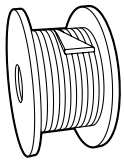
ZAPP PRECISION WIRE
ALLOY 25-6MO (UNS NO8926)

QUALITY SYSTEM CERTIFIED TO ISO 9001



ALLOY 25-6MO (UNS NO8926) WIRE FOR:

_ Armoring applications on electromechanical cables
_ Wirelines for down hole service applications
_ Shaping/shaped wire for down hole well screens

CHARACTERISTICS

Alloy 25-6MO (UNS NO8926) is a “super austenitic” stainless steel offering excellent corrosion resistance in a wide variety of aggressive, aqueous environments. It contains about 6% molybdenum which along with higher levels of chromium and nickel, readily enables it to replace the conventional austenitic steels such as Type 316 and Type 317. It also represents a cost-effective alternative to the higher nickel alloys in some marine, petroleum, and chemical processing environments.

The alloy offers excellent resistance to pitting and crevice corrosion. Performance in these areas is often measured using Critical Pitting Temperatures (CPT), Critical Crevice Temperatures (CCT), and Pitting Resistance Equivalent Numbers (PREN). Data* is available to show superior values for alloy 25-6MO compared to AISI 316, AISI 317, alloy 904L, and alloy 2205.
ASTM Standard Test Methods G 48 is also referenced. It covers the procedures for the determination of the resistance of various alloys to pitting and crevice corrosion.

FOR COMPARISON PURPOSES, PREN AND CPT NUMBERS ARE PRESENTED FOR THESE ALLOYS:

PREN AND CPT NUMBERS*

Alloy	PREN	CPT (°F)	CPT (°C)
316	26	72	22
alloy 2205	36	108	42
XM19	38	106	41
alloy 28	40	129	54
25-6MO	47	149	65
27-7MO	56	176	80
MP35N®	53	183	84

*PREN = Cr + 3.3 Mo + 30N

CPT (°C) = 2.5 Cr + 7.6 Mo + 31.9 N – 41

* Reference: Inco Alloys International publication number IAI-43-3, (INCO alloy 25-6MO) dated 1994.

LIMITING CHEMICAL COMPOSITION OF ALLOY 25-6MO

Ni	Cr	Mo	Cu	N	C	Mn	Fe
24.00 - 26.00	19.00 – 21.00	6.0 – 7.0	0.5 – 1.5	0.15 – 0.25	0.020 max	2.00 max	remainder

The chemical balance (and especially the 25% nickel and the 0.20% nitrogen contents) provides significantly better resistance to chloride-ion stress corrosion cracking than lower nickel alloys such as AISI 317 stainless steel. This is illustrated quite well by the Copson U-Curve in the INCO publication IAI-46-3.*

PHYSICAL PROPERTIES OF ALLOY 25-6MO AT ROOM TEMPERATURE ARE AS FOLLOWS

Density	0.290 [lb/in^3]
Melting range	2,410 – 2,550 [°F]
Specific heat	0.12 [Btu/lb • °F]
Electrical resistivity	480 [ohm • circ mil/ft]
Permeability at 200 oersted	1.005

Alloy 25-6MO is also identified as UNS N08926. Wire products are covered by ASTM B649. A number of other commercially available alloy designations are related to alloy 25-6MO through the UNS N08926 designation or through published chemistry ranges. These alternate designations or trademarks include:

_ INCO® alloy 25-6MO
(trademark of Inco Alloys International)
_ GD31MO (trademark of Greening Donald)
_ SUPA 75 (trademark of Bridon)
_ Cronifer® 1925hMo (trademark of Krupp VDM)
_ AL6XN (trademark of Allegheny Ludlum Corporation)
_ Phy 4529
(trademark of Metalimphy Alloys Corporation)

Through the connecting UNS NO8926 alloy designation, 25-6MO, SUPA 75, and GD31MO describe the same alloy and therefore have equivalent chemistries. Material produced to the UNS NO8926 chemistry ranges and manufactured into armor wire or wirelines by Zapp Precision Wire will provide an excellent quality product. Zapp Precision Wire technology, quality, and superior wire drawing capabilities will make the difference for these critical applications.

The Zapp Precision Wire quality system is registered to ISO 9001:2000. For additional information on this or any other Zapp Precision Wire product, please contact the Customer Service Department at 843-851-0700 or fax your inquiry to 843-851-0100, or e-mail the inquiry to sales@zapp.com.

The alloy 25-6MO wire produces higher mechanical properties than AISI 316L. Tensile strengths in the order of 210/250,000 psi are achieved through cold drawing. At these strength levels, the wire is ductile and able to successfully pass the wrap test in the as drawn condition as well as the as drawn plus exposed to temperatures as high as 400°F conditions. This wrap or bend test shows no surface cracking or failure.

ZAPP TECHNICAL DATA

ALLOY CHEMISTRY

Alloy	UNS	C	Mn	Cr	Ni	Mo	Cu	N	Co	Ti
316	S31600	.08	2.0	16.0 – 18.0	10.0 – 14.0	2.0 – 3.0.	-	-	-	-
XM19	S20910	.06	4.0 - 6.0	20.5 – 23.5	11.5 – 13.5	1.5 – 3.0	-	.20 - .40	-	-
25-6MO	NO8926	.02	2.0	19.0 – 21.0	24.0 - 26.0	6.0 – 7.0	.5 – 1.5	.15 - .25	-	-
27-7 MO	S31277	.02	3.0	20.5 – 23.0	26.0 – 28.0	6.6 – 8.0	.5 – 1.5	.30 - .40	-	-
MP35N®	R30035	.02	0.1	19.0 – 21.0	33.0 – 37.0	9.0 – 10.5	-	-	BAL	1.0

(Maximum values unless range specified)

ARMOR WIRE TYPICAL TENSILE STRENGTH RANGES (KSI)

Size	316	XM19	25-6MO	27-7MO	MP35N®
.010" - .029"	230/260	250/280	245/275	250/280	270/300
.030" - .049"	225/260	245/280	240/275	245/280	265/300

WIRELINE MINIMUM BREAK STRENGTH**

Size	316	XM19	25-6MO	27-7MO	MP35N®
.082"	1100#	1190#	1175#	1200#	1225#
.092"	1400#	1500#	1475#	1510#	1520#
.108"	1880#	2065#	2050#	2075#	2090#
.125"	2500#	2740#	2650#	2750#	2770#
.140"	3140#	3430#	3250#	3460#	3470#
.150"	3620#	3950#	3750#	3960#	3970#
.160"	4100#	4500#	4250#	4510#	4520#

(** The recommended **safe working load** is 60% of minimum break strength)

DENSITY/CORROSION

Alloy	Density (lb/in³)	Corrosion (PREN)	CPT (°F)	CPT (°C)
316	.287	26	72	22
XM19	.285	38	106	41
25-6MO	.290	47	149	65
27-7MO	.289	56	176	80
MP35N®	.309	53	183	84

PREN = Cr + 3.3 Mo + 30N

EXAMPLES OF THEORETICAL ACCEPTABLE WELL ENVIRONMENTS FOR 25-6MO WIRE*

Chlorides	Temp °F	H2S	CO2	Pressure (PSI)	Req. Minimum Pitting Index (PI)	25-6MO (PI)	25-6MO (PREN)
18,000 ppm	300	<1 %	1 %	5,000	31.50	43.65	47
100,000 ppm	300	<1 %	10 %	9,000	31.50	43.65	47
100,000 ppm	158	6%	82 %	3,674	40.00	43.65 **	47
100,000 ppm	325	15 %	3 %	3,100	43.00	43.65 **	47
200,000 ppm	405	225ppm	18%	12,000	35.00	43.65	47
20,000 ppm	425	20ppm	10 %	15,000	35.00	43.65	47

** Marginally acceptable

* The theoretical acceptable well environments are based in the SOCRATES software. SOCRATES is a comprehensive material selection tool for oil and gas applications that selects corrosion resistant alloys (CRA) through material evaluation based on mechanical strength parameters, heat treatment/cold work and hardness limitations. The program also evaluates the characterization of the environment in terms of operating pressure, temperature, pH, H2S, chlorides, elemental sulfur, aeration, gas to oil ratio and water to gas ratio water cut. Stress corrosion cracking, hydrogen embrittlement cracking, sulfide stress cracking and resistance to pitting corrosion are also evaluated. The examples above are based on the environment listed and do not take into consideration the actual values of elemental sulfur, aeration, gas to oil ratio and water to gas ratio water cut.

PI= Cr + 3.3Mo + 11N + 1.5(W+Nb)

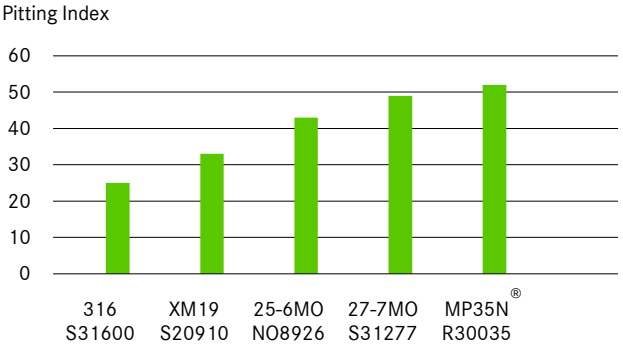
PREN = Cr + 3.3Mo + 30N

NOTE: The information contained in the following summary report does not represent a commitment by Honeywell InterCorr International or Zapp Precision Wire, Inc. The information contained in this document and the Socrates software is purely advisory in nature. In no event shall Honeywell InterCorr, Zapp Precision Wire, Inc., or their employees or agents have liability for damages, including but not limited to, consequential damages arising out of or in connection with any person's use or inability to use the information in this document.

NOMINAL CHEMICAL COMPOSITION COMPARISON

Chemical Element	UNS S31600 316	UNS S20910 XM19	UNS NO8926 25-6MO	UNS S31277 27-7MO	UNS R30035 MP35N®
Fe	65.40	56.40	46.30	39.65	1.00
Mn	2.00	5.00	2.00	3.00	0.15
Ni	12.00	12.50	25.00	27.00	35.00
Co	*	*	*	*	32.90
Cr	17.00	22.00	20.00	21.75	20.00
Mo	2.50	2.25	6.50	7.25	9.75
W	*	*	*	*	*
Cb	*	0.20	*	*	*
N	*	0.30	0.20	0.35	*
*Trace					
PI	25.25	33.03	43.65	49.53	52.18

MATERIAL SELECTION OVERVIEW



ZAPP PRECISION WIRE
WIRE I BAR I PROFILE I FLAT WIRE
Zapp Precision Wire, Inc.
475 International Circle
Summerville, South Carolina 29483
U.S.A.
Phone 1 843 851-0700
Fax 1 843 851-0010
Toll-free 1 888-777-3962
Precisionwire-usa@zapp.com
www.zapp.com

Further information regarding our products and locations are available in our image brochure and under www.zapp.com

Last revision: September 2009