Data Sheet D-20

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ALLOY 625 CONSUMABLES

Alloy type

Consumables matching the nickel base 625 alloy with typical composition of Ni-21%Cr-9%Mo-3.5%Nb.

Materials to be welded

Matching Alloy 625

ASTM-ASME	DIN	BS
UNS N06625	2.4856	NA21
A494 CW-6MC (cast)		

Proprietary Alloys

Inconel 625 (Inco)
Nicrofer 6020hMo (VDM)
Nicrofer 6022hMo (VDM)

Other Alloys

High Nickel Alloys:	Superaustenitic alloys:
Inconel 601 (Inco)	UNS S31254
Incoloy 800H (Inco)	254SMO (Avesta)
Incoloy 825 (Inco)	904L
And equivalents	Similar alloys

Cryogenic:	Dissimilar:
9%Ni steels	Combinations of above

Applications

These consumables are designed to match the composition and properties of alloy 625. Originally developed to give high temperature strength and structural stability, alloy 625 is also widely used for its resistance to general corrosion, pitting, crevice and stress corrosion cracking in severe chloride media. These properties are conferred by high levels of chromium, molybdenum and niobium, which also raise strength to the highest amongst standard nickel-base alloys. Useful properties from –269°C to above 1000°C are achieved.

In addition to matching alloy 625, suitable for welding **heat resisting** alloys including Inconel 601 (except severe sulphidising conditions), Incoloy 800/800H (preferred to **Nimrod AKS** above about 900°C), or combinations of these with other alloys for **furnace equipment**, **petrochemical** and **power generation** plants. Some other applications include:

Overmatching corrosion-resistant welds in alloy 825, Hastelloys G and G3, alloy 28, 904L, 6%Mo super-austenitic stainless 254SMo, and also **overlays** on **pumps**, **valves** and **shafts**, often in **offshore** and **marine** environments where high pitting resistance (PRE = 50) and tolerance to weld metal dilution are essential.

Welds in **high strength** ferrous alloys including **cryogenic** 9% nickel steels and for reclamation of dies where rapid **work-hardening** and **toughness** are required.

Microstructure

In the as-welded condition this nickel base weld metal consists of solid-solution strengthened austenite with carbides.

Welding guidelines

No preheat required and maximum interpass of 250°C. When welding superaustenitic alloys the interpass temperature should be controlled to a maximum of 100°C.

Related alloy groups

For welding superaustenitic stainless steels C276 (D-30), alloy 59 (D-31) and alloy C22 (D-32) are also suitable.

Products available

Process	Product	Specification
MMA	**Nimrod 625**	AWS ENiCrMo-3
	Nimrod 625KS	AWS ENiCrMo-3
TIG/MIG	**62-50**	AWS ERNiCrMo-3
SAW	**62-50**	AWS ERNiCrMo-3
	NiCr	BS EN SA FB2
FCW	**Supercore 625P**	AWS ENiCrMo3T1-1/4

General Data for all MMA Electrodes

Storage	**3 hermetically sealed ring-pull metal tins** per carton, with unlimited shelf life. Direct use from tin is satisfactory for longer than a working shift of 8h. Excessive exposure of electrodes to humid conditions will cause some moisture pick-up and increase the risk of porosity. For electrodes that have been exposed: **Redry** 200 – 250°C/1-2h to restore to as-packed condition. Maximum 350° C, 3 cycles, 10h total. **Storage** of redried electrodes at 50 – 200°C in holding oven or heated quiver: no limit, but maximum 6 weeks recommended. Recommended ambient storage conditions for opened tins (using plastic lid): < 60% RH, > 18°C.
Fume data	Fume composition, wt % typical:

Fe	Mn	Ni	Cr	Mo	Cu	F	OES (mg/m^3)
1	4	9	6	1	0.1	20	0.8

NIMROD 625

Downhand MMA electrode for surfacing

Product description

MMA electrode designed to combine easy operation with the deposition of high quality weld metal and a finished bead of good appearance. The electrode has a basic-rutile flux system and is made on a nickel core wire. **Nimrod 625** operates on AC or DC+ and is designed primarily for the downhand/flat or H-V positions. Optimised for surfacing and overlays, for joining Nimrod 625KS is preferred.

Recovery is about 170% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.11 ENiCrMo-3
BS EN ISO 14172 E Ni6625

ASME IX Qualification

QW432 F-No 43

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Nb	Fe	Mo	Cu
min	--	0.5	--	--	--	20.0	55	3.15	--	8.0	--
max	0.10	1.0	0.75	0.015	0.020	23.0	--	4.15	2.5	10.0	0.50
typ	0.04	0.8	0.7	0.005	0.008	21.5	64	3.4	< 1.5	9	0.05

All-weld mechanical properties

As welded			min *	typical
Tensile strength		MPa	760	800
0.2% Proof stress		MPa	420	480
Elongation on 4d		%	30	34
Elongation on 5d		%	27	32
Reduction of area		%	--	30
Impact energy	- 196°C	J	--	> 28
Hardness (as welded)		HV	--	250
Hardness (work-hardened)		HV	--	450

* Cannot meet TS > 827MPa required by cold rolled ASTM N06625 Grade 1, but meets PS > 414MPa and properties of hot rolled grades. Cast CW-6MC solution annealed 1175°C + WQ requires TS > 485MPa.

Operating parameters

DC +ve AC (OCV: 70V)

ø mm	3.2	4.0	5.0
min A	90	130	160
max A	155	210	260

Packaging data

ø mm	3.2	4.0	5.0
length mm	350	350	450
kg/carton	13.8	13.5	16.8
pieces/carton	243	156	93

NIMROD 625KS

Basic coated MMA pipe-welding electrode for 625

Product description

MMA electrode with a basic flux system made on a 625 core wire. The electrode is designed to combine easy operation with the deposition of high quality, radiographically sound weld metal and a finished bead of good appearance. **Nimrod 625KS** is optimised for DC+ welding in all positions including pipework qualified in the ASME 6G position.

Recovery is about 120% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.11 E NiCrMo-3
BS EN ISO 14172 ENi 6625

ASME IX Qualification

QW432 F-No 43

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Nb	Fe	Mo	Cu
min	--	0.5	--	--	--	20.0	55	3.15	--	8.0	--
max	0.10	1.0	0.75	0.015	0.020	23.0	--	4.15	2.5	10.0	0.50
typ	0.04	0.7	0.4	0.005	0.005	22	63	3.2	< 1.5	9.3	0.01

All-weld mechanical properties

As welded			min *	typical	+ 160°C
Tensile strength		MPa	760	800	725
0.2% Proof stress		MPa	420	500	440
Elongation on 4d		%	30	40	33
Elongation on 5d		%	27	38	31
Reduction of area		%	--	40	32
Impact energy	- 196°C	J	--	60	--
Hardness (as welded)		HV	--	250	--
Hardness (work-hardened)		HV	--	450	--

* Cannot meet TS > 827MPa required by cold rolled ASTM N06625 Grade 1, but meets PS > 414MPa and properties of hot rolled grades. Cast CW-6MC solution annealed 1175°C + WQ requires TS > 485MPa.

Operating parameters

DC +ve

ø mm	2.5	3.2	4.0	5.0
min A	60	70	100	130
max A	80	110	155	210

Packaging data

ø mm	2.5	3.2	4.0	5.0
length mm	300	300	350	350
kg/carton	11.1	12.6	15.0	15.0
pieces/carton	660	447	300	189

62-50

Solid wire for TIG, MIG and SAW

Product description

Solid wire for TIG, MIG and SAW.

Specifications

AWS A5.14 ERNiCrMo-3
BS EN ISO 18274 SNi6625
Approvals DNV and LRS (TIG)

ASME IX Qualification

QW432 F-No 43

Composition (wire wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	Al	Ti	Fe
min	--	--	--	--	--	20.0	60.0	8.0	3.15	--	--	--	--
max	0.05	0.50	0.50	0.015	0.015	23.0	bal	10.0	4.15	0.50	0.40	0.40	1.0
typ	0.015	0.02	0.05	0.004	0.004	22	65	9	3.5	0.05	0.2	0.2	0.2

All-weld mechanical properties

Typical values as welded			TIG	SAW + NiCr	TIG +165°C
Tensile strength		MPa	780	715	710
0.2% Proof stress		MPa	520	430	440
Elongation on 4d		%	42	50	42
Elongation on 5d		%	40	47	40
Impact energy	- 100°C	J	100	--	--
Impact energy	- 196°C	J	80	100	--
Hardness cap/mid		HV	205/225	235/255	--

Cannot meet TS > 827MPa required by cold rolled ASTM N06625 Grade 1, but meets PS > 414MPa and properties of hot rolled grades. Cast CW-6MC solution annealed 1175°C + WQ requires TS > 485MPa.

Typical operating parameters

	TIG *	MIG	SAW
Shielding	Ar	Ar or ArHe	NiCr flux
Current	DC-	Pulsed	DC+
Diameter	2.4mm	1.2mm	1.6mm
Parameters	100A, 12V	130A, 29V (mean)	260A, 26V

* Also required as a purge for root runs.

Packaging data

ø mm	TIG	MIG	SAW
0.8	--	15kg spool	--
1.0	--	To order	--
1.2	--	15kg spool	--
1.6	2.5kg tube	--	25kg coil
2.0	2.5kg tube	--	--
2.4	2.5kg tube	--	25kg coil
3.2	2.5kg tube	--	--

Fume data

MIG fume composition (wt %) (TIG & SAW fume negligible)

Fe	Mn	Cr^3	Ni	Mo	Cu	OES (mg/m^3)
1	1	17	50	9	< 0.5	1

SUPERCORE 625P

Rutile all-positional flux cored wire

Product description

Flux cored wire made with a nickel alloy sheath and rutile flux system. **Supercore 625P** is designed for all-positional welding and combines easy operability, high deposit quality and exceptional weld bead appearance. Metal recovery is about 90% with respect to the wire.

Specifications

AWS A5.34 ENiCrMo3T1-1/4

ASME IX Qualification

QW432 F-No 43

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	Ti	Fe
min	--	--	--	--	--	20.0	58.0	8.0	3.15	--	--	--
max	0.10	0.50	0.50	0.015	0.02	23.0	--	10.0	4.15	0.50	0.40	5.0
typ	0.02	0.3	0.2	0.005	0.005	21	66	8.5	3.4	0.02	0.2	1.0

All-weld mechanical properties

As welded			min	typical
Tensile strength		MPa	690	770
0.2% Proof stress		MPa	--	500
Elongation on 4d		%	25	46
Elongation on 5d		%	--	42
Reduction of area		%	--	42
Impact energy	+ 20°C	J	--	95
	-196°C	J	--	80
Hardness cap/mid		HV	--	230/230

Operating parameters

Shielding gas: 80%Ar-20%CO_2 or 100% CO_2 at 20-25l/min. Proprietary gases may be used but argon should not exceed 85%.

Current: DC+ve ranges as below for Ar-20%CO_2. Welding with 100%CO_2 requires approx. 2-3V higher:

ø mm	amp-volt range	typical	stickout
1.2 (downhand)	150 – 250A, 25 – 32V	180A, 29V	15 – 20mm
1.2 (positional)	150 – 180A, 25 – 28V	160A, 26V	15 – 20mm

Packaging data

Spools vacuum-sealed in barrier foil with cardboard carton: 15kg.
The as-packed shelf life is virtually indefinite.
Resistance to moisture absorption is high, but to maintain the high integrity of the wire surface and prevent any possibility of porosity, it is advised that part-used spools are returned to polythene wrappers.
Where possible, preferred storage conditions are 60% RH max, 18°C min.

Fume data

Fume composition (wt %)

Fe	Mn	Ni	Cr^3	Cr^6	Cu	F	OES (mg/m^3)
1	3	10	5	5	0.1	5	1.0