistance to pitting and crevice corrosion. INCONEL Filler Metal 622 is useful for many dissimilar joints involving INCONEL and INCOLOY alloys, and carbon, low-alloy and stainless steels. Submerged arc welding and overlaying can be done with INCOFLUX NT120 Submerged Arc Flux.

Specifications
AWS A5.14 ERNiCrMo-10 (UNS N06022)
ASME II, Part C, SFA-5.14, ERNiCrMo-10 (UNS N06022)
ASME IX, F-No.43
*(EN) ISO 18274 – SNi6022 (NiCr21Mo13Fe4W3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV - 926/032088
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Nickel	Remainder	Cu	0.50 max.
C	0.015 max.	Co	2.5 max.
Mn	0.50 max.	Cr	20.0-22.5
Fe	2.0-6.0	Mo	12.5-14.5
P	0.02 max.	V	0.35 max.
S	0.01 max.	W	2.5-3.5
Si	0.08 max.	Others	0.50 max.

Typical Mechanical Properties

Tensile Strength, psi		115,000
	MPa	793
Elongation, (4d) %		40

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 625

INCONEL Filler Metal 625 is used for gas-metal-arc and gas-tungsten-arc welding of INCONEL alloy 625, INCOLOY alloy 825, INCOLOY alloy 25-6MO, and a range of high alloy austenitic and super austenitic stainless steels. It is also used for surfacing of steel, for welding 9% Ni steels, and for welding various corrosion-resistant alloys such as alloy 20. INCONEL Filler Metal 625 can be used for joining and overlaying with INCOFLUX NT100 Submerged Arc Flux. The weld metal has high strength over a broad temperature range and has resistance to localized attack such as pitting and crevice corrosion.

INCONEL Filler Metal 625 is useful for many dissimilar joints involving INCONEL and INCOLOY alloys, carbon steels, low-alloy steels, and stainless steels.

Specifications
AWS A5.14 ERNiCrMo-3 (UNS N06625)
ASME II, Part C, SFA-5.14, ERNiCrMo-3 (UNS N06625)
ASME IX, F-No.43
*BS 2901 NA43
*DIN 1736 SG-NiCr21Mo9Nb (2.4831)
*(EN) ISO 18274 – SNi6625 (NiCr22Mo9Nb)
*Supply to these specifications available upon request
For manufacture to ASME III NCA3800, NB2400, MIL, Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
VdTUV 2854.01; 2855.01
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	58.0 min.	Al	0.40 max.
C	0.10 max.	Ti	0.40 max.
Mn	0.50 max.	Cr	20.0-23.0
Fe	1.0 max.	Nb+Ta	3.15-4.15
S	0.015 max.	Mo	8.0-10.0
Cu	0.50 max.	P	0.02 max.
Si	0.50 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi		105,000
	MPa	724
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 625

INCO-WELD® 686CPT® Filler Metal

INCO-WELD 686CPT Filler Metal is used for gas-tungsten-arc and gas-metal-arc welding of duplex, super-duplex and super-austenitic stainless steels, as well as nickel alloys such as UNS N06059 and N06022, INCONEL alloy C-276, and INCONEL alloys 22, 625, and 686. It is also capable of being used to deposit overlays of outstanding corrosion-resistance onto a range of steels. The high alloy levels (of Cr + Mo + W) result in increased resistance to pitting, crevice and general corrosion. INCO-WELD 686CPT Filler Metal is of great value for service environments requiring general corrosion-resistance in HCl or sulfuric acid; for resistance to crevice corrosion in hot, concentrated acid chloride solutions such as sulfur dioxide, saturated NaCl solutions and oxidizing chloride solutions; and for resistance to intergranular attack, after sensitization, in highly oxidizing environments. Submerged arc welding can be done with INCOFLUX NT120 Submerged Arc Flux.

Specifications
AWS A5.14 ERNiCrMo-14 (UNS N06686)
ASME II, Part C, SFA-5.14, ERNiCrMo-14 (UNS N06686)
ASME IX, F-No.43
*(EN) ISO 18274 – SNi6686 (NiCr21Mo16W4)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
VdTUV 06808.00; 06809.00
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	Remainder	Cu	0.5 max.
C	0.01 max.	Si	0.08 max.
Mn	1.0 max.	Ti	0.25 max.
Fe	5.0 max.	Cr	19.0-23.0
P	0.02 max.	Mo	15.0-17.0
S	0.02 max.	W	3.0-4.4
Al	0.5 max.	Others	0.50 max.

Typical Mechanical Properties

Tensile Strength, psi		110,000
	MPa	758
Elongation, (4d) %		35

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCO-WELD® 686CPT® Filler Metal

INCO-WELD® 725NDUR Filler Metal

INCO-WELD 725NDUR Filler Metal is an age hardenable version of INCONEL Filler Metal 625. After post-weld heat treatment it combines the excellent corrosion resistance of INCONEL Filler Metal 625 with higher strength and hardness. Oil patch applications require the same temperature ranges for stress relieving of low alloy steels (such as AISI 4130) as the temperature range required for age hardening INCO-WELD 725NDUR Filler Metal. If post-weld annealing is followed by the aging treatment, even higher strength and hardness values are obtained.

The filler metal can be used with both the gas metal arc and gas tungsten arc processes.

Specifications
AWS A5.14 ERNiCrMo-15 (UNS N07725)
ASME II, Part C, SFA-5.14, ERNiCrMo-15 (UNS N07725)
*(EN) ISO 18274 – SNi7725 (NiCr21Mo8Nb3Ti)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA 38000, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	55.0 to 59.0	Ti	1.0 to 1.7
	C	0.03 max.	Cr	19.0 to 22.5
	Mn	0.35 max.	Nb+Ta	2.75 to 4.00
	Fe	Remainder	Mo	7.0 to 9.5
	S	0.01 max.	P	0.015 max.
	Si	0.20 max.	Others	0.50 max.
	Al	0.35 max.		

Typical Mechanical Properties	Tensile Strength, psi	174,000
	MPa	1200

(Age hardened condition: 1900°F (1038°C) /1 hour plus 1350°F (732°C) /8 hours, Furnace Cool to 1150°F (621°C) /8 hours, Air Cool)

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCO-WELD® C-276 Filler Metal

INCO-WELD C-276 Filler Metal is used for gas-tungsten-arc and gas-metal-arc welding of INCONEL alloy C-276 and other nickel-chromium-molybdenum alloys. It is also used for surfacing of steel. The weld metal has excellent corrosion resistance in many aggressive media and is especially resistant to pitting and crevice corrosion.

Dissimilar-welding applications include welding INCONEL alloy C-276 to other nickel alloys, to stainless steels, and to low-alloy steels. Submerged arc welding can be done with INCOFLUX NT120 Submerged Arc Flux and for welding 9% Ni steels INCOFLUX 9 is preferred.

Specifications
AWS A5.14 ERNiCrMo-4 (UNS N10276)
ASME II, Part C, SFA-5.14, ERNiCrMo-4 (UNS N10276)
ASME IX, F-No.43
2.4886
*BS 2901 NA48
*DIN 1736 SG-NiMo16Cr16W (2.4886)
*(EN) ISO 18274 – SNi6276 (NiCr15Mo16Fe6W4)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Canadian Welding Bureau
Other approvals may be applicable. Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	Remainder	Cu	0.50 max.
	C	0.02 max.	Co	2.50 max.
	Mn	1.0 max.	Cr	14.5-16.5
	Fe	4.0-7.0	Mo	15.0-17.0
	P	0.04 max.	V	0.35 max.
	S	0.03 max.	W	3.0-4.5
	Si	0.08 max.	Others	0.50 max.

Minimum Mechanical Properties	Tensile Strength, psi	100,000
	MPa	690
	Elongation, (4d) %	30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39in.)

INCO-CORED® 625AP Flux Cored Wire

INCO-CORED 625AP Flux Cored Wire is a companion to INCONEL Filler Metal 625 and INCONEL Welding Electrode 112. It offers excellent weldability in addition to the higher deposition rate associated with flux-cored wires. The 625AP is designed for all-position operability. The recommended shielding gas is 75% Argon / 25% Carbon Dioxide.

This product provides a deposited weld chemistry equivalent to that achieved with INCONEL Filler Metal 625. The integrity of the weld deposit chemistry is assured by the fact that INCO-CORED 625 Flux Cored wire has a full alloy sheath.

The product is used to weld INCONEL alloy 625, INCOLOY alloy 825, INCOLOY alloy 25-6MO, and other molybdenum-containing stainless steels. It is also used for surfacing steel, the welding of nickel steels, and for welding various corrosion-resisting alloys such as alloy 20. The weld metal has high strength, and exceptional corrosion resistance, including resistance to localized attack such as pitting and crevice corrosion.

The 625AP product is useful for making dissimilar metal welds involving INCONEL and INCOLOY alloys, carbon steels, low-alloy steels, and stainless steels. Power supply: direct current, electrode positive.

Specifications AWS A5.34 as classification ENiCrMo3T1-4 (UNS W86625)

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Typical Chemical Composition (%)

Ni	64	C	0.04
Cr	20	Ti	0.1
Mo	9	S	<0.015
Nb	3.4	Al	0.05
Fe	0.5	P	<0.02
Si	0.3	Cu	0.05
Mn	0.3	Others	<0.5

Typical Mechanical Properties

Tensile Strength, psi	110,000
MPa	758
Elongation, (4d) %	45

Available Product Forms

mm / in								
mm	1.14	1.6						
in	0.045	0.062						

0.062 and 0.045 on level layer wound 30 lb. wire basket spools

INCONEL® Filler Metal 52

INCONEL Filler Metal 52 is used for gas-tungsten-arc and gas-metal-arc welding of INCONEL alloy 690. This NiCrFe welding product was developed to meet the changing needs of the nuclear industry, the higher chromium level providing greater resistance to stress-corrosion cracking in the nuclear, pure water environment. INCONEL Filler Metal 52 produces corrosion-resistant overlays on most low-alloy and stainless steels. It can also be used in applications requiring resistance to oxidizing acids. It is useful for dissimilar joints involving INCONEL and INCOLOY alloys, and carbon, low-alloy and stainless steels and for overlaying on to steel.

Specifications
AWS A5.14 ERNiCrFe-7 (UNS N06052)
ASME II, Part C, SFA-5.14, ERNiCrFe-7 (UNS N06052)
ASME IX, F-No.43
*(EN) ISO 18274 – SNi6052 (NiCr30Fe9)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	Remainder	Cr	28.0-31.5
C	0.04 max.	Ti	1.0 max.
Mn	1.0 max.	Al	1.10 max.
Fe	7.0-11.0	P	0.02 max.
S	0.015 max.	Nb+Ta	0.10 max.
Si	0.50 max.	Al+Ti	1.5 max.
Mo	0.50 max.	Others	0.50 max.
Cu	0.30 max.		

Minimum Mechanical Properties

Tensile Strength, psi	80,000
MPa	552
Elongation, (4d) %	30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm / in								
mm	0.8	0.9	1.0	1.14	1.2	1.6	2.4	3.2
in	0.030	0.035	0.040	0.045	0.047	0.062	0.093	0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 52M

INCONEL Filler Metal 52M is used for the gas-tungsten-arc and gas-metal-arc welding of INCONEL alloy 690, and the overlaying of carbon steels and stainless steels to provide a nickel-chromium alloy corrosion resistant surface. The high chromium level provides excellent resistance to stress corrosion cracking in the nuclear, pure water environment. The product can also be used in applications requiring resistance to oxidizing acids. It is useful for dissimilar joints involving INCONEL and INCOLOY alloys.

This product contains Boron and Zirconium to minimize the tendency for ductility-dip cracking, while it is especially resistant to oxide "floaters" and inclusions.

Specifications
AWS A5.14 ERNiCrFe-7A (UNS N06054)
ASME II, Part C, SFA-5.14, ERNiCrFe-7A
ASME IX, F-No.43

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition (%)

Ni	Remainder	Ti	1.0 max.
C	0.04 max.	Co	0.12 max.
Mn	1.0 max.	Nb	0.50 to 1.0
Fe	7.0 to 11.0	P	0.02 max.
S	0.015 max.	Zr	0.02 max.
Si	0.50 max.	B	0.005 max.
Cu	0.30 max.	Mo	0.50 max.
Cr	28.0 to 31.5	Others	0.50 max.
Al	1.10 max.		

Minimum Mechanical Properties

Tensile Strength, psi	80,000
MPa	552
Elongation, (4d) %	30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 52MSS

INCONEL Filler Metal 52MSS is the third generation 30% chromium INCONEL® welding product designed to resist nuclear pure water intergranular stress corrosion cracking. The addition of 4% molybdenum and an increased level of niobium up to 2.5% brings INCONEL® Filler Metal 52MSS excellent resistance to ductility-dip cracking (DDC) or cold cracking during fabrication. Because of the low levels of aluminum and titanium, it provides remarkably "clean" weld deposits that tend to be free of inclusions, oxides, and porosity. INCONEL® Filler Metal 52MSS is used for fabrication and repair of nuclear components and also exhibits good resistance to root-cracking. The good wetting and clean welds make INCONEL® Filler Metal 52MSS ideal for remote-controlled multi-pass welds in radioactively "hot" repair situations.

Specifications
AWS A5.14 ERNiCrFe-13 (UNS N06695)
ASME II, Part C, SFA-5.14, ERNiCrFe-13 (UNS N06695)
ASME IX, F-No.43
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	54.0-62.0	Cr	28.0-31.5
C	0.03 max.	Ti	0.50 max
Mn	1.0 max.	Al	0.50 max
Fe	balance	P	0.02 max.
S	0.015 max.	Nb+Ta	1.5 - 3.5
Si	0.50 max.	Al+Ti	1.5 max.
Mo	3.0 - 5.0.	Others	0.50 max.
Cu	0.30 max.		

Minimum Mechanical Properties

Tensile Strength, psi	94,000
MPa	650
Elongation, (4d) %	40

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight length – 915mm (36 in) or 1000mm (39 in); Spool weight-13.6 kg (30lb)
Other European spools sizes EN759 – S100, S200, S300, BS300, S350

INCONEL® Filler Metal 53MD

INCONEL Filler Metal 53MD is used for the gas-tungsten-arc and gas-metal-arc welding of INCONEL alloy 693, and the overlaying of carbon steels and stainless steels to provide a nickel-chromium-aluminum alloy corrosion resistant surface. The high chromium and aluminum levels provide excellent resistance to metal dusting in chemical and petrochemical applications. The product also provides excellent resistance to carburization, sulfidation, and other high temperature corrosion forms.

Specifications

AWS A5.14 as classification ERNiCrFeAl-1 (UNS N06693)

Approvals

Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition (%)

Ni	Remainder	Cr	27.0 to 31.0
C	0.15 max.	Al	2.5 to 4.0 max.
Mn	1.0 max.	Ti	1.0 max.
Fe	2.5 to 6.0	Co	0.12 max.
S	0.01 max.	Nb+Ta	0.50 to 2.5
Si	0.50 max.	P	0.03 max.
Cu	0.30 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi	110,000
MPa	760
Elongation, (4d) %	45

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 601

INCONEL Filler Metal 601 is used for gas-tungsten-arc welding of INCONEL alloy 601. It is the preferred welding product for all gas-tungsten-arc welding of INCONEL alloy 601. The GTAW process with INCONEL Filler Metal 601 is the only recommended joining method for applications involving temperatures over 2100°F (1150°C) or for applications at lower temperatures involving exposure to hydrogen sulfide or sulfur dioxide. The weld metal is comparable to the base metal in resistance to corrosion and oxidation.

Specifications

AWS A5.14 ERNiCrFe-11 (UNS N06601)
ASME II, Part C, SFA-5.14, ERNiCrFe-11 (UNS N06601)
ASME IX, F-No.43
*BS2901 NA 49
*DIN 1736 SG-NiCr23Al (2.4626)
*(EN) ISO 18274 – SNi6601 (NiCr23Fe15Al)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals

Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	58.0-63.0	Mn	1.0 max.
Cr	21.0-25.0	S	0.015 max.
Fe	Remainder	Si	0.50 max.
Al	1.0-1.7	Cu	1.0 max.
C	0.10 max.	Others	0.50 max.
P	0.03 max.		

Typical Mechanical Properties

Tensile Strength, psi	94,000
MPa	648
Elongation, (4d) %	42

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 92

INCONEL Filler Metal 92 is used for gas-tungsten-arc and gas-metal-arc welding of austenitic and ferritic steels and nickel alloys. Applications include joining INCONEL and INCOLOY alloys to stainless steels, carbon steels, and MONEL alloys; joining MONEL alloys and Nickel 200 to stainless steels; and joining stainless steels to carbon steels. The filler metal is also used for welding nickel steels. The high Ti concentration provides excellent porosity resistance in field welding applications.

INCONEL Filler Metal 92 provides high strength and corrosion resistance at temperatures ranging from the cryogenic region to over 1800°F (980°C). Weld deposits can be age hardened for greater strength at temperatures to about 1300°F (700°C).

Specifications
AWS A5.14 ERNiCrFe-6 (UNS N07092)
ASME II, Part C, SFA-5.14, ERNiCrFe-6 (UNS N07092)
ASME IX, F-No.43
*BS 2901 NA39
*(EN) ISO 18274 – SNi 7092 (NiCr15Ti3Mn)
*Supply to these specifications available upon request
For manufacture to ASME III NCA3800, NB2400, MIL, Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni+Co	67.0 min.	Cu	0.50 max.
C	0.08 max.	Cr	14.0-17.0
Mn	2.0-2.7	Ti	2.5-3.5
Fe	8.0 max.	P	0.03 max.
S	0.015 max.	Others	0.50 max.
Si	0.35 max.		

Minimum Mechanical Properties (As Welded)

Tensile Strength, psi		80,000
	MPa	552
Elongation, (4d) %		30

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm / in	0.8 / 0.030	0.9 / 0.035	1.0 / 0.040	1.14 / 0.045	1.2 / 0.047	1.6 / 0.062	2.4 / 0.093	3.2 / 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCONEL® Filler Metal 617

INCONEL Filler Metal 617 is used for gas-tungsten-arc and gas-metal-arc welding of INCONEL alloy 617. Because of the weld metal's high temperature strength, oxidation resistance, and metallurgical stability, the filler metal is also used for joining various dissimilar high-temperature alloys. Examples are INCOLOY alloys 800HT and 803 and cast alloys such as HK-40, HP, and HP-45 Modified.

Specifications
AWS A5.14 ERNiCrCoMo-1 (UNS N06617)
ASME II, Part C, SFA-5.14, ERNiCrCoMo-1 (UNS N06617)
*BS 2901 NA 50
*DIN 1736 SG-NiCr22Co12Mo (2.4627)
*(EN) ISO 18274 – SNi 6617 (NiCr22Co12Mo9)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni	Remainder	Mn	1.0 max.
Cr	20.0-24.0	Si	1.0 max.
Co	10.0-15.0	S	0.015 max.
Mo	8.0-10.0	Ti	0.60 max.
Al	0.80-1.50	Cu	0.50 max.
C	0.05-0.15	P	0.03 max.
Fe	3.0 max.	Others	0.50 max.

Minimum Mechanical Properties

Tensile Strength, psi		90,000
	MPa	620
Elongation, (4d) %		25

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm / in	0.8 / 0.030	0.9 / 0.035	1.0 / 0.040	1.14 / 0.045	1.2 / 0.047	1.6 / 0.062	2.4 / 0.093	3.2 / 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Ni-Fe Filler Metal

NILO® Filler Metal CF36 & 365

NILO Filler Metal CF36 is used for the gas-metal-arc, gas-tungsten-arc, and submerged-arc welding of NILO alloy 36. Filler Metal CF36 is formulated to have low thermal expansion characteristics similar to NILO alloy 36, while providing freedom from solidification and reheat cracking. Argon is recommended for the GMAW-Spray process, Argon/25% helium for the GMAW-Pulsed Arc and Short-Arc processes, and INCOFLUX NT100 for the SAW process.

NILO Filler Metal 365 offers further improvements in strength and performance, and is used to weld NILO alloy 365 for fiber-reinforced epoxy-resin tooling applications. NILO Filler Metal 365 has 43% nickel and is strengthened by additions of Ti and Nb. It is an age hardenable alloy, strengthened by heat treatment to reach property levels well above those of conventional nickel-iron alloys. NILO Filler Metal 365 is formulated to have low thermal expansion characteristics similar to NILO alloy 365, producting high-quality, crack-free, vacuum-tight welds by the submerged-arc process using INCOFLUX 6, the gas-metal-arc process-spray mode using Argon shielding gas, and the gas tungsten-arc process-pulsed mode using 75/25 Argon/Helium shielding gas, and the gas tungsten-arc process using Argon shielding gas. It also produces excellent quality welds in NILO 36 alloy with slightly overmatching mechanical properties in the as-welded condition. Higher values can be achieved by moderate stress-relief procedures. FM 365 also provides resistance to DDC during fabrication.

Specifications none

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

	NILO Filler Metal CF36		Limiting Chemical Composition	NILO Filler Metal 365	
Typical Chemical Composition	Ni	36	Ni	42.0-45.0	
	Fe	62	Fe	Balance	
	C	0.2	C	0.04	
	Mn	0.4	Si	0.20	
	Nb	1.6	Mn	0.40	
			Nb	1.6	
			Al	0.20	
			Ti	1.0-2.0	

Typical Mechanical Properties	Tensile Strength, psi	80,000
	MPa	550
	Elongation, (4d) %	25

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm / in	0.8 / 0.030	0.9 / 0.035	1.0 / 0.040	1.14 / 0.045	1.2 / 0.047	1.6 / 0.062	2.4 / 0.093	3.2 / 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Ni-Fe-Cr Filler Metal

INCOLOY® Filler Metal 65

INCOLOY Filler Metal 65 is used for gas-tungsten-arc welding of INCOLOY alloy 825 and other nickel-iron-chromium-molybdenum-copper alloys of similar composition. The weld metal is highly corrosion resistant, particularly in reducing chemicals such as sulphuric and phosphoric acids. INCOLOY Filler Metal 65 can also be used for depositing overlays on carbon and low alloys steels.

Specifications
AWS A5.14 ERNiFeCr-1 (UNS N08065)
ASME II, Part C, SFA-5.14, ERNiFeCr-1 (UNS N08065)
ASME IX, F-No.45
*BS 2901 NA41
*(EN) ISO 18274 – SNi8065 (NiFe30Cr21Mo3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	38.0-46.0	Cr	19.5-23.5	
	C	0.05 max.	Al	0.20 max.	
	Mn	1.0 max.	Ti	0.60-1.20	
	Fe	22.0 min.	Mo	2.50-3.50	
	S	0.03 max.	P	0.03 max.	
	Si	0.50 max.	Others	0.50 max.	
	Cu	1.5-3.0			

Minimum Mechanical Properties	Tensile Strength, psi	80,000
	MPa	552
	Elongation, (4d) %	25

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm / in	0.8 / 0.030	0.9 / 0.035	1.0 / 0.040	1.14 / 0.045	1.2 / 0.047	1.6 / 0.062	2.4 / 0.093	3.2 / 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Ni-Fe-Cr Filler Metal

INCONEL® Filler Metal 718

INCONEL Filler Metal 718 is used for gas-tungsten-arc welding of INCONEL alloys 718, 706 and X-750. The weld metal is age hardenable and has mechanical properties comparable to those of the base metals.

Specifications
AWS A5.14 ERNiFeCr-2 (UNS N07718)
ASME II, Part C, SFA-5.14, ERNiFeCr-2 (UNS N07718)
*BS2901 NA 51
*DIN 1736 SG-NiCr19NbMoTi (2.4667)
*(EN) ISO 18274 – SNi7718 (NiFe19Cr19Nb5Mo3)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), Rolls Royce, AMS and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition

Ni	50.0-55.0	Al	0.20-0.80
C	0.08 max.	Ti	0.65-1.15
Mn	0.35 max.	Nb+Ta	4.75-5.50
Fe	Remainder	Mo	2.80-3.30
S	0.015 max.	P	0.015 max.
Si	0.35 max.	B	0.006 max.
Cu	0.30 max.	Co	1.0 max.
Cr	17.0-21.0		

Minimum Mechanical Properties

Tensile Strength, psi	165,000
MPa	1138

(Age hardened condition: 1325°F (720°C)/8 hours, Furnace Cool 100°F (55°C)/hour to 1150°F (620°C)/8 hours, Air Cool)

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm in	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

Cast Iron Filler Metal

NI-ROD® 44 Filler Metal

NI-ROD 44 Filler Metal is a solid, nickel-iron-manganese wire designed for automatic and semi-automatic welding of ductile, malleable and gray cast irons in all positions. Submerged-arc welding is done with INCOFLUX NT100 Submerged Arc Flux.

NI-ROD 44 Filler Metal offers high-speed, high-quality welds, and can be used with all robotics, automatic and semi-automatics processes, and in all positions. It provides the wetting and crack-resistant weldability that allows steel forgings and castings to be re-designed in less expensive ductile iron and welded automatically.

Pre- and post-weld heat treatments are not usually required but may be advantageous for heavy section, fully restrained joints in low ductility castings.

Specifications
AWS A5.15 ERNiFeMn-CI (UNS N02216)
ASME II, Part C, SFA5.15 ERNiFeMn-CI (UNS N02216)
*(EN) ISO 1071 – S CI 6002 (S C NiFeMn-CI)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Typical Chemical Composition

Ni	44	Mn	11
C	1.5	Fe	45

Typical Mechanical Properties

Tensile Strength, psi	100,000
MPa	690
Elongation, (4d) %	35

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

NI-ROD® 99 Filler Metal

NI-ROD 99 Filler Metal is used for gas-metal-arc, gas-tungsten-arc and submerged-arc welding of ductile, malleable, and gray cast irons. It is a solid nickel alloy wire designed for making easily machined welds by automatic and semi-automatic processes. In highly diluted, single-layer deposits, pure nickel weld metal has better machinability than other welding products for cast irons. Submerged-arc welding is done with INCOFLUX NT100 Submerged Arc Flux.

Disimilar-welding applications include gas-metal-arc welding of cast irons to low-alloy and carbon steels.

Specifications
AWS A5.15 ERNi-CI (UNS N02215)
ASME II, Part C, SFA-5.15, ERNi-CI(UNS N02215)
*BS 2901 NA46
*(EN) ISO 1071 S CI 4003 (S C Ni-CI)
*Supply to these specifications available upon request
For manufacture to ASME III (NCA3800, NB2400), and other specifications please refer your inquiry to the Technical Department prior to order placement.

Approvals
Please confirm details of current scope of approvals with the Technical Department prior to order placement.

Limiting Chemical Composition	Ni+Co	99.0 min.	Cu	0.25 max.
	Fe	0.40 max.	C	0.15 max.
	Mn	0.35 max.	S	0.01 max.
	Si	0.35 max.	Others	1.00 max.

Typical Mechanical Properties	Tensile Strength, psi		71,000
		MPa	490
	Elongation, (4d) %		12

Filler metals available on spool and in cut straight lengths in a variety of sizes selected from the following diameters:

Available Product Forms

mm **in**	0.8 0.030	0.9 0.035	1.0 0.040	1.14 0.045	1.2 0.047	1.6 0.062	2.4 0.093	3.2 0.125

Straight Lengths - 915 mm (36 in.) or 1000 mm (39 in.)

INCOFLUX® 5 Submerged Arc Flux

INCOFLUX 5 is an agglomerated Submerged Arc Welding (SAW) Flux designed for wire welding with MONEL Filler Metal 60. Typical applications are groove welding MONEL alloy 400 to itself and to ferritic materials. A major application is for overlaying carbon steels with the corrosion resistant MONEL Filler Metal 60 .

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	260-280	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	250-300	32-35	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles/min for 0.062 in. and 35-60 for 0.093 in.					
0.062 in. 1.6mm	260-280	32-35	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S A FB2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® 8 Submerged Arc Flux

INCOFLUX 8 is an agglomerated Submerged Arc Welding (SAW) Flux designed for wire welding primarily with MONEL Filler Metal 67, although it can also be used with MONEL Filler Metal 60. Typical applications are groove welding 70/30, 80/20, and 90/10 Copper-Nickel alloys. It can also be used for overlaying carbon steels, but requires a buffer layer of either Nickel Filler Metal 61 or MONEL Filler Metal 60 in order to prevent excess iron dilution that can embrittle the copper-nickel deposit.

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	260-280	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-350	32-35	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles/min for 0.062 in. and 35-60 for 0.093 in.					
0.062 in. 1.6 mm	260-280	32-35	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S A FB2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® 9 Submerged Arc Flux

INCOFLUX 9 is a fused Submerged Arc Welding (SAW) Flux designed for wire welding with INCONEL Filler Metal 625 and INCO-WELD C276 Filler Metal corrosion resistant nickel-chromium-molybdenum alloys. The main application for this flux is for the groove welding of 9% Ni steels used in the production of LNG storage tanks. The flux provides optimum operability and weld bead profile in the horizontal (2G) and flat (1G) positions. The flux can also be used for the groove and overlay welding using austenitic stainless steel alloy filler metals.

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads. Can also be welded using AC.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	240-290	30-33	8-11 in./min. 200-280 mm/min.	3/4-7/8 in. 19-22 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	250-300	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles/min for 0.062 in. and 35-60 for 0.093 in.					
0.062 in. 1.6 mm	240-260	32-34	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S F CS2

Particle Size
Tyler Mesh: 10 x 150 Mesh (0.11 mm x 2.0 mm), EN 760 1-20

Packaging
44 pound (20.00 kg) Polyethylene Bags.

INCOFLUX® ESS1 Electroslag Strip Flux

INCOFLUX ESS1 Electroslag StripWelding (ESSW) Flux is designed for strip welding with INCONEL Weldstrips 82 and 625. It is used for overlaying carbon steels with the two alloys. The agglomerated, neutral flux provides the ability to achieve a chemical composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make, without magnetic steering, flat overlays that may be used in the as-welded condition.

Welding Parameters: Overlay Welding using DCEP current and Stringer beads.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	1100-1300	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in.	600-700	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® ESS2 Electroslag Strip Flux

INCOFLUX ESS2 Electroslag Strip Welding (ESSW) Flux is designed for strip welding with INCONEL Weldstrip 52M and 52MSS. It is used for overlaying carbon steels with these two alloys. The agglomerated, neutral flux provides the ability to achieve a chemical composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make flat overlays that may be used in the as-welded condition.

Welding Parameters: Overlay Welding using DCEP current.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	1100-1300	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in.	600-700	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® ESS3 Electroslag Strip Flux

INCOFLUX ESS3 Electroslag Strip Welding (ESSW) Flux is designed for strip welding with the INCONEL Weldstrips 82, 622 and 625, and INCO-WELD C-276 and 686CPT. It is used for electroslag overlaying of carbon steels with these alloys. The agglomerated, neutral flux and the electroslag process provide the ability to achieve a low dilution composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make flat overlays that may be used in the as-welded condition.

Welding Parameters: Overlay Welding using DCEP current.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	1100-1300	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in.	600-700	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm

Specification
EN 760 - S A FB2

Particle Size
Tyler Mesh: 12 x 68 Mesh (0.2 mm x 1.7 mm), EN 760 2-16

Packaging
55 pound (25 kg) Polyethylene Bags.

INCOFLUX® ESS4 Electroslag Strip Flux

INCOFLUX ESS4 Electroslag Strip Welding (ESSW) Flux is designed for strip welding with the INCONEL Weldstrips 622, 625, INCO-WELD C-276 and 686CPT. It is used for electroslag overlaying of carbon steels with these alloys. The agglomerated, neutral flux and the electroslag process provide the ability to achieve a low dilution composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make flat overlays that may be used in the as-welded condition. The silicon pick-up in the weld is less than 0.2%.

Welding Parameters: Overlay Welding using DCEP current.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	1100-1300	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in.	600-700	23-24	6-7 in./min. 150-175 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm

Specification
EN 760 - S A FB2

Particle Size
Tyler Mesh: 12 x 68 Mesh (0.2 mm x 1.7 mm), EN 760 2-16

Packaging
55 pound (25 kg) Polyethylene Bags.

INCOFLUX® NT100
Submerged Arc Welding Flux

INCOFLUX NT100 Submerged Arc Flux is a neutral, agglomerated flux designed for wire welding with Nickel Filler Metal 61, INCONEL Filler Metals 82 and 625, NI-ROD 44 Filler Metal and NILO Filler Metals CF36 and CF42. Typical applications are groove welding Nickel 200 alloy to itself and to steels, and overlaying carbon steels with the Nickel 61 filler metal. The flux is also suitable to use with INCONEL Filler Metals 82 and 625 for overlaying and multi-pass welding. NI-ROD 44 Filler Metal and INCOFLUX NT100 are used to submerged arc weld cast irons to themselves and to steels. INCOFLUX NT100 is also used with NILO Filler Metal CF36 and CF42 to join Invar, NILO 36 and NILO 42.

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	250-280	28-30	10-12 in./min. 250-305 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-350	30-33	10-12 in./min. 250-305 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles / min for 0.062 in. and 35-50 for 0.093 in.					
0.062 in. 1.6 mm	240-260	32-34	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
50 pound (22.68 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® NT110
Submerged Arc Welding Flux

INCOFLUX NT110 is an agglomerated Submerged Arc Welding (SAW) Flux for wire welding with MONEL Filler Metal 60 (70% Ni, 30% Cu) and MONEL Filler Metal 67 (70% Cu, 30% Ni). Typical applications with MONEL Filler Metal 60 are groove welding MONEL alloy 400 to itself and to ferritic materials. A major application is for overlaying carbon steels with the corrosion resistant MONEL Filler Metal 60.
The flux is used with MONEL Filler Metal 67 to join Copper-Nickel alloys (90/10, 80/20 and 70/30). Overlays on ferritic steels require a buffer layer of Nickel 61 or MONEL 60.

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	260-280	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/2 in. 19-25 mm
0.093 in. 2.4 mm	300-350	32-35	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles/min for 0.062 in. and 35-50 for 0.093 in.					
0.062 in. 1.6 mm	260-280	32-35	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	1/2-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S A FB2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® NT120 Submerged Arc Welding Flux

INCOFLUX NT120 is an agglomerated Submerged Arc Welding (SAW) Flux for wire welding with the corrosion resistant nickel-chromium-molybdenum-tungsten alloys such as INCONEL Filler Metal 622, INCO-WELD C-276 Filler Metal, and INCO-WELD 686CPT Filler Metal. Typical applications are the groove welding of nickel alloys of a similar composition (eg. C-22, C-276, 59, 686). The flux and wire combinations are also for welding stainless steels (eg. 6% Mo and duplex stainless steels, etc.) and nickel alloys where enhanced weld metal corrosion properties are required through the Ni-Cr-Mo-W filler metals.

Welding Parameters: Groove and Overlay Welding using DCEP current and Stringer beads.

Diameter	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.062 in. 1.6 mm	240-290	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	250-300	30-33	8-11 in./min. 200-280 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm
Overlay Welding with Oscillation: Use DCEN current and Oscillation Frequency of 50-70 cycles/min for 0.062 in. and 35-50 for 0.093 in.					
0.062 in. 1.6 mm	240-260	32-34	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 in. 19-25 mm
0.093 in. 2.4 mm	300-400	34-37	4 in./min. 100 mm/min.	7/8-1 in. 22-25 mm	3/4-1 1/4 in. 19-32 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® SAS1 Submerged Arc Strip Flux

INCOFLUX SAS1 Submerged Arc Strip Welding (SASW) Flux is designed for strip welding with INCONEL Weldstrips 82 and 625. It is used for overlaying carbon steels with the two alloys. The agglomerated, neutral flux provides the ability to achieve a chemical composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make flat overlays that may be used in the as-welded condition.

Welding Parameters: Overlay Welding using DCEP current.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	700-900	25-28	4-5 in./min. 100-125 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in	300-450	25-28	4-5 in./min. 100-125 mm/min.	3/4-1 in. 19-25 mm	3/4–1 1/2 in. 19-38 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

INCOFLUX® SAS2 Submerged Arc Strip Flux

INCOFLUX SAS2 Submerged Arc Strip Welding (SASW) Flux is designed for strip welding with INCONEL Weldstrips 52, 52M and 52MSS . It is used for overlaying carbon steels with the two alloys. The agglomerated, neutral flux provides the ability to achieve a chemical composition nearly matching the Weldstrip in the second layer. The smooth, tight ripples and excellent wetting provide the ability to make flat overlays that may be used in the as-welded condition.

Welding Parameters: Overlay Welding using DCEP current.

Strip Size	Amperes	Volts	Travel Speed	Extension Stick-Out	Flux Depth
0.5 mm x 60 mm 0.02 in. x 2.36 in.	700-900	25-28	4-5 in./min. 100-125 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm
0.5 mm x 30 mm 0.02 in. x 1.18 in.	300-450	25-28	4-5 in./min. 100-125 mm/min.	3/4-1 in. 19-25 mm	3/4-1 1/2 in. 19-38 mm

Specification
EN 760 - S A AF2

Particle Size
Tyler Sieves: 10 x 60 Mesh (0.25 mm x 2.0 mm), EN 760 2-20

Packaging
60 pound (27.22 kg) Polyethylene Bucket with a hermetically sealed lid that has a rubber gasket seal.

Weldstrip & Flux Reference Chart

A range of nickel alloy welding strips are manufactured by Special Metals Welding Products Company for use with the submerged arc and electroslag cladding processes. These strips are available in a range of sizes including 30 mm, 60 mm, 90 mm and 120 mm. A list of nickel alloys available as weldstrip includes:

AWS Class	Special Metals Welding Products Designations
EQNi-1	Nickel Weldstrip 61
EQNiCu-7	MONEL® Weldstrip 60
EQCuNi	MONEL® Weldstrip 67
EQNiCrFe-7A	INCONEL® Weldstrip 52M
EQNiCrFe-13	INCONEL® Weldstrip 52MSS
EQNiCr-3	INCONEL® Weldstrip 82
EQNiCrMo-3	INCONEL® Weldstrip 625
EQNiCrMo-14	INCO-WELD® 686CPT Weldstrip

Packaging
12 in. (305 mm) ID, 60 lb (27.22 kg) coil
Other coil sizes are available upon request.

Flux Reference Chart

PRODUCT	SUBMERGED ARC WIRE	ELECTROSLAG STRIP	SUBMERGED ARC STRIP
INCONEL Weldstrip 52M	INCO-FLUX NT100	INCOFLUX ESS2	INCOFLUX SAS2
INCONEL Filler Metal 82	INCOFLUX NT100	INCOFLUX ESS1	INCOFLUX SAS1
INCONEL Filler Metal 625	INCOFLUX NT100	INCOFLUX ESS1	INCOFLUX SAS1
INCONEL Filler Metal 686CPT	INCOFLUX NT120	INCOFLUX ESS4	INCOFLUX SAS1
INCONEL Filler Metal 622	INCOFLUX NT120	—	—
INCONEL Filler Metal 825*	—	INCOFLUX ESS2	
INCO-WELD Filler Metal C-276	INCOFLUX NT120 and 9	—	—
Nickel Filler Metal 61	INCOFLUX NT100	—	—
Nickel Filler Metal 60	INCOFLUX NT110 & 5	—	—
Nickel Filler Metal 67	INCOFLUX NT110 & 8	—	—

*special order only

Thermal Spray Wires

A list of nickel-base alloy wire manufactured by Special Metals Welding Products Company for use with the thermal spray process includes:

Special Metals Welding Products Designations	AWS Class	Nominal Composition
DURANICKEL® Thermal Spray 301TSW*	—	95 Ni - 5-Al
INCONEL® Thermal Spray 622TSW	A5.14 ERNiCrMo-10	Ni21CrMoW
INCONEL® Thermal Spray 625TSW	A5.14 ERNiCrMo-3	NiCrMoNb
INCONEL® Thermal Spray 718TSW	A5.14 ERNiFeCr-2	NiFeCrNbMo
INCONEL® Thermal Spray 72MTSW	A5.14 ERNiCr-7	Ni - 38 Cr
INCONEL Thermal Spray 82TSW	A5.14 ERNiCr-3	NiCr20Mn3Nb
INCONEL® Thermal Spray 8020TSW	—	80Ni-20Cr
INCONEL® Thermal Spray C276TSW	A5.14 ERNiCrMo-4	NiCrMoW
MONEL® Thermal Spray 60TSW	A5.14 ERNiCu-7	70 Ni - 30 Cu

* Pratt & Whitney Specification for 301TSW-PWA 36937

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Nickel Alloy Welding Consumables SUGGESTED SELECTIONS

Filler Metals For Gas Metal Arc, Gas Tungsten Arc and Submerged-Arc Welding

	Nickel 200	MONEL alloy 400	INCONEL alloy 600	INCONEL alloy 625	INCONEL alloy 686	INCOLOY alloys 803, 800 and 800H/HT	INCOLOY alloy 825	Carbon, Low alloy & Nickel Steels	3 - 30% Chromium Steels	Austenitic Stainless Steels	Duplex and Super Duplex Stainless Steels	Cast high-temperature alloys	Copper-Nickel alloys
Nickel 200	Nickel 61 Nickel 141	MONEL 60 Nickel 61	INCONEL 82 Nickel 61	INCONEL 625 INCONEL 82 Nickel 61	I-W 686CPT INCONEL 625 INCONEL 82 Nickel 61	INCONEL 82 Nickel 61	INCONEL 625 INCONEL 82 Nickel 61	INCONEL 82 Nickel 61	INCONEL 82 Nickel 61	INCONEL 82 Nickel 61	I-W 686CPT INCONEL 82	INCONEL 82 Nickel 61	MONEL 60 MONEL 67 Nickel 61
MONEL alloy 400	MONEL190 Nickel 141	MONEL 60 INCONEL 625 INCONEL 112 MONEL 190	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82 Nickel 61	I-W 686CPT INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82 MONEL 60	INCONEL 625 INCONEL 82 MONEL 60	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	MONEL 60 MONEL 67 Nickel 61
INCONEL alloy 600	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182	INCONEL 82 INCO-WELD A INCONEL 182	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	INCONEL 617 INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 617 INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 82	INCONEL 617 INCONEL 625 INCONEL 82	INCONEL 82 Nickel 61
INCONEL alloy 625	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182	INCONEL 625 INCONEL 112	I-W 686CPT INCONEL 625	INCONEL 617 INCONEL 625 INCONEL 82	INCONEL 625	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625	INCONEL 617 INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82 Nickel 61
INCONEL alloy 686	INCO-WELD A I-W 686CPT Nickel 141	I-W 686CPT INCO-WELD A INCONEL 112	INCO-WELD A INCONEL 82 I-W 686CPT	I-W 686CPT INCONEL 112	I-W 686CPT I-W 686CPT	I-W 686CPT INCONEL 617 INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625	I-W 686CPT INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	I-W 686CPT	I-W 686CPT INCONEL 617 INCONEL 82	I-W 686CPT INCONEL 625 Nickel 61
INCOLOY alloys 800, 803 and 800H/HT	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 117	INCO-WELD A INCONEL 112 INCONEL 117 INCONEL 182	INCO-WELD A I-W 686CPT	INCONEL 617 INCONEL 82 INCO-WELD A INCONEL 117	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 617 INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 82	INCONEL 617 INCONEL 625 INCONEL 82	INCONEL 82 Nickel 61
INCOLOY alloy 825 & Super Austenitic Stainless Steel	INCO-WELD A Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 182	INCONEL 112 INCONEL 122 I-W 686CPT	I-W 686CPT INCONEL 112 INCONEL 122	INCO-WELD A INCONEL 112	INCONEL 625 I-W 686CPT INCONEL 112 I-W 686CPT	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 622	INCONEL 625 INCONEL 82	INCONEL 82 Nickel 61
Carbon, Low alloy & Nickel Steels	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182 MONEL 190	INCO-WELD A INCONEL 112 INCONEL 182	INCONEL 112 INCO-WELD A	INCO-WELD A I-W 686CPT INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 117	INCO-WELD A INCONEL 112 INCONEL 182	INCONEL 625 INCONEL 82 INCO-WELD A INCONEL 112	INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82	INCONEL 82 Nickel 61
3 - 30% Chromium Steels	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 117	INCONEL 112 INCO-WELD A	INCO-WELD A I-W 686CPT INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 117	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCO-WELD 112	INCONEL 625/52 INCONEL 82 INCO-WELD A INCONEL 112/152	INCONEL 625 INCONEL 82	I-W 686CPT INCONEL 625 INCONEL 82	INCONEL 625 INCONEL 82 INCONEL 617	INCONEL 82 Nickel 61
Austenitic Stainless Steels	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182 MONEL 190	INCO-WELD A INCONEL 112 INCONEL 117 INCONEL 182	I-W 686CPT INCONEL 112	INCO-WELD A I-W 686CPT INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 117	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 182	I-W 686CPT INCONEL 82/625 I-W A/686CPT INCONEL 112	I-W 686CPT INCONEL 82	INCONEL 82	INCONEL 82 Nickel 61
Duplex and Super Duplex Stainless Steels	I-W 686CPT INCO-WELD A Nickel 141	I-W 686CPT INCO-WELD A	I-W 686CPT INCO-WELD A	I-W 686CPT INCONEL 112	I-W 686CPT	I-W 686CPT INCO-WELD A	I-W 686CPT INCONEL 112	I-W 686CPT INCO-WELD A	I-W 686CPT INCO-WELD A	I-W 686CPT INCO-WELD A	I-W 686CPT I-W 686CPT	I-W 686CPT INCONEL 82	I-W 686CPT INCONEL 82
Cast high-temperature alloys	INCO-WELD A INCONEL 112 INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 INCONEL 182 MONEL 190	INCO-WELD A INCONEL 117	INCO-WELD A INCONEL 117	I-W 686CPT INCONEL 117	INCO-WELD A INCONEL 117	INCO-WELD A INCONEL 112	INCO-WELD A INCONEL 112 INCONEL 182	INCO-WELD A INCONEL 112 INCONEL 117	INCO-WELD A INCONEL 112 INCONCEL 117	I-W 686CPT INCO-WELD A	INCONEL 617 INCONEL 82 INCO-WELD A INCONEL 117	INCONEL 82 Nickel 61
Copper-Nickel alloys	MONEL 187 MONEL 190 Nickel 141	MONEL 187 MONEL 190 Nickel 141	INCO-WELD A INCONEL 182 Nickel 141	INCO-WELD A INCONEL 112 Nickel 141	I-W 686CPT Nickel 141	INCO-WELD A INCONEL 182 Nickel 141	INCO-WELD A INCONEL 182 Nickel 141	INCO-WELD A INCONEL 182 MONEL 190 Nickel 141	INCO-WELD A INCONEL 182 Nickel 141	INCO-WELD A INCONEL 182 Nickel 141	I-W 686CPT INCO-WELD A	INCO-WELD A INCONEL 182 Nickel 141	MONEL 67 MONEL 187

Electrodes For Shielded Metal Arc Welding

Data contained in this chart is for information only and should not be used for specification purposes.

Selected Conversions Factors for U.S. Customary to SI Metric Units

To convert from	to	multiply by
atmosphere (760 mm Hg)	pascal (Pa)	$1.013\ 25 \times 10^{5}$
Btu (International Table)	joule (J)	$1.055\ 056 \times 10^{3}$
Btu/h	watt (W)	$2.930\ 711 \times 10^{-1}$
Btu/lb·°F	J/kg·°C	$4.186\ 8 \times 10^{3}$
Btu·in/ft²·h·°F	W/m·°C	$1.442\ 279 \times 10^{-1}$
calorie	joule (J)	4.186 8
circular mil	square metre (m^2)	$5.067\ 075 \times 10^{-10}$
foot	metre (m)	$3.048\ 000 \times 10^{-1}$
ft²	square metre (m^2)	$9.290\ 304 \times 10^{-2}$
ft³	cubic metre (m^3)	$2.831\ 685 \times 10^{-2}$
ft·lbf	joule (J)	1.355 818
ft·lbf/min	watt (W)	$2.259\ 697 \times 10^{-2}$
ft/s²	m/s²	$3.048\ 000 \times 10^{-1}$
gallon (U.S. liquid)	cubic metre (m^3)	$3.785\ 412 \times 10^{-3}$
horsepower (electric)	watt (W)	$7.460\ 000 \times 10^{2}$
inch	metre (m)	$2.540\ 000 \times 10^{-2}$
in²	square metre (m^2)	$6.451\ 600 \times 10^{-4}$
in³	cubic metre (m^3)	$1.638\ 706 \times 10^{-5}$
inch of mercury (60°F)	pascal (Pa)	$3.376\ 85 \times 10^{3}$
inch of water (60°F)	pascal (Pa)	$2.488\ 4 \times 10^{2}$
kgf/cm²	pascal (Pa)	$9.806\ 650 \times 10^{4}$
kip (1000 lbf)	newton (N)	$4.448\ 222 \times 10^{3}$
kip/in² (ksi)	pascal (Pa)	$6.894\ 757 \times 10^{6}$
oersted	A/m	7.957 75 x 10
ohm-circ mil/ft	Ω·m	$1.662\ 426 \times 10^{-9}$
ounce (U.S. fluid)	cubic metre (m^3)	$2.957\ 353 \times 10^{-5}$
ounce-force	newton (N)	$2.780\ 139 \times 10^{-1}$
ounce (avoirdupois)	kilogram (kg)	$2.834\ 952 \times 10^{-2}$
pint (U.S. liquid)	cubic metre (m^3)	$4.731\ 765 \times 10^{-4}$
pound-force (lbf)	newton (N)	4.448 222
pound (lb avoirdupois)	kilogram (kg)	$4.535\ 924 \times 10^{-1}$
lbf/in² (psi)	pascal (Pa)	$6.894\ 757 \times 10^{3}$
lb/in³	kg/m³	$2.767\ 990 \times 10^{4}$
lb/ft³	kg/m³	$1.601\ 846 \times 10$
quart (U.S. liquid)	cubic metre (m^3)	$9.463\ 529 \times 10^{-4}$
ton (short, 2000 lb)	kilogram (kg)	$9.071\ 847 \times 10^{2}$
torr (mm Hg, 0°C)	pascal (Pa)	$1.333\ 22 \times 10^{2}$
W·h	joule (J)	$3.600\ 000 \times 10^{3}$
yard	metre (m)	$9.144\ 000 \times 10^{-1}$
yd²	square metre (m^2)	$8.361\ 274 \times 10^{-1}$
yd³	cubic metre (m^3)	$7.645\ 549 \times 10^{-1}$

Grain-Size Equivalents

ASTM Number	Average Grain Diameter in.	mm
00	0.020	0.508
0	0.0141	0.359
1	0.010	0.254
2	0.007	0.180
3	0.005	0.127
4	0.0035	0.089
5	0.0025	0.064
6	0.0018	0.045
7	0.0012	0.032
8	0.0009	0.022
9	0.0006	0.016
10	0.0004	0.011

Millimetre — Inch Equivalents

mm	in.	mm	in.
1	0.039	14	0.551
2	0.079	15	0.590
3	0.118	16	0.630
4	0.157	17	0.669
5	0.197	18	0.709
6	0.236	19	0.748
7	0.276	20	0.787
8	0.315	21	0.827
9	0.354	22	0.866
10	0.394	23	0.906
11	0.433	24	0.945
12	0.472	25	0.984
13	0.512	26	1.024

Decimal and Metric Equivalents of Fractions of an Inch

in.	in.	mm	in.	in.	mm
1/32	0.03125	0.794	17/32	0.53125	13.494
1/16	0.0625	1.588	9/16	0.5625	14.287
3/32	0.09375	2.381	19/32	0.59375	15.081
1/8	0.125	3.175	5/8	0.625	15.875
5/32	0.15625	3.969	21/32	0.65625	16.669
3/16	0.1875	4.762	11/16	0.6875	17.462
7/32	0.21875	5.556	23/32	0.71875	18.256
1/4	0.25	6.350	3/4	0.75	19.050
9/32	0.28125	7.144	25/32	0.78125	19.844
5/16	0.3125	7.937	13/16	0.8125	20.637
11/32	0.34375	8.731	27/32	0.84375	21.431
3/8	0.375	9.525	7/8	0.875	22.225
13/32	0.40625	10.319	29/32	0.90625	23.018
7/16	0.4375	11.112	15/16	0.9375	23.812
15/32	0.46875	11.906	31/32	0.96875	24.606
1/2	0.5	12.700	1	1.0	25.4

Multiple and Submultiple Units

Unit Prefix	Symbol	Magnitude
micro	μ	0.000 001 (10^{-6})
milli	m	0.001 (10^{-3})
centi	c	0.01 (10^{-2})
deci	d	0.1 (10^{-1})
deka	da	10 (10^{1})
hecto	h	100 (10^{2})
kilo	k	1000 (10^{3})
mega	M	1 000 000 (10^{6})
giga	G	1 000 000 000 (10^{9})
tera	T	1 000 000 000 000 (10^{12})

Approximate Relationships Between Hardness Values, Nickel and High-Nickel Alloys[a]

Diamond Pyramid Hardness Number, DPH	Brinell Hardness Number, BHN	Rockwell Hardness Number								Rockwell Superficial Hardness Number						Knoop Hardness Number[b] KHN
		A Scale	B Scale	C Scale	D Scale	E Scale	F Scale	G Scale	K Scale	15-N Scale	30-N Scale	45-N Scale	15-T Scale	30-T Scale	45-T Scale	
Diamond Pyramid Indenter—1, 5, 10, 30 Kgf Load	10 mm Standard Ball, 3000 Kgf Load	60 Kgf Load, Diamond Penetrator	100 Kgf Load, 1/16" (1.588 mm) Ball	150 Kgf Load Diamond Penetrator	100 Kgf Load Diamond Penetrator	100 Kgf Load, 1/8" (3.175 mm) Ball	60 Kgf Load, 1/16" (1.588 mm) Ball	150 Kgf Load, 1/16" (1.588 mm) Ball	150 Kgf Load, 1/8" (3.175 mm) Ball	15 Kgf Load, Superficial Diamond Penetrator	30 Kgf Load, Superficial Diamond Penetrator	45 Kgf Load, Superficial Diamond Penetrator	15 Kgf Load, 1/16" (1.588 mm) Ball	30 Kgf Load, 1/16" (1.588 mm) Ball	45 Kgf Load, 1/16" (1.588 mm) Ball	Knoop Indenter 500 and 1000 gf Load
513	479	75.5	—	50.0	63.0	—	—	—	—	85.5	68.0	54.5	—	—	—	—
481	450	74.5	—	48.0	61.5	—	—	—	—	84.5	66.5	52.5	—	—	—	—
452	425	73.5	—	46.0	60.0	—	—	—	—	83.5	64.5	50.0	—	—	—	—
427	403	72.5	—	44.0	58.5	—	—	—	—	82.5	63.0	47.5	—	—	—	—
404	382	71.5	—	42.0	57.0	—	—	—	—	81.5	61.0	45.5	—	—	—	—
382	363	70.5	—	40.0	55.5	—	—	—	—	80.5	59.5	43.0	—	—	—	436
362	346	69.5	—	38.0	54.0	—	—	—	—	79.5	58.0	41.0	—	—	—	413
344	329	68.5	—	36.0	52.5	—	—	—	—	78.5	56.0	38.5	—	—	—	392
326	313	67.5	—	34.0	50.5	—	—	—	—	77.5	54.5	36.0	—	—	—	372
309	298	66.5	**106**	32.0	49.5	—	**116.5**	94.0	—	76.5	52.5	34.0	94.5	85.5	77.0	352
285	275	64.5	**104**	28.5	46.5	—	**115.5**	91.0	—	75.0	49.5	30.0	94.0	84.5	75.0	325
266	258	63.0	**102**	25.5	44.5	—	**114.5**	87.5	—	73.5	47.0	26.5	93.0	83.0	73.0	304
248	241	61.5	100	22.5	42.0	—	**113.0**	84.5	—	72.0	44.5	23.0	92.5	81.5	71.0	283
234	228	60.5	98	20.0	40.0	—	**112.0**	81.5	—	70.5	42.0	20.0	92.0	80.5	69.0	267
220	215	59.0	96	**17.0**	38.0	—	**111.0**	78.5	100.0	69.0	39.5	17.0	91.0	79.0	67.0	251
209	204	57.5	94	**14.5**	36.0	—	**110.0**	75.5	98.0	68.0	37.5	14.0	90.5	77.5	65.0	239
198	194	56.5	92	**12.0**	34.0	—	**108.5**	72.0	96.5	66.5	35.5	11.0	89.5	76.0	63.0	226
188	184	55.0	90	**9.0**	32.0	**108.5**	**107.5**	69.0	94.5	65.0	32.5	7.5	89.0	75.0	61.0	215
179	176	53.5	88	**6.5**	30.0	**107.0**	**106.5**	65.5	93.0	64.0	30.5	5.0	88.0	73.5	59.5	204
171	168	52.5	86	**4.0**	28.0	**106.0**	**105.0**	62.5	91.0	62.5	28.5	2.0	87.5	72.0	57.5	195
164	161	51.5	84	**2.0**	26.5	**104.5**	**104.0**	59.5	89.0	61.5	26.5	**-0.5**	87.0	70.5	55.5	187
157	155	50.0	82	—	24.5	**103.0**	**103.0**	56.5	87.5	—	—	—	86.0	69.5	53.5	179
151	149	49.0	80	—	22.5	**102.0**	**101.5**	53.0	85.5	—	—	—	85.5	68.0	51.5	173
145	144	47.5	78	—	21.0	**100.5**	**100.5**	50.0	83.5	—	—	—	84.5	66.5	49.5	166
140	139	46.5	76	—	**19.0**	99.5	99.5	47.0	82.0	—	—	—	84.0	65.5	47.5	160
135	134	45.5	74	—	**17.5**	98.0	98.5	43.5	80.0	—	—	—	83.0	64.0	45.5	154
130	129	44.0	72	—	**16.0**	97.0	97.0	40.5	78.0	—	—	—	82.5	62.5	43.5	149
126	125	43.0	70	—	**14.5**	95.5	96.0	37.5	76.5	—	—	—	82.0	61.0	41.5	144
122	121	42.0	68	—	**13.0**	94.5	95.0	34.5	74.5	—	—	—	81.0	60.0	39.5	140
119	118	41.0	66	—	**11.5**	93.0	93.5	31.0	72.5	—	—	—	80.5	58.5	37.5	136
115	114	40.0	64	—	**10.0**	91.5	92.5	—	71.0	—	—	—	79.5	57.0	35.5	—
112	111	39.0	62	—	**8.0**	90.5	91.5	—	69.0	—	—	—	79.0	56.0	33.5	—
108	108	—	60	—	—	89.0	90.0	—	67.5	—	—	—	78.5	54.5	31.5	—
106	106	—	58	—	—	88.0	89.0	—	65.5	—	—	—	77.5	53.0	29.5	—
103	103	—	56	—	—	86.5	88.0	—	63.5	—	—	—	77.0	51.5	27.5	—
100	100	—	54	—	—	85.5	87.0	—	62.0	—	—	—	76.0	50.5	25.5	—
98	98	—	52	—	—	84.0	85.5	—	60.0	—	—	—	75.5	49.0	23.5	—
95	95	—	50	—	—	83.0	84.5	—	58.0	—	—	—	74.5	47.5	21.5	—
93	93	—	48	—	—	81.5	83.5	—	56.5	—	—	—	74.0	46.5	19.5	—
91	91	—	46	—	—	80.5	82.0	—	54.5	—	—	—	73.5	45.0	17.0	—
89	89	—	44	—	—	79.0	81.0	—	52.5	—	—	—	72.5	43.5	14.5	—
87	87	—	42	—	—	78.0	80.0	—	51.0	—	—	—	72.0	42.0	12.5	—
85	85	—	40	—	—	76.5	79.0	—	49.0	—	—	—	71.0	41.0	10.0	—
83	83	—	38	—	—	75.0	77.5	—	47.0	—	—	—	70.5	39.5	7.5	—
81	81	—	36	—	—	74.0	76.5	—	45.5	—	—	—	70.0	38.0	5.5	—
79	79	—	34	—	—	72.5	75.5	—	43.5	—	—	—	69.0	36.5	3.0	—
78	78	—	32	—	—	71.5	74.0	—	42.0	—	—	—	68.5	35.5	1.0	—
77	77	—	30	—	—	70.0	73.0	—	40.0	—	—	—	67.5	34.0	**-1.5**	—

[a] Hardness Conversion Chart for Nickel and High-Nickel Alloys. A.S.T.M., E140-84.
The use of hardness scales for hardness values shown above in **bold** are not recommended by the manufacturers of hardness testing machines since they are beyond the ranges recommended for accuracy. Such values are shown for comparative purposes, only, where comparisons may be desired and the recommended machine and scale are not available.

[b] For Knoop hardness determinations the specimen must be polished, etched, and repolished until a final light etch shows a clearly defined microstructure free from disturbed metal. Care must be exercised to insure that the top and bottom of the mounted specimen are parallel. In no case shall the departure from symmetry in the longitudinal direction of the indentation be greater than 5 filar microscope units.

Approximate Comparison of Gauges

Gauge No.	INCHES: American or Brown & Sharpe's	INCHES: Birmingham or Stubs'	INCHES: Washburn & Moen's	INCHES: Imperial S.W.G.	INCHES: London or Old English	INCHES: United States Standard	MILLIMETRES: United States Standard	MILLIMETRES: Stubs'
7/0	—	—	0.4900	0.500	—	0.5000	12.700	—
6/0	0.5800	—	0.4615	0.464	—	0.4687	11.906	—
5/0	0.5165	—	0.4305	0.432	—	0.4375	11.113	—
4/0	0.4600	0.454	0.3938	0.400	0.454	0.4062	10.319	11.532
3/0	0.4096	0.425	0.3625	0.372	0.425	0.3750	9.525	10.795
2/0	0.3648	0.380	0.3310	0.348	0.380	0.3437	8.731	9.652
1/0	0.3249	0.340	0.3065	0.324	0.340	0.3125	7.938	8.636
1	0.2893	0.300	0.2830	0.300	0.300	0.2812	7.144	7.620
2	0.2576	0.284	0.2625	0.276	0.284	0.2656	6.747	7.214
3	0.2294	0.259	0.2437	0.252	0.259	0.2500	6.350	6.579
4	0.2043	0.238	0.2253	0.232	0.238	0.2343	5.953	6.045
5	0.1819	0.220	0.2070	0.212	0.220	0.2187	5.556	5.588
6	0.1620	0.203	0.1920	0.192	0.203	0.2031	5.159	5.156
7	0.1443	0.180	0.1770	0.176	0.180	0.1875	4.763	4.572
8	0.1285	0.165	0.1620	0.160	0.165	0.1718	4.366	4.191
9	0.11440	0.148	0.1483	0.144	0.148	0.1562	3.969	3.759
10	0.10190	0.134	0.1350	0.128	0.134	0.1406	3.572	3.404
11	0.09074	0.120	0.1205	0.116	0.120	0.1250	3.175	3.048
12	0.08081	0.109	0.1055	0.104	0.109	0.10930	2.778	2.769
13	0.07196	0.095	0.0915	0.092	0.095	0.09375	2.381	2.413
14	0.06408	0.083	0.0800	0.080	0.083	0.07812	1.984	2.108
15	0.05707	0.072	0.0720	0.072	0.072	0.07031	1.786	1.829
16	0.05082	0.065	0.0625	0.064	0.065	0.06250	1.588	1.651
17	0.04526	0.058	0.0540	0.056	0.058	0.05625	1.429	1.473
18	0.04030	0.049	0.0475	0.048	0.049	0.05000	1.270	1.245
19	0.03589	0.042	0.0410	0.040	0.040	0.04375	1.111	1.067
20	0.03196	0.035	0.0348	0.036	0.035	0.03750	0.953	0.889
21	0.02846	0.032	0.0317	0.032	0.0315	0.03437	0.873	0.813
22	0.02535	0.028	0.0286	0.028	0.0295	0.03125	0.794	0.711
23	0.02257	0.025	0.0258	0.024	0.0270	0.02812	0.714	0.635
24	0.02010	0.022	0.0230	0.022	0.0250	0.02500	0.635	0.559
25	0.01790	0.020	0.0204	0.020	0.0230	0.02187	0.556	0.508
26	0.01594	0.018	0.0181	0.018	0.0205	0.01875	0.476	0.457

Dimensions of Standard Pipe Sizes

Nominal Pipe Size, in.	Outside Diameter		Nominal Wall Thickness For: Schedule 5		Schedule 10		Schedule 40		Schedule 80		Schedule 160	
	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.
1/8	0.405	10.29	—	—	0.049	1.24	0.068	1.73	0.095	2.41	—	—
1/4	0.540	13.72	—	—	0.065	1.65	0.088	2.24	0.119	3.02	—	—
3/8	0.675	17.14	—	—	0.065	1.65	0.091	2.31	0.126	3.20	—	—
1/2	0.840	21.34	0.065	1.65	0.083	2.11	0.109	2.77	0.147	3.73	0.187	4.75
3/4	1.050	26.67	0.065	1.65	0.083	2.11	0.113	2.87	0.154	3.91	0.218	5.54
1	1.315	33.40	0.065	1.65	0.109	2.77	0.133	3.38	0.179	4.55	0.250	6.35
1 1/4	1.660	42.16	0.065	1.65	0.109	2.77	0.140	3.56	0.191	4.85	0.250	6.35
1 1/2	1.900	48.26	0.065	1.65	0.109	2.77	0.145	3.68	0.200	5.08	0.281	7.14
2	2.375	60.32	0.065	1.65	0.109	2.77	0.154	3.91	0.218	5.54	0.343	8.71
2 1/2	2.875	73.02	0.083	2.11	0.120	3.05	0.203	5.16	0.276	7.01	0.375	9.52
3	3.500	88.90	0.083	2.11	0.120	3.05	0.216	5.49	0.300	7.62	0.438	11.10
3 1/2	4.000	101.60	0.083	2.11	0.120	3.05	0.226	5.74	0.318	8.08	—	—
4	4.500	114.30	0.083	2.11	0.120	3.05	0.237	6.02	0.337	8.56	0.531	13.50
5	5.563	141.30	0.109	2.77	0.134	3.40	0.258	6.55	0.375	9.52	0.625	15.90
6	6.625	168.30	0.109	2.77	0.134	3.40	0.280	7.11	0.432	11.00	0.718	18.20
8	8.625	219.10	0.109	2.77	0.148	3.76	0.322	8.18	0.500	12.70	0.906	23.00
10	10.750	273.00	0.134	3.40	0.165	4.19	0.365	9.27	0.593	15.10	—	—
12	12.750	323.80	0.165	4.19	0.180	4.57	0.406	10.30	0.687	17.40	—	—

Comparisons of Gauges & Standard Pipe Sizes

Albert Sauveur type of table. Look up reading in middle column; if in degrees Celsius, read Fahrenheit equivalent in right hand column; if in degrees Fahrenheit, read Celsius equivalent in left hand column.

−459.4 to 0: °C		°F	0 to 100: °C		°F	°C		°F	100 to 1000: °C		°F	°C		°F	1000 to 2000: °C		°F	°C		°F	2000 to 3000: °C		°F	°C		°F
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Temperature Conversions

STORAGE & HANDLING CONDITIONS FOR SPECIAL METALS WELDING CONSUMABLES

Shielded Metal Arc Welding Electrode.
The flux coating on Shielded Metal Arc Welding (SMAW) electrodes is hygroscopic or moisture absorbing. The amount of moisture absorbed is dependent on the atmospheric conditions of temperature and humidity experienced by the electrode after the packaging has been opened. The amount of moisture which is absorbed increases with time of exposure.

During the manufacturing process SMAW electrodes are baked at a high temperature and following manufacture the flux coating has a low moisture content. Prior to use, electrodes should be left in their unopened original moisture proof hermetically sealed containers and stored in a dry area. Once the container is opened, the deep seating lid should be replaced as the lid provides an effective barrier to moisture ingress. Once the container is opened, the electrodes should be stored in a cabinet equipped with either a desiccant or heated to 10- 15ºF (6-8ºC) above the highest expected ambient temperature or both.

Electrodes which have absorbed excessive moisture should be re-baked in a vented oven at 600ºF ±25°F (315ºC±15°C) for one hour or 500ºF±25°F (260ºC±15°C) for two hours. Electrodes must be removed from their original containers during this re-baking operation. Electrodes should not be stacked more than 6 layers deep on shelves within the oven. Most electrodes can be re-baked at least 2-3 times without substantially affecting both the integrity of the flux coating and their welding performance. Following the re-baking operation the electrodes should be allowed to cool to room temperature prior to use.

A common problem that may occur is the uneven absorption of moisture by the electrodes. For example, electrodes exposed overnight may exhibit "fingernailing" (uneven burn-off on one side of the electrode) problems during welding when used the next day. In this instance the reason that "fingernailing" occurs is due to moisture being absorbed by only one side of the electrode causing that side to burn off more slowly and unevenly. Correct storage conditions will prevent this type of "fingernailing" problem.

Submerged Arc Welding Fluxes.
Agglomerated submerged arc welding (SAW) fluxes are manufactured using minerals and metallic powders held together by silicate binders. Fused fluxes are manufactured using minerals, which are melted to form a glass, which is subsequently crushed to form the flux particles. Submerged arc welding fluxes absorb moisture with the amount of moisture absorbed being dependent upon the atmospheric conditions and time of exposure. Most of the Special Metals fluxes are supplied in air tight 90 mil plastic buckets with an 'O' ring seal in the lid. The 'O' ring seal is an effective moisture barrier that works when the bucket is both opened and re-sealed correctly to allow the 'O' ring to seat properly. To open the bucket of flux, the embossed tab on the lid must be pulled, or cut free, and then peeled loose from the lid. This removes a thin ring of plastic from the circumference of the lid. Once this ring of plastic is removed, the lid is quickly and easily opened and resealed. Properly seating the 'O' ring is necessary in order to prevent any flux that remains in the bucket from absorbing moisture. INCOFLUX 9 is supplied in heavy duty plastic sacks. Fluxes should be stored in a dry area and labels should never be removed from the packaging.

Submerged arc welding fluxes can be re-baked if it is suspected that the flux has absorbed excessive moisture. Re-baking should be performed at 700-900ºF (375-480ºC) for two hours in a vented oven for all INCOFLUX fluxes except INCOFLUX 9. For INCOFLUX 9 re-baking should be conducted at 300-480ºF (150- 250ºC) in a vented oven. Flux should be placed on metal trays with a maximum flux depth on the tray of 2" (50mm). The plastic buckets and plastic sacks should not be baked.

Flux re-cycling.
- Flux can be re-cycled successfully and the following guidelines should be adopted for flux re-cycling: During continuous welding operations unfused flux can be recycled and returned to the flux hopper for re-use.
- Slag and metallic particles should be removed from the recycled flux and discarded prior to using recycled flux.
- Fines should be removed from recycled flux. Excessive levels of fines will impair the welding performance of the flux and degrade the weld bead appearance.
- Re-crushed slag should not be used as flux for welding operations.
- Following a break in welding operations any unused flux should be removed from the welding machine hopper and stored in a heated hopper (250-300°F, 120-150°C) for a maximum period of 24 hours. This flux should then be mixed with twice its volume of new flux prior to reuse.
- Care should be taken when using forced air recycling systems to ensure that such systems use only dry air and that the flux particles are not damaged or degraded by using high air flow rates (which can result in the formation of large quantities of dust). Only dry air must be used in forced air recycling systems to prevent moisture pick up by the flux. Compressed air systems used for operating power tools should not be used for flux recovery as they may contain oil lubricant.

Bare Wire.
Bare wire products used for GMAW (MIG), GTAW (TIG) and SAW welding should be kept in a dry store prior to use. Containers should be kept closed when not in use. Spooled wire is supplied packed in plastic bags and used spools should be replaced into a plastic bag for storage to prevent surface contamination. Wire should be stored at ambient conditions of temperature and humidity, and dusty areas should be avoided when wire is not enclosed in some type of dust-protecting container. Cut-length wire used for GTAW welding should be protected from dust and airborne contamination after removal from the packaging. All bare wire should be protected from surface contamination (dust, grinding particles etc.) when in use and during storage.

Flux Cored Wire.
Flux cored wire storage conditions are similar to those for SMAW electrodes. Flux cored wires are packaged in plastic bags containing desiccant which protects the wire from moisture pick up. Cartons should be protected from water damage and the labels should never be removed. Used coils of wire should be stored in a sealed cabinet equipped with desiccant or heated to a temperature 10-15°F (6-8°C) above ambient or both. If the flux-cored wire is suspected of picking up excessive levels of moisture please contact the Technical Department at Special Metals Welding Products Company for advice on potential re-baking of the wire.

Safety & Handling

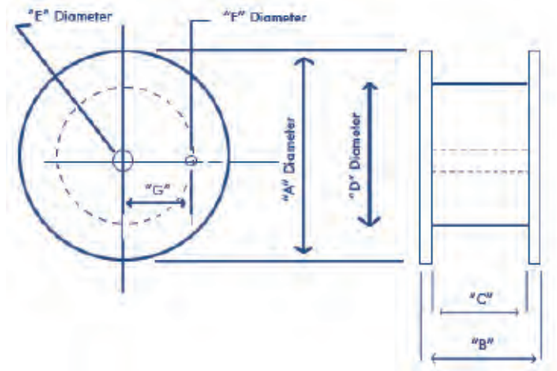
WARNING: POSSIBLE CANCER HAZARD OR LUNG DAMAGE IF INHALED - MAY CAUSE ALLERGIC REACTION - MAY CONTAIN FLUORIDES.

PROTECT YOURSELF AND OTHERS - TAKE PRECAUTIONS WHEN WELDING -BEFORE USE. READ AND UNDERSTAND THIS INFORMATION, THE MANUFACTURER'S INSTRUCTIONS. MATERIAL SAFETY DATA SHEETS (MSDS), AND YOUR EMPLOYER'S SAFETY PRACTICES, WHICH SHOULD BE BASED ON THE SAFETY IN WELDING AND CUTTING (ANSI Z49.1), AND OSHA SAFETY AND HEALTH STANDARDS 29CFR1910.

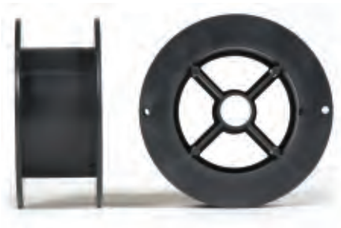
FUMES AND GASES CAN BE HAZARDOUS TO YOUR HEALTH, SKIN SENSITIZATION, IRRITATION OF SKIN, EYE, AND RESPIRATORY TRACT, NEUROLOGICAL DAMAGE OR DEATH CAN RESULT FROM OVER-EXPOSURE. KEEP YOUR HEAD OUT OF THE FUME. USE VENTILATION, PREFERABLY LOCAL EXHAUST VENTILATION, ADEQUATE TO KEEP THE CONCENTRATION OF FUMES AND GASES BELOW THE EXPOSURE LIMITS, AWAY FROM YOUR BREATHING ZONE AND THE GENERAL AREA. SPECIAL ATTENTION TO VENTILATION IS REQUIRED IN CONFINED, SMALL OR CROWDED SPACES. IF ADEQUATE VENTILATION IS NOT AVAILABLE, WEAR APPROPRIATE RESPIRATORY PROTECTION. WASH SKIN AFTER CONTACT WITH DUST OR FUME.

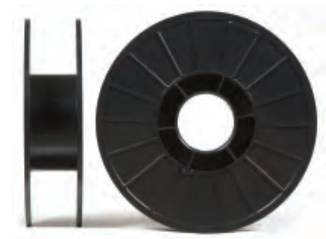
ARC RAYS CAN INJURE EYE AND BURN SKIN. ELECTRIC SHOCK CAN KILL. DO NOT TOUCH LIVE ELECTRICAL PARTS, WEAR CORRECT EYE, EAR AND BODY PROTECTION.

Spooled Wire Packaging



Minimum order quanities may apply in certain diameter - capacity combinations.

2 Pound Spool *not a stock item minimums apply	Dimensions Imperial	Dimensions Metric	Available Diameters Imperial	Available Diameters Metric
	Capacity: 2 lb Material: Plastic "A" 4" "B" 1-3/4" "C" 1-1/2" "D" 2-3/4" "E" 5/8" "F" – "G" –	Capacity: .9 kg Material: Plastic "A" 10.2 cm "B" 4.5 cm "C" 3.8 cm "D" 6.9 cm "E" 1.6 cm "F" – "G" –	.030" .035" .039" .045" .047"	.8 mm .9 mm 1.0 mm 1.14 mm 1.2 mm

10 Pound Spool *not a stock item minimums apply	Imperial	Metric	Imperial	Metric
	Capacity: 10 lb Material: Plastic "A" 7-7/8" "B" 2-1/8" "C" 1-3/4" "D" 3-3/4" "E" 2.035" min. "F" 3/8" x .130" "G" 1-3/4"	Capacity: 4.54 kg Material: Plastic "A" 20.0 cm "B" 5.4 cm "C" 4.5 cm "D" 9.5 cm "E" 5.2 cm "F" .9 cm x .3 cm "G" 4.5 cm	.030" .035" .039" .047"	.8 mm .9 mm 1.0 mm 1.14 mm 1.2 mm

30 Pound Spool	Imperial	Metric	Imperial	Metric
	Capacity: 33 lb Material: Plastic "A" 11-7/8" "B" 4" "C" 3-1/2" "D" 8" "E" 2.035" min. "F" 3/8" "G" 1-3/4"	Capacity: 15.0 kg Material: Plastic "A" 30.0 cm "B" 10.2 cm "C" 8.9 cm "D" 20.3 cm "E" 5.2 cm "F" .9 cm "G" 4.5 cm	.030" .035" .039" .045" .047" .062"	.8 mm .9 mm 1.0 mm 1.14 mm 1.2 mm 1.6 mm

Spooled Wire Packaging

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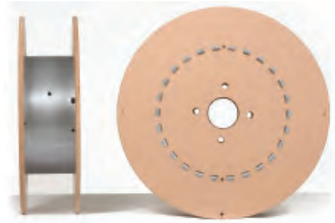
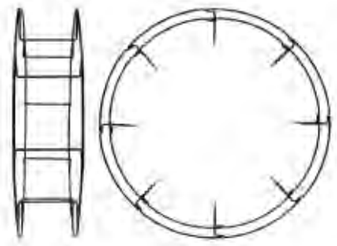
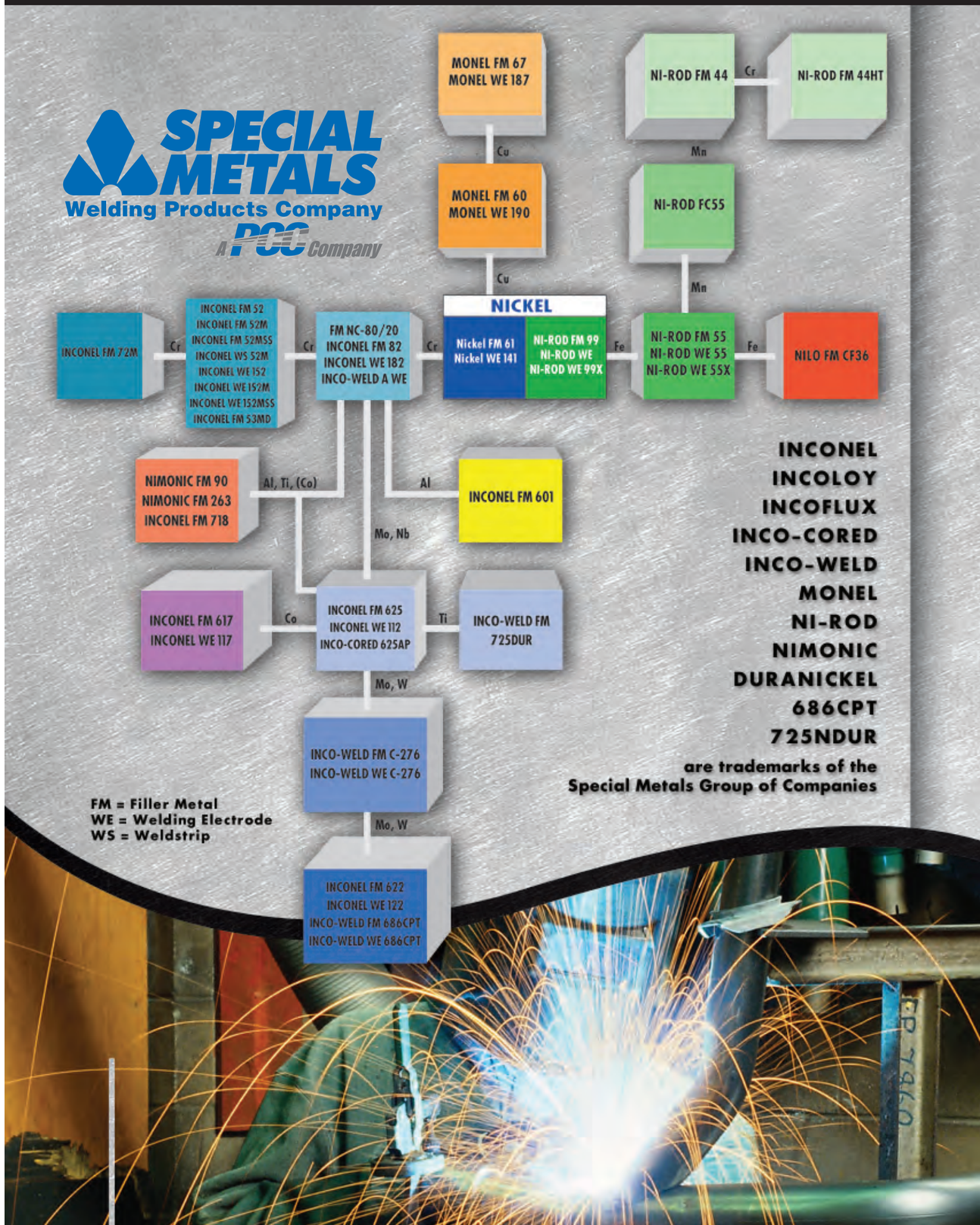
	Dimensions		Available Diameters	
Wire Basket	**Imperial**	**Metric**	**Imperial**	**Metric**
	Capacity: 44 lb Material: Steel Wire "A" 11- 3/4" "B" 4" "C" 3-5/8" "D" 7-3/8" "E" 2.035" min. "F" 3/8" "G" 1-3/4"	Capacity: 20.0 kg Material: Steel Wire "A" 30.0 cm "B" 10.16 cm "C" 9.21 cm "D" 18.73 cm "E" 5.2 cm "F" .95 cm "G" 4.45 cm	.030" .035" .045" .047" .062"	.8 mm .9 mm 1.14 mm 1.2 mm 1.6 mm
Fiberboard Spool	**Imperial**	**Metric**	**Imperial**	**Metric**
	Capacity: 60 lb Material: Fiberboard "A" 13-13/16" "B" 4" "C" 3-3/8" "D" 8-1/4" "E" 2.035" min. "F" 3/8" "G" 1-3/4"	Capacity: 27.22 kg Material: Fiberboard "A" 13.81 cm "B" 10.16 cm "C" 8.57 cm "D" 20.96 cm "E" 5.2 cm "F" .9 cm "G" 4.5 cm	.045" .047" .062" .078" .093" .125"	1.14 mm 1.2 mm 1.6 mm 2.0 mm 2.4 mm 3.2 mm
500 Pound Reel	**Imperial**	**Metric**	**Imperial**	**Metric**
	Capacity: 500 lb Material: Steel "A" 30.0" "B" 11 - 12-3/4" "C" 9-5/8 - 11-5/8" "D" 17" "E" 1-1/4" "F" 7/8 - 1-3/4" "G" 2-1/2 - 4"	Capacity: 227 kg Material: Steel "A" 76.0 cm "B" 27.94-32.39 cm "C" 24.45-29.53 cm "D" 46.18 cm "E" 31.75 cm "F" 2.22-4.44 cm "G" 6.35-10.16 cm	.062" .078" .093" .125"	1.6 mm 2.0 mm 2.4 mm 3.2 mm
Coil Carrier Wire Basket	**Imperial**	**Metric**	**Imperial**	**Metric**
	Capacity: 60 lb Material: Steel "A" 16-3/8" "B" 4-1/16" "C" 3-3/4" "D" — "E" 12" "F" — "G" —	Capacity: 27.22 kg Material: Steel "A" 41.5 cm "B" 10.3 cm "C" 9.5 cm "D" — "E" 30.48 cm "F" — "G" —	.062" .078" .093" .125"	1.6 mm 2.0 mm 2.4 mm 3.2 mm



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