Repair & Maintenance

CMn STEELS

DATA SHEET **E-70**

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Alloy type

Consumables for welding mild and CMn steels of 340-510MPa tensile strength.

Materials to be welded

API	5L grades A, B, X42, X52, X60.
ASTM/ASME	A36; A106 grades A, B &C; A139; A210 grades A1 & C; A234 grade WPB; A334 grade 1, A216 grade WCA, WCB, WCC
BS EN	10025 grades S235 & S275
BS	1449 pt 1 grades 1-15 & 34/20-43/25; 3059, 3601 & 3602 grades 320 & 360; 4360 grades 43 & 50; 1501 grades 151 & 161
DIN	St37; St44; St50; St52.

Applications

Used for a diverse range of applications in **general engineering and fabrication**, **pipework** and **pressure vessel** fabrication. The flux cored wire also finds widespread use in **ship** and **bridge building**.

Microstructure

Predominantly ferrite.

Welding guidelines

Preheat and PWHT would often not be required but actual requirements will depend on grade and thickness of base material being welded.

Related alloy groups

The 1%Ni consumables (data sheet A-40) are used for applications requiring better low temperature impact properties.

Products available

Process	Product	Specification
TIG	**ER70S-2**	ER70S-2
	ER70S-3	ER70S-3
	ER70S-6	ER70S-6
FCW	**Metcore DWA 50**	E71T-1M

General Data for all Solid Wires

Storage

Recommended ambient storage conditions: <60% RH, >18°C.

Typical operating parameters

	TIG
Shielding	Ar
Current	DC-
Diameter	2.4mm
Voltage	150A, 15V

Fume data

Fume composition, wt % typical (TIG fume negligible):

Fe	Mn	Cr^3	Ni	Mo	Cu	OES (mg/m^3)
53	7	< 0.1	< 0.1	0.1	1.2	5

ER70S-2

Mild steel TIG wire

Product description

Solid copper coated wire for TIG. This wire has extra deoxidation (Al, Ti & Zr) and is often referred to as 'triple deoxidised'. This is claimed to have advantages for rimming or semi-killed steels and rusty or contaminated plate. Owing to the high levels of deoxidants some precipitation may occur in multipass welds, particularly following PWHT. Also suitable for subsequent vitreous enamelling, where the low carbon and the Ti+Zr suppress blistering of the enamel during stoving.

Specifications

AWS A5.18	ER70S-2
BS EN ISO 636-A	(W2Ti)
BS 2901: Pt1	A15
DIN 8559	(WSG1)

ASME IX Qualification

QW432 F-No 6, **QW442** A-No 1

Composition (wire wt %)

	C	Mn	Si	S	P	Cu	Al	Ti	Zr	Ni	Cr	Mo	V
min	--	0.90	0.40	--	--	--	0.05	0.05	0.02	--	--	--	--
max	0.07	1.40	0.70	0.025	0.025	0.4	0.15	0.15	0.12	0.15	0.15	0.15	0.03
typ	0.05	1.2	0.5	0.01	0.01	0.1	0.08	0.10	0.05	0.04	0.04	0.01	0.005

All-weld mechanical properties

Typical values as welded			min	typical
Tensile strength		MPa	480	620
0.2% Proof stress		MPa	400	550
Elongation on 4d		%	22	23
Impact energy	- 30°C	J	27	30*
Hardness cap/mid		HV	--	220/240

* Single values may be lower, particularly after PWHT.

Packaging data

ø mm	TIG
1.2	5kg tube
1.6	5kg tube
2.4	5kg tube
3.2	5kg tube

ER70S-3

Mild steel TIG wire

Product description

Solid copper coated wire for TIG. This is a higher carbon double deoxidised wire with Mn and Si which produces reliable impact properties.

Specifications

AWS A5.18	ER70S-3
BS EN ISO 636-A	(W2Si)
BS 2901: Pt1	(A17)
DIN 8559	(WSG1)

ASME IX Qualification

QW432 F-No 6, **QW442** A-No 1

Composition (wire wt %)

	C	Mn	Si	S	P	Cu	Ni	Cr	Mo	V
min	0.06	0.90	0.45	--	--	--	--	--	--	--
max	0.15	1.40	0.70	0.025	0.025	0.4	0.15	0.15	0.15	0.03
typ	0.1	1.1	0.6	0.01	0.01	0.1	0.04	0.04	0.01	0.005

All-weld mechanical properties

Typical values as welded			min	typ
Tensile strength		MPa	480	540
0.2% Proof stress		MPa	400	460
Elongation on 4d		%	22	34
Impact energy	- 30°C	J	27	180
Hardness cap/mid		HV	--	170/200

Packaging data

ø mm	TIG
1.6	to order
2.4	to order

ER70S-6

Mild steel TIG wire

Product description	Solid copper coated wire for TIG. This is a good general purpose filler wire, double deoxidised with higher levels of Mn and Si, providing reliable impact properties.
Specifications	**AWS A5.18** ER70S-6 **BS EN ISO 636-A** (W3Si1) **BS 2901: Pt1** A18 **DIN 8559** (WSG2)
ASME IX Qualification	**QW432** F-No 6, **QW442** A-No 1

Composition (wire wt %)

	C	Mn	Si	S	P	Cu	Ni	Cr	Mo	V
min	0.06	1.40	0.80	--	--	--	--	--	--	--
max	0.12	1.60	1.15	0.025	0.035	0.4	0.15	0.15	0.15	0.03
typ	0.08	1.5	0.85	0.015	0.01	0.15	0.04	0.04	0.01	0.005

All-weld mechanical properties

Typical values as welded			min	typ
Tensile strength		MPa	480	575
0.2% Proof stress		MPa	400	445
Elongation on 4d		%	22	34
Impact energy	- 30°C	J	27	180
Hardness cap/mid		HV	--	175/220

Packaging data

ø mm	TIG
1.6	5kg tube
2.4	5kg tube
3.2	5kg tube

METCORE DWA 50

All-positional CMn rutile flux cored wire

Product description

Flux cored wire with a rutile flux system for spray transfer at low currents and easy operation in all welding positions, including positional pipework. The wire is designed for standard mild and CMn steels. Suitable for single-sided welds on ceramic backing systems. Low moisture potential giving weld metal hydrogen content of typically < 5ml/100g.

Metal recovery 90% with respect to wire.

Specifications

AWS A5.20	E71T-1M
BS EN ISO 17632-A	T 422 PM1 H5
BS EN ISO 17632-B	T492T1-1MA-H5
BS 7084	T521 GPH

ASME IX Qualification

QW432 F-No 6, **QW442** A-No 1

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	V
min	--	--	--	--	--	--	--	--	--
max	0.08	1.75	0.90	0.03	0.04	0.20	0.50	0.30	0.08
typ	0.05	1.2	0.5	0.01	0.01	< 0.1	0.1	0.1	0.02

All-weld mechanical properties

As welded (PWHT with caution)			min *	typical as-welded	typical 600°C/4h
Tensile strength		MPa	510-650	580	575
0.2% Proof stress		MPa	420	510	485
Elongation on 4d		%	22	29	32
Elongation on 5d		%	18	25	30
Reduction of area		%	--	70	--
Impact energy	0°C	J	--	150	140
	- 20°C	J	27	90	45
Hardness		HV	--	200	--

* As specified by AWS A5.20 E71T-1M as-welded. Since toughness may be reduced by PWHT, batch testing (to order) is advised to confirm specific requirements.

Operating parameters

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

Current: DC+ve ranges as below:

ø mm	amp-volt range	typical	stickout
1.2	130-300A, 16-32V	232A, 26V	15-25mm

Packaging data

Spools supplied in 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	Cr	Ni	Cu	F	OES (mg/m^3)
36	10	<0.1	<0.1	<0.5	2	5