Stainless Steels

DATA SHEET **B-40**

METRODE PRODUCTS LTD
HANWORTH LANE, CHERTSEY
SURREY, KT16 9LL
Tel: +44(0)1932 566721
Fax: +44(0)1932 565168 Sales
Fax: +44(0)1932 569449 Technical
Fax: +44(0)1932 566199 Export
Email: info@metrode.com
Internet: http//www.metrode.com

CONSUMABLES FOR 904L

Alloy type

904L is a nominally 20%Cr-25%Ni-5%Mo-2%Cu fully austenitic alloy with good corrosion resistance.

Materials to be welded

ASTM-ASME	DIN	BS
N08904	1.4505	1449: 904S13
	1.4506	1504: 364C11 (cast)
	1.4536	
	1.4539	
	1.4585	
	1.4500 (cast)	

Proprietary alloys

Uddelholm 904L
2RK65 (Sandvik)
Cronifer 1925LC (VDM)
254SLX (Avesta Polarit)
Uranus B6 & B6M (Creusot Loire)

Suitable for copper-free variants of the above alloys and also to overmatch leaner alloys such as 317L, 317LN, 317LM, 317LMN, 1.4439, 1.4440 and S31726.

Applications

These consumables give a fully austenitic, low carbon weld metal with molybdenum and copper, with good resistance to corrosion in sulphuric, phosphoric and other inorganic and organic acids.

They are not normally chosen for resistance to corrosion in concentrated nitric acid. For service in severe chloride pitting media, overmatching nickel-base weld metal is recommended, see alloy 625 (data sheet D-20).

It is the preferred weld metal for some lower alloy austenitics such as Creusot UHB 34L and UHB 734L for wet process phosphoric acid service.

Applications include **tanks** and **process vessels**, **piping systems**, **agitators** and **rotors** and **cast pumps** and **valves** for use in the **fertiliser**, **phosphoric**, **sulphuric** and **acetic acid** plants, and in **salt** and **seawater** environments. It is also used in some **offshore** applications, including **overlays** on mild and low alloy steels.

Microstructure

In the as-welded condition the weld metal microstructure is fully austenitic.

Welding guidelines

No preheat or PWHT is required, interpass should be controlled to 150°C maximum and heat input should also be controlled particularly with larger diameter MMA electrodes.

Products available

Process	Product	Specification
MMA	**Ultramet 904L**	E385-16
	Ultramet B904L	E385-15
TIG/MIG	**20.25.4Cu**	ER385

General Data for all 904L 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 150 – 250°C/1-2h to restore to as-packed condition. Maximum 250° 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)
8	8	2	7	1.5	0.5	18	0.7

* F=28% for basic coated Ultramet B904L but this does not affect OES.

ULTRAMET 904L

Rutile MMA electrode for welding 904L

Product description

MMA electrode (formerly 21.26.5.CuNb.R) with a special rutile flux on low carbon, high purity austenitic stainless steel core wire. Careful control of carbon, silicon, manganese and molybdenum contents to give resistance to microfissuring.

Recovery is about 130% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.4	E385-16
BS EN 1600	E 20 25 5 Cu NL R 52
BS 2926	(Nearest 20.25.5.LCuNb.R)
DIN 8556	E 20 25 5 L Cu R26

ASME IX Qualification

QW432 F-No 5

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	N
min	--	1.0	--	--	--	19.5	24.0	4.2	1.2	--	--
max	0.03	2.5	0.90	0.02	0.030	21.5	26.0	5.2	2.0	0.5	0.25
typ	0.02	1.2	0.55	0.015	0.02	20.5	25	4.6	1.5	0.02	0.09

All-weld mechanical properties

As welded			min	typical
Tensile strength		MPa	560	620
0.2% Proof stress		MPa	320	420
Elongation on 4d		%	30	38
Elongation on 5d		%	25	35
Reduction of area		%	--	50
Impact energy	- 196°C	J	--	50
Hardness cap/mid		HV	--	185/200

Operating parameters

DC +ve or AC (OCV: 70V min)

ø mm	2.5	3.2	4.0
min A	60	75	100
max A	90	120	155

Packaging data

ø mm	2.5	3.2	4.0
length mm	300	350	350
kg/carton	12.0	13.5	14.1
pieces/carton	525	306	213

ULTRAMET B904L

Basic all-positional MMA pipe-welding electrode for alloy 904L

Product description

Special basic flux on low carbon, high purity austenitic stainless steel core wire. Careful control of carbon, silicon, manganese and molybdenum contents to give resistance to microfissuring.

Recovery is about 130% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.4	E385-15
BS EN 1600	E 20 25 5 Cu NL B 62
BS 2926	(Nearest 20.25.5.LCuNb.B)
DIN 8556	E 20 25 5 L Cu B 20+

ASME IX Qualification

QW432 F-No 5

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	N
min	--	1.0	--	--	--	19.5	24.0	4.2	1.2	--	--
max	0.03	2.5	0.90	0.02	0.030	21.5	26.0	5.2	2.0	0.5	0.25
typ	0.025	2	0.4	0.005	0.02	21	25	4.8	1.8	0.05	0.08

ULTRAMET B904L (continued)

All-weld mechanical properties

As welded			min	typical
Tensile strength		MPa	560	620
0.2% Proof stress		MPa	320	440
Elongation on 4d		%	30	41
Elongation on 5d		%	25	38
Reduction of area		%	--	60
Impact energy	- 196°C	J	--	50
Hardness cap/mid		HV	--	190/215

Operating parameters

DC +ve

ø mm	2.5	3.2	4.0
min A	60	75	100
max A	90	120	155

Packaging data

ø mm	2.5	3.2	4.0
length mm	300	350	350

20.25.4.Cu

Solid TIG and MIG wire matching alloy 904L

Product description

Solid wire for TIG and MIG.

Specifications

AWS A5.9	ER385
BS EN ISO 14343-A	20 25 5 Cu L
BS EN ISO 14343-B	SS385
BS 2901: Pt2	904S92
DIN 8556	(Nearest SG-X2CrNiMoCu 20 25 / 1.4519)

ASME IX Qualification

QW432 F-No 6

Composition (wire wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu
min	--	1.0	0.25	--	--	19.5	24.0	4.2	1.2
max	0.025	2.5	0.50	0.015	0.020	21.5	26.0	5.2	2.0
typ	0.01	1.7	0.3	0.001	0.015	20	25	4.5	1.5

All-weld mechanical properties

Typical values as welded			TIG
Tensile strength		MPa	650
0.2% Proof stress		MPa	490
Elongation on 4d		%	35
Elongation on 5d		%	32
Impact energy	+ 20°C	J	210
Hardness cap/mid		HV	175/195

Typical operating parameters

	TIG	MIG
Shielding	Argon *	Ar+2%O_2 **
Current	DC-	DC+
Diameter	2.4mm	1.2mm
Parameters	100A, 12V	230A, 30V

* Also required as a purge for root runs.

** Ar-He-CO_2 proprietary mixtures also suitable.

Packaging data

ø mm	TIG	MIG
1.2	--	15kg spool
1.6	2.5kg tube	--
2.4	2.5kg tube	--

Fume data

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

Fe	Mn	Cr^3	Ni	Mo	Cu	OES (mg/m^3)
28	13	16	20	3	2.5	2.5