

Ulbrich Stainless Steels & Special Metals, Inc.
Safety Data Sheet (SDS) 001

SECTION 1: IDENTIFICATION

Product Identifier: High Performance, Stainless Steel and Related Alloys, designated as follows:

Stainless Steel and Related Alloys: 201; 254 SMO; 301; 301 AL; 301Si; 302; 303; 303 SE; 304; 304 L; 304 LV; 304 V; 3049; 305; 30512; 308; 309; 309 S; 309 SCB; 310; 310 S; 316; 316 L; 316 LN; 316 Ti; 317; 317 L; 321; 330; 347; 384; 405; 409; 410; 410 S; 414; 416; 416 SE; 420; 420 A; 420 HC; 420 LC; 420 MO; 430; 430Li; 434; 436; 439; 440 A; 440 C; 441; 442; 444; 446; 18 SR¹; Carpenter 20 CB3²; Carpenter 455²; Custom 450; 18-9LW¹; 19-90L⁴; Greek Ascology; AL-6XN⁴; 904L; Duplex 2205; Duplex 2304; Duplex 2507
High Manganese Alloys: Nitronic 32¹; Nitronic 33¹; Nitronic 40 (21-6-9)¹; Nitronic 50¹; Nitronic 60¹.
Precipitation Hardening and High Iron Alloys: A 286⁴; AM-350⁴; 17-4PH¹; 17-7PH¹; PH 15-7MO¹.
Electronic Alloys: Ulbravar 29-17 (Alloy 2917); Ulbraseal 36 (Alloy 36); Ulbraseal 42 (Alloy 42) Ulbraseal 46 (Alloy 46); Ulbraseal 52.
Nickel, Nickel Based & Nickel-Iron-Chromium Alloys: 80Ni-20 Cr; Ni 200; Ni 201; Ni 233; Ni 270; Hastelloy B3⁵; Hastelloy B2⁵; Hastelloy C-4⁵; Hastelloy C276⁵; Hastelloy C22⁵; Hastelloy G-3⁵; Hastelloy G-30⁵; Hastelloy X⁵; Haynes 214⁵; Haynes 230⁵; Haynes 242⁵; Haynes 282⁵; HR 120⁵; Waspaloy⁶; Nimonic 75³; Monel 400³; Monel 401³; Monel R405³; Monel K500³; Inconel 600³; Inconel 601³; Inconel 617³; Inconel 625³; Inconel 702³; Inconel 718³; Inconel 722³; Inconel X-750³; Incoloy 800³; Incoloy 801³; Incoloy 825³; Ni-Span-C 902³
Cobalt Based Superalloys and Related Alloys: L-605 (Haynes 25)⁵; Haynes 188⁵; N 155; ULMET

Product Form: Metal Alloy/Mixture

Intended Use of the Product: Solid stainless steel and related products, various uses

Supplier's Details: Ulbrich Stainless Steels & Special Metals, Inc.

153 Washington Avenue, P.O. Box 294,
 North Haven, CT USA, 06473-1191
 Phone Number (203) 239-4481 • (800) 243-1676
 SDS Technical Contact Weekdays (203) 265-8299
 FAX: (203) 239-7479 • E-Mail: information@ulbrich.com
 Emergency Telephone Number (203) 239-4481; Chemtrec 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

Classification (GHS-US): Most products covered by this SDS are articles and, as such, are not considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1910.1200). Materials resulting from machining these products may be considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR

Acute toxicity - Oral	Category 4
Respiratory sensitization	Category 1B
Skin sensitization	Category 1
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (repeated exposure)	Category 1

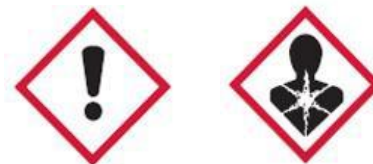
Label Elements:

Emergency Overview

Signal Word: Danger

Hazard statements:

Harmful if swallowed
 May cause allergy or asthma symptoms or breathing difficulties if inhaled
 May cause an allergic skin reaction
 May cause cancer
 Causes damage to the respiratory tract prolonged or repeated exposure if inhaled.
 Suspected of damaging fertility or the unborn child
 Causes eye irritation.



Appearance Various massive product

Physical state Solid

Odor Odorless

Precautionary Statements - Prevention

Do not breathe dusts / fume / gas / mist / vapor / spray.
 Do not handle until all safety precautions have been read and understood
 Wear protective gloves / protective clothing / eye protection / face protection.
 Use personal protective equipment as required
 Contaminated work clothing must not be allowed out of the workplace.
 Take off and wash contaminated clothing before reuse.

Precautionary Statements - Response

If exposed, concerned, experiencing respiratory symptoms, or feel unwell: Get medical advice/attention.
 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
 If on skin: Wash with plenty of water.
 If skin irritation occurs: Get medical advice/attention

STORAGE

DISPOSAL

Store away from acids and incompatible materials. Store locked up
 Store in accordance with federal/state and local regulations.

Metal scrap should be recycled whenever possible
 Dispose of in accordance with federal/state or local regulations.

Hazards not otherwise classified: None Known, No data available
Unknown acute toxicity statement (mixture): None Known, No data available

SECTION 3: COMPOSITION/ INFORMATION ON INGREDIENTS

STAINLESS STEEL ALLOYS

ALLOY	UNS No.	CONSTITUTENT(S) % Maximum unless otherwise shown.												
		C	Mn	Si	Cr	Ni	Mo	Fe	Cb + Ta	Ti	P	Cu	Other	Other
201	S0100	0.15	5.5/7.5	1.0	16.0/18.0	3.5/5.5		BAL						
254 SMO	S31254	0.02	1.0	0.8	19.5/20.5	17.5/18.5	6.0/6.5	BAL			0.03	0.5/1.0		S 0.01
301	830100	0.15	2.0	1.0	16.0/18.0	6.0/8.0		BAL			0.45			S 0.03
301 AL	830100	0.15	2.0	1.0	16.0/18.0	6.0/8.0		BAL						
301Si	S30116	0.15	2.0	1.3	16.0/18.0	6.0/8.0	0.75	BAL			0.04	0.75		S 0.03
302	S30200	0.15	2.0	1.0	17.0/19.0	7.0/10.0	0.75	BAL			0.04			S 0.03
302 HQ	S30430	0.08	2.0	1.0	17.0/19.0	8.0/10.0		BAL			0.045	3.0-4.0		S 0.03
303	S30300	0.15	2.0	1.0	17.0/19.0	8.0/10.0		BAL			0.02			S 0.15
303 SE	S30323	0.15	2.0	1.0	17.0/19.0	8.0/10.0		BAL			0.17		Se 0.15/0.35	
304	S30400	0.08	2.0	1.0	18.0/20.0	8.0/10.5		BAL						
304 L	S30403	0.03	2.0	1.0	18.0/20.0	8.0/12.0		BAL						
304 LV		0.03	2.0	1.0	18.0/20.0	8.0/10.5		BAL						
304 V		0.08	2.0	1.0	18.0/20.0	8.0/9.5		BAL			0.04			
3049		0.10	2.0	0.75	18.0/20.0	9.0/10.5		BAL			0.045			
305	S30500	0.12	2.0	1.0	17.0/19.0	10.5/13.0		BAL						
30512		0.12	2.0	1.0	17.0/19.0	12.0/13.0	0.75	BAL			0.04	0.75		
308	S30800	0.08	2.0	1.0	19.0/21.0	10.0/12.0		BAL						
309	S30900	0.20	2.0	1.0	22.0/24.0	12.0/15.0		BAL						
309 S	S30908	0.08	2.0	1.0	22.0/24.0	12.0/15.0		BAL						
309 SCB		0.08	2.0	0.75	22.0/24.0	12.0/16.0		BAL	10XC/1.1 max		0.75			
310	S31000	0.25	2.0	1.5	24.0/26.0	19.0/22.0		BAL			0.045			S 0.2
310 S	S31008	0.08	2.0	1.5	24.0/26.0	19.0/22.0		BAL						
316	S31600	0.08	2.0	1.0	16.0/18.0	10.0/14.0	2.0/3.0	BAL						
316 L	S31603	0.03	2.0	1.0	16.0/18.0	10.0/14.0	2.0/3.0	BAL						
316 LN		0.02	2.0	0.75	16.0/18.0	10.0/14.0	2.0/3.0	BAL						
316 Ti	S31635	0.08	2.0	1.0	16.0/18.0	10.0/14.0	2.0/3.0	BAL		0.07	0.045	0.075		S 0.03
317	S31700	0.08	2.0	1.0	18.0/20.0	11.0/15.0	3.0/4.0	BAL						
317 L	S31703	0.03	2.0	1.0	18.0/20.0	11.0/15.0	3.0/4.0	BAL						
321	S32100	0.08	2.0	1.0	17.0/19.0	9.0/12.0		BAL		5XC/0.7max				
330	N08330	0.08	2.0	0.75/1.5	17.0/20.0	34.0/37.0		BAL						
347	S34700	0.08	2.0	1.0	17.0/19.0	9.0/13.0		BAL	10XC min					
384	S38400	0.08	2.0	1.0	15.0/17.0	17.0/19.0		BAL						
405	S40500	0.08	1.0	1.0	11.5/14.5	0.5		BAL			0.04		Al 0.10/0.30	
409	S40900	0.08	1.0	1.0	10.5/11.75			BAL		6XCmin/0.75				
410	S41000	0.15	1.0	1.0	11.5/13.5			BAL						
410 S	S41008	0.08	1.0	1.0	11.5/14.5	0.6		BAL		0.2	0.04			S 0.03
414	S41400	0.15	1.0	1.0	11.5/13.5	1.25/2.5		BAL						
416	S41600	0.15	1.25	1.0	12.0/14.0			BAL						S 0.15 min
416 SE	S41623	0.15	1.25	1.0	12.0/14.0			BAL		0.15 min				
420	S42000	0.15 min	1.0	1.0	12.0/14.0	0.5	0.5	BAL						
420 A		0.25	1.0	1.0	12.0/14.0	1.0		BAL			0.04			S 0.03
420 HC		0.15	1.0	1.0	12.0/14.0	0.5		BAL			0.04			S 0.03
420 LC	S42000	0.27	1.0	1.0	12.0/14.0	0.5	0.5	BAL			0.04	0.5	Al 0.15	S 0.03
420 MO		0.30/0.40	1.0	1.0	12.0/14.0	0.5	0.5/1.75	BAL		0.05	0.04	0.5		S 0.03
430	S4300	0.12	1.0	1.0	16.0/18.0			BAL		0.5			Al 0.15	
430Li	S43000	0.022	1.0	1.0	16.0/18.0	0.5	0.5	BAL			0.04	0.5		S 0.03
434	S43400	0.12	1.0	1.0	16.0/18.0		0.75/1.25	BAL		0.5	0.04			S 0.03
436	S43600	0.12	1.0	1.0	16.0/18.0		0.75/1.25	BAL	5XC/0.80 max		0.04			S 0.03
439	S43035	0.04	1.0	0.6	17.0/18.0	0.5		BAL		0.2/0.6				
440 A	A44002	0.60/0.75	1.0	1.0	16.0/18.0		0.75	BAL						
440 C	S44004	0.95/1.2	1.0	1.0	16.0/18.0		0.75	BAL			0.04			
441	S44100	0.03	1.0	1.0	17.5/19.0	1.0		BAL	9XC+3/1.0 max	0.1/0.6	0.04			S 0.02
442	S44200	0.20	1.0	1.0	18.0/23.0			BAL						
444		0.025	1.0	1.0	17.5/19.5	1.0	1.75/2.5	BAL	0.8		0.04			
446	S44600	0.20	1.50	1.0	23.0/27.0			BAL						
A 286 ⁴	K66286	0.08	2.0	1.0	13.5/16.0	24.0/27.0	1.0/1.75	BAL		1.9/2.3	0.04		Al 0.35	V 0.5 S 0.035
AM-350 ⁴	S35000	0.07/0.11	0.5/1.25	0.50	16.0/17.0	4.0/5.0	2.5/3.25	BAL			0.04			S 0.03
PH 15-7 MO ¹	S15700	0.09	1.0	1.0	14.0/16.0	6.5/7.75	2.0/3.0	BAL			0.04		Al 0.75/1.5	S 0.03
17-4 PH ¹	S17400	0.07	1.0	1.0	15.0/17.5	3.0/5.0		BAL	0.3		0.04	3.0/5.0	Al 0.75/1.5	S 0.03
17-7 PH ¹	S17700	.09	1.0	1.0	16.0/18.0	6.5/7.75		BAL			0.04		Al 0.75/1.5	S 0.03
18 SR ¹	N/L	0.02	0.50	1.0	17.0/19.0	0.50		BAL		3.0/6.0			Al 1.0/2.0	
18-9LW ¹	N/L	0.10	2.0	1.0	17.0/19.0	8.0/10.0	0.5	BAL	0.5	1.4		3.0/4.0		
19-90L ⁴	K63198	0.28/0.35	0.75/1.5	0.3/0.8	18.0/21.0	8.0/11.0	1.0/1.75	BAL	0.25/0.60	0.1/0.35	0.04	0.50	W 1.0/1.75	
CARPENTER 20 CB3 ²	N08020	0.06	2.0	1.0	19.0/21.0	32.5/35.0	2.0/3.0	BAL	8XC/1.0 max		0.035	3.0/4.0		
CARPENTER 455 ²		0.10	1.0	1.0	11.5	8.0/9.0	0.50	BAL		1.0/2.0		2.0/3.0		
CUSTOM 450	S45000	0.05	1.0	1.0	14/16	5/7	0.5/1	75			0.03	1.25/1.75		S 0.03
GREEK ASCOLOGY	F41800	0.15/0.2	0.50	0.50	12.0/14.0	2.0	0.50	BAL			0.03		W 2.5/3.5	S 0.01 V 2.2
AL-6XN ⁴	N08367	0.03	2.0	1.0	20.0/22.0	23.5/25.5	6.0/7.0	BAL				0.75		
904L	N08904	0.02	2.0	1.0	23.0	28.0	5.0				0.045	2.0		S 0.035
DUPLEX 2205	S2205	0.03	2.0	1.0	22.0/23.0	4.5/6.5	3.0/3.5	BAL			0.03			S 0.02
DUPLEX 2304	S2304	0.03	2.5	1.0	21.5/24.5	3.0/5.5	0.05/0.6	BAL			0.04	0.05/0.6		S 0.04
DUPLEX 2507	S32750	0.03	1.2	0.8	24.0/26.0	6.0/8.0	3.0/5.0	BAL			0.035	0.50		S 0.02
CAS Number		7440-44-0	7439-96-5	7440-21-3	7440-47-3	7440-02-0	7439-98-7	7439-89-6	Ta 7440-03-1 Cb 7440-25-7	7440-32-6	7723-14-0	7440-50-8	Se 7782-49-2 Al 7429-90-5 W 7440-33-7	S 7446-09-5 Co 7440-48-4 V 7440-62-2

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

HIGH MANGANESE ALLOYS

ALLOY	UNS No.	CONSTITUTENT(S) % Maximum unless otherwise shown.												
		C	Mn	Si	Cr	Ni	Mo	Fe	Cb + Ta	Ti	P	N	Al	V
NITRONIC 32 ¹	S24100	10	12.0	5	18.0	1.6		BAL				0.35		
NITRONIC 33 ¹	S24000	0.06	13.0	0.5	18.0	3.0		BAL				0.30		
NITRONIC 40 ¹	S21904	0.08	8.0/10.0	1.0	18.0/20.0	5.0/7.0		BAL				0.15/0.40		
NITRONIC 50 ¹	S20910	0.06	4.0/6.0	10	20.5/23.5	11.5/13.5	1.5/3.0	BAL	0.1/0.3			0.2/0.4		0.1/0.3
NITRONIC 60 ¹	S21800	0.10	7.0/9.0	3.5/4.5	16.0/18.0	8.0/9.0	0.75	BAL	0.1	0.05	0.04		0.35	0.1/0.5
CAS Number		7440-44-0	7439-96-5	7440-21-3	7440-47-3	7440-02-0	7439-98-7	7439-89-6	Ta 7440-03-1 Cb 7440-25-7	7440-32-6	7723-14-0	7727-37-9	7429-90-5	7440-62-2

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

ELECTRONIC ALLOYS

ALLOY	UNS No.	CONSTITUENT(S) % Maximum unless otherwise													
		C	Mn	Si	Cr	Ni	Co	Cu	Fe	Al	Mo	Ti	Mg	Zr	Other
ULBRASEAL36	K93601	0.03	0.30	0.20	0.10	36.0	0.05	0.15	BAL	0.01					
ULBRASEAL42	K94100	0.05	0.80	0.30	0.25	41.0			BAL	0.10					
ULBRASEAL46		0.05	0.80	0.30	0.25	46.0			BAL	0.10					
ULBRASEAL52	K95050	0.05	0.60	0.30	0.25	50.5			BAL	0.10					
ULBRAVAR29-17	K94610	0.04	0.50	0.20	0.20	29.0	17.0	0.20	BAL	0.10	0.20	0.10	0.10	0.10	
CAS Number		7440-44-0	7439-96-5	740-21-3	7440-47-3	7440-02-0	7440-48-4	7440-50-8	7439-89-6	7429-90-5	7439-98-7	7440-32-6	1309-48-4	7440-67-7	

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

NICKEL, NICKEL BASED, NICKEL-IRON-CHROMIUM AND COPPER NICKEL ALLOYS

ALLOY	UNS No.	CONSTITUTENT(S) % Maximum unless otherwise shown														
		C	Mn	Fe	Si	Cu	Cr	Al	Ti	Ni	Mo	Cb + Ta	Co	W	Other	Other
80Ni-20Cr	N/L	0.15	2.5	1.0	0.75/1.60		19.0/21.0			BAL						
CN 715	C71500	0.05	1.0	1.0		BAL				33			1.0			Zn 1.0
Ni 200	N0220	0.08	0.18	0.2	0.15	0.13				BAL						S 0.005
Ni 201	N02201	0.01	0.18	0.2	0.18	0.13				BAL						S 0.005
Ni 233	N/L	0.10	0.30	0.10	0.10	0.10			0.005	BAL						S 0.008
Ni 270	N02270	0.01	0.001	0.003	0.001	0.001	0.001		0.001	BAL						S 0.001
INCONEL 600 ³	N06600	0.08	0.5	8.0	0.25	0.25	15.5			BAL						
INCONEL 601 ³	N06601	0.05	0.5	14.1	0.25	0.50	23.0	1.35		BAL						
INCONEL 617 ³	N06617	0.07	0.5	1.5	0.5	0.20	22.0	1.20	0.3	52.0	9.0		1.25			
INCONEL 625 ³	N06625	0.05	0.25	2.5	0.25		21.5	0.2	0.2	BAL	9.0	3.65				
INCONEL 702 ³	N/L	0.05	0.5	1.0	0.35	0.25	15.5	3.25	0.63	BAL						
INCONEL 718 ³	N07718	0.08	0.35	BAL	0.35	0.30	17.0/21.0	0.2/0.8	0.65/1.15	50/55	2.8/3.3	4.75/5.5	1.0			
INCONEL 722 ³	N/L	0.08	1.0	5.0/9.0	0.70	0.50	14.0/17.0	0.4/1.0	2.0/2.75	BAL			1.0			
INCONEL X-750 ³	N07750	0.08	0.35	5.0/9.0	0.35	0.50	14.0/17.0	0.4/1.0	2.25/2.75	BAL		7/1.2	1.0			
INCOLOY 800 ³	N08800	0.10	0.75	39/46	0.50	0.38	19/23	0.15/0.6	0.15/0.6	30/35						
INCOLOY 801 ³	N08801	0.05	1.0	44/48	0.5	0.25	19/22		1.1	BAL		0.2	1.0		Zr 0.01	V 0.2
INCOLY 825 ³	N08825	0.05	0.10	22/30	0.5	1.5/3.0	19.5/23.5	0.2	0.6/1.2	38/46	2.5/3.5	0.5				
NI-SPAN-C 902 ³	N09902	0.06	80	BAL	1.0		4.9/5.75	0.3/0.8	2.2/2.75	BAL			2.5	3.0/4.5		V 0.35
HASTELLOY B2 ⁵	N10665	0.02	1.0	2.0	0.10	0.5	1.0			BAL	26.0/30.0		1.0	0.5		
HASTELLOY B3 ⁵	N10675	0.02	3.0	1.5	0.10	0.2	1.0/3.0		0.20	BAL	27.0/32.0	0.2	1.0	3.0	Zr 0.01	V 0.2
HASTELLOY C-4	N06455	0.01	1.0	3.0	0.08		14.0/18.0			BAL	14.0/17.0		3.0		P 0.025	S 0.010
HASTELLOY C276 ⁵	N10276	0.01	1.0	4.0/7.0	0.08		14.5/16.5			BAL	15.0/17.0		2.5	3.0/4.5		V 0.35
HASTELLOY C22 ⁵	W86022	0.015	0.50	2.0/6.0	0.08		20.0/22.5			BAL	12.5/14.5		2.5	2.5/3.5		V 0.35
HASTELLOY G3 ⁵	N06985	0.015		18/21	1.0	2.5	21/23.5			BAL	6.0/8.0	0.5	5.0	W 1.5	P 0.04	S 0.03
HASTELLOY G30 ⁵	N06030	0.03	1.5	13.0/17.0	0.80	1.0/2.4	28.0/31.5			BAL	4.0/6.0	0.3/1.5	5.0	1.5/4.0		
HASTELLOY X ⁵	N06002	0.05/0.15	1.0	17.0/20.0	1.0	0.50	20.5/23.0	0.50	0.15	BAL	8.0/10.0		0.5/10.0	17.0/20.0		
HAYNES 214 ⁵	N/L	0.15	0.2	2.0/6.0	0.10		15.0/17.0	4.0/5.0	0.10	BAL	0.10		0.10	0.10		
HAYNES 230 ⁵	N/L	0.05/0.15	1.0	17.0/20.0	1.0		20.5/23.0			BAL	8.0/10.0		0.5/2.5	0.2/1.0		
HAYNES 242 ⁵	N10242	0.03	0.8	2.0	0.4	0.5	7/9	0.5		BAL	24.0/26.0		1.0			
HAYNES 282 ⁵	N07718	0.06	0.3	1.5	0.15		19.0/21.0	1.0/2.0	3.0	BAL	8.0/9.0		9.0/11.0	0.50		
HR 120	N08120	0.05	0.75	30/35	0.6		25	0.1		BAL	2.5	0.7	3	2.5		
WASPALLOY ⁶	N07001	0.02/0.10	0.1	2.0	0.15	0.10	18.0/21.0	1.2/3.0	2.75/4.0	BAL	3.5/5.0		12.0/15.0		Zr .02/.08	
NIMONIC 75 ³	N06075	0.12	1.0	3.0	1.0	0.25	19.0/21.0			BAL						
MONEL 400 ³	N04400	0.30	2.0	2.5	0.5	28/34				BAL						S 0.024
MONEL 401 ³	N04400	0.10	2.25	0.75	0.25	BAL				40/45						S 0.015
MONEL R405 ³	N04405	0.15	1.0	1.25	0.25	31.5				BAL						S0.043
MONEL K500 ³	N05500	0.13	0.75	1.0	0.25	29.5		2.73	0.60	BAL						S 0.005
CAS Number		7440-44-0	7439-96-5	7439-89-6	7440-21-3	7440-50-8	7440-47-3	7429-90-5	7440-32-6	7440-02-0	7439-98-7	Ta 7440-03-1 Cb 7440-25-7	7440-48-4	7440-33-7	Zr 7440-67-7 P 7723-14-0 Mg 7439-95-4	V 7440-62-2 S 7446-09-5 Zn 7440-66-6

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

COBALT BASED SUPERALLOYS AND RELATED ALLOYS

ALLOY	UNS No.	CONSTITUTENT(S) % Maximum unless otherwise shown.														
		C	Mn	P	S	Si	Cr	Ni	Co	Fe	W	La	Cu	Mo	Cb + Ta	Other
L-605 HAYNES 25 ⁵	R30605	0.05/0.15	1.0/2.0	0.04	0.03	0.40	19.0/21.0	9.0/11.0	BAL	3.0	14.0/16.0					
HAYNES 188 ⁵	R30188	0.05/0.15	1.25	0.02	0.015	0.2/0.5	20.0/24.0	20.0/24.0	BAL	3.0	13.0/16.0	0.02/0.12				
MP35N	R30035	0.02	0.15	0.015	0.01	0.15	19.0/21.0	33.0/37.0	BAL	1.0				9.0/10.5	Ti 1.0	
N-155	R30155	0.08/0.16	1.0/2.0	0.04	0.04	1.0	20.0/22.5	19.0/21.0	18.5/21.0	BAL	2.0/3.0		0.50	2.5/3.5	0.75/1.25	N 0.10/0.20
ULMET	231233	0.06	0.08			0.3	26	9	BAL	3.0	2			5		
CAS Number		7440-440	7439-96-5	7723-14-0	7704-34-9	7440-21-3	7440-47-3	7440-02-0	7440-48-4	7439-89-6	7440-33-7	7439-91-0	7440-50-8	7439-98-7	Cb 7440-25-7 Ta 7440-03-1	N 7727-37-9 Ti 7440-32-6

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

All commercial metals may contain small amounts of various elements (less than 0.1%), in addition to those specified. These small quantities frequently originate in the raw material used.

4. FIRST AID MEASURES

Description of necessary measures:

Inhalation: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned, experiencing respiratory symptoms, or feel unwell: Get medical advice/attention or call a poison center or doctor/physician.

Eye Contact: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with water for 15 minutes. Remove contact lenses, if present and easy to do. Do not allow victim to rub or keep eyes tightly shut. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin Contact: If on skin: Wash thoroughly after handling. Wash with plenty of water. If irritation or rash occurs: Get medical advice, attention. Skin cuts and abrasions can be treated by standard first aid or medical treatment. Quickly remove dust contaminated clothing but do not shake clothing.

Ingestion: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if swallowed: Call a poison center or doctor/physician if you feel unwell. Rinse mouth. If exposed, concerned or feel unwell: Get medical advice/attention.

Most important symptoms/effects, acute and delayed (chronic):

Symptoms: May cause allergic skin reaction. May cause acute gastrointestinal effects if swallowed.

Note to Physicians: Treat symptomatically

5. FIRE FIGHTING MEASURES

Flash Point (With Test Method)

None

Flammable (Explosive) Limits V/V%

LEL: None

UEL: None

Extinguishing Media	Do not spray water on burning metal as a violent explosion may result. This product is not flammable in the form it is sold. May be flammable if there are finely divided pieces resulting from processing of this product. Carbon dioxide is not effective in extinguishing burning metals. Do not spray water on burning metal as an explosion may occur. Use class "D" fire extinguisher, smother with dry sand, or salt (NaCl).
Specific Hazards Rising From The Chemical	No unusual fire or explosion hazards from solid alloys in massive form. Dust, chips, thin strips, etc. created by grinding or processing can ignite if a substantial number of small particles are dispersed or adequate ignition source is present. The hazard increases with finer particles. An explosion may follow a fire initiated in a mass of wet metal fines. The explosive characteristics of such material is caused by the steam and hydrogen generated within the burning mass. Metals may react exothermically with acids and oxidizers.
Special Protective Equipment And Precautions For Fire-Fighters:	Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

6. ACCIDENTAL MATERIAL RELEASE OR SPILL CONTROL MEASURES

In solid form this material poses no special clean-up problems. If this material is in powder or dust form, do not dry sweep. Notify safety personnel. Clean-up should be conducted with a grounded vacuum system utilizing high efficiency particulate air (HEPA) filtration. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air, land and water. Cleanup personnel should protect against dust inhalation and skin or eye contact, follow handling precautions below, and use non-sparking tools. Properly label all materials collected in waste container. Follow applicable OSHA regulations (29 CFR), EPA regulations (40 CFR), Canadian Workplace Hazardous Materials Information System (WHMIS) Regulations, and other regulatory requirements.

7. HANDLING AND STORAGE

Handling Precautions	Wear cut resistant gloves and clothing to avoid cuts. Metal in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may suddenly uncoil to try to lay flat in a long strip when banding is cut or other forces are released. Measures should be taken to ensure that uncoiling will not occur. Machining of alloys may result in fine turnings, chips, dust, or fumes. Small diameter materials may be combustible or flammable. Keep this material away from any source of ignition. Keep fines and turnings completely dry or very wet (more than 25% water content by weight) for handling safety. Explosions can result from ignition of powder or machining fines containing moisture. Fires and explosions can result from dispersing fines and dust in air, especially if confined. Avoid these conditions. Avoid dust inhalation and eye or skin contact. Wear personal protective equipment to prevent contact with skin and eyes (Section 8). Practice good personal hygiene after handling, especially before eating, drinking, smoking, or applying cosmetics.
Storage Precautions	In solid form this material poses no special problems. Avoid breathing dust or fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment or both.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation	Local exhaust ventilation should be used to control exposure to airborne dust and fume emissions near the source (during crushing, grinding, welding, etc.). Assure exposure is less than regulatory limits.
Respiratory Protection	None required as shipped, if processing emits welding fumes, airborne dusts or similar hazards use NIOSH approved respirator as specified by an industrial hygienist/safety professional. Obtain medical approval for respirator users. Use a welding or air supplied respirator where local exhaust or ventilation does not keep exposure below overexposure limits.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

Eye Protection	Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc. Contact lenses should not be worn if working with metal dusts and powders.
Skin Protection	Wear gloves as necessary to prevent metal cuts, skin abrasions and skin contact. Protective clothing such as arm, foot, body protection etc., may be required during handling operations as appropriate for the exposure.
Recommended Monitoring Procedures	No medical surveillance required while working with metal in massive form. If processing creates dust, fume or other hazard, conduct industrial hygiene evaluation of processes. Follow requirements for medical surveillance of product constituents, compounds and fume if welding fume, dust or other hazards are created by customer processing or handling.

Occupational Exposure Limits (OELs): This product in the physical form it is sold does not present an inhalation hazard. However, operations including, but not limited to, cutting, welding, and grinding may produce fumes and/or particulates. The following exposure limits are for the constituents of the materials under these and similar processes.

Constituents	OSHA PEL ¹	ACGIH TLV ²
OSHA ACGIH Particulate: No Limit Established	15 mg/m ³ , total dust (PNOR) 5 mg/m ³ , respirable fraction (PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as respirable fraction, PNOS)
Aluminum (Al)	15 mg/m ³ (as total dust) 5 mg/m ³ (as respirable fraction)	10 mg/m ³ (as metal dust) 5.0 mg/m ³ (as welding fume)
Boron (B)	15 mg/m ³ (as total dust, boron oxide)	10 mg/m ³ (as boron oxide)
Cobalt (Co)	0.1 mg/m ³ (as dust & fume)	0.02 mg/m ³
Chromium (Cr)	0.5 mg/m ³ (as Cr II & III, inorganic compounds) 1.0 mg/m ³ (as Cr, metal) 0.005 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble) "AL" 0.0025 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m ³ (as Cr III, inorganic compounds) 0.5 mg/m ³ (as Cr, metal) 0.05 mg/m ³ (as Cr VI, inorganic compounds) 0.01 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble)
Copper (Cu)	0.1 mg/m ³ (as fume, Cu) 1.0 mg/m ³ (as dusts & mists, Cu)	0.1 mg/m ³ (as fume) 1.0 mg/m ³ (as dusts & mists, Cu)
Iron (Fe)	10 mg/m ³ (as iron oxide fume)	5.0 mg/m ³ (as iron oxide dust and fume)
Lead (Pb)	50 µg/m ³ TWA (as Pb) 30 µg/m ³ Action Level (as Pb)	0.05 mg/m ³
Magnesium (Mg)	15 mg/m ³ (as magnesium oxide)	10 mg/m ³ (as magnesium oxide)
Manganese (Mn)	"C" 5.0 mg/m ³ (as Fume & Mn compounds)	0.2 mg/m ³
Molybdenum (Mo)	15 mg/m ³ (as total dust, soluble compounds) 5.0 mg/m ³ (as respirable fraction)	10 mg/m ³ (as Mo insoluble compounds, inhalable fraction) 3.0 mg/m ³ (as Mo insoluble compounds, respirable fraction) 0.5 mg/m ³ (as Mo soluble compounds, respirable fraction)
Nickel (Ni)	1.0 mg/m ³ (as Ni metal & insoluble compounds)	1.5 mg/m ³ (as inhalable fraction Ni metal) 0.2 mg/m ³ (as inhalable fraction Ni inorganic only insoluble and soluble)
Niobium (Nb)/ Columbium (Cb)	10 mg/m ³ (PNOR)	10 mg/m ³ (PNOS)
Phosphorus elemental (P)	0.1 mg/m ³	0.02 ppm (0.1 mg/m ³)
Selenium (Se)	0.2 mg/m ³	0.2 mg/m ³
Silicon (Si)	15 mg/m ³ (total dust, PNOR) 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³
Sulfur (S)	5 ppm (13 mg/m ³) (as Sulfur Dioxide)	0.25 mg/m ³ (as Sulfur Dioxide)
Tantalum (Ta)	5 mg/m ³	5 mg/m ³
Tungsten (W)	NE	5.0 mg/m ³ STEL 10 mg/m ³
Titanium (Ti)	NE	NE
Tin, inorganic compounds (Sn)	2 mg/m ³	2 mg/m ³
Vanadium (V)	"C" 0.5 mg/m ³ (as V2O5 respirable dust) "C" 0.1 mg/m ³ (as V2O5 fume)	0.05 mg/m ³ (as V2O5, inhalable fraction)
Zinc (Zn)	5 mg/m ³	2 mg/m ³
Zirconium (Zr)	5 mg/m ³	5 mg/m ³ STEL: 10 mg/m ³

NE - None Established, if none established, see "Particulate Where No Limit Has Been Established" in first row or specific compounds created by welding, etc.

Notes:

- OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a Ceiling Limit, which should not be exceeded during any part of the workday unless otherwise noted. A Short Term Exposure Limit (STEL) is a 15-minute exposure, which should not be exceeded.
- Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
- The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL): Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
- Inhalable fraction. The concentration of inhalable particulate is to be determined from the fraction passing a size-selector per OSHA, ACGIH and other regulatory agencies.
- PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit.
- Respirable fraction - The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs® and BEIs®.
- PNOS (Particles Not Otherwise Specified). Particles not specified are covered by the PNOS limit.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid	Appearance And Color: Silver /Gray Color	Odor: No Odor	Odor Threshold: Not Available
pH: Not Available	Evaporation Rate: Not Available		
Boiling Range: Not Available	Vapor Pressure (MmHg): Not Available	Initial Boiling Point: Not Available	

9. PHYSICAL AND CHEMICAL PROPERTIES (CONTINUED)

Melting Point: 900°F - 3200°F	Vapor Density (Air=1): Not Available	Specific Gravity (H2O=1): 7.5 - 8.0
Flash Point: None	% Volatiles By Volume: None	Auto-Ignition Temperature: Not Available

Relative Density: Not Available		Evaporation Rate: Not Available		Decomposition Temperature: Not Available	
Solubility In Water = None		Flammable Limits V/V% LEL: None		UEL: None	
Viscosity: Not Available		Partial Coefficient: N-Octanol/ Water: Not Available			
10. Stability And Reactivity					
Reactivity		Hazardous reactions should not occur under normal conditions.			
Stability/ Chemical Stability		These alloys are stable materials under normal handling and storage conditions.			
Possibility of Hazardous Reactions		Should not occur to solid metal under normal handling and storage conditions.			
Conditions to Avoid		Avoid strong acids or bases. Avoid creating or spreading dust. Sparks, heat, open flame and other sources of ignition.			
Incompatible Materials		Dissolves in hydrofluoric acid. Ignites in the presence of flourine. When heated above 200°C, may react exothermically with chlorine, bromine, halocarbons, carbon tetrachloride, Freon, carbon tetrafluoride, acetylene, acids and oxidizers. Corrosion is unlikely, however, if it does occur, hydrogen might be evolved, causing a potentially explosive environment.			
Hazardous Decomposition Products		Solid metal is stable but may decompose from combustion and/or chemical reaction. This may produce various hazardous materials such as elemental metals, metal oxides, carbon dioxide, carbon monoxide, sulfur compounds, metal compounds including hexavalent chromium, titanium dioxide, vanadium pentoxide and acids.			
11. TOXICOLOGICAL INFORMATION					
Toxicity Data	Eye: Rabbit (cobalt) unknown amount produced severe reaction with abscess involving lens, ciliary body, vitreous humor and retina.				
	Skin: Nickel-containing alloys may cause sensitization by skin contact.				
	Ingestion:	Guinea Pig (nickel): LD ₅₀ : 5 mg/kg Mouse (boron): LD ₅₀ : 560 mg/kg Rat (cobalt): LD ₅₀ : 6,171 mg/kg Rat (Iron): LD ₅₀ : 30,000 mg/kg Rat (manganese) LD ₅₀ : 9,000 mg/kg	Rat (Titanium): LD ₅₀ : >5,000 mg/kg Rabbit (Silicon Dioxide): LD ₅₀ : >5,000 mg/kg Rabbit (cobalt): LD ₅₀ : 750 mg/kg Human (copper): TD _{Lo} : 120 µg/kg, affects the gastrointestinal tract (nausea or vomiting). Human (chromium): LD _{Lo} : 71 mg/kg		
	Inhalation:	Rabbit (nickel): TC _{Lo} : 130 µg/m ³ 35 weeks (intermittent) - 6 hours Human (chromium VI): TC _{Lo} : 110 µg/m ³ 3 years (continuous) tumorigenic (carcinogenic per RTECS) Pig (cobalt): TC _{Lo} : 100 µg/m ³ 6 hours for 13 weeks (intermittent) Human (manganese): TC _{Lo} : 2300µg/m ³ Rat (titanium): LC ₅₀ : >6,820 mg/ m ³			
	Subchronic:	Rat (molybdenum) inhalation: 12-16 g/m ³ /1 hour/30 days, resulted in slight growth depression, and thickening of the intra-alveolar septa, which contained connective tissue fibers.			
	Other:	Dog (nickel) Intravenous: LD _{Lo} : 10 mg/kg Rat (chromium), Implant: TD _{Lo} : 1200 µg/kg intermittent over 6 weeks. Rat (cobalt) intramuscular: 126 mg/kg, tumorigenic at site of application. Rabbit (molybdenum) intra-tracheal: LD _{Lo} : 70 mg/kg produced focal fibrosis (pneumoconiosis).			
	Nickel alloys and hexavalent chromium compounds are listed as carcinogens by IARC. Detailed information from these sources may be obtained from the following: IARC Monographs on the evaluation of carcinogenic risk of Chemicals to Man; and the NTP annual report on carcinogens, NTP Public Information Office, MD B204 Box 12233, Research Triangle Park, North Carolina 27709.				
	Welding Fumes: Follow OSHA and NIOSH methods for monitoring of welding fumes to determine exposure potential.				
	Teratology:	Rat (nickel) oral: TDLo: 158 mg/kg Rat (molybdenum) oral: 5800 µg/kg given to female 30 weeks prior to mating and during days 1-20 of pregnancy caused specific musculoskeletal system development abnormalities.			
	Reproduction:	Rat (molybdenum) oral: 6050 µg/kg given to female 35 weeks prior to mating produced pre-, and post-implantation mortality. Rat (cobalt) unspecified exposure route, 0.05 mg/kg continuous, administered throughout gestation to female was embryotoxic.			
Mutagenicity:	Hamster (chromium III) lung cell: 34 mg/L caused sister chromatid exchange. Human (cobalt) DNA damage: Human Leukocyte 3mg/L. Human (Chromium VI) DNA damage: Human Leukocyte 50µmol/L.				
12. ECOLOGICAL INFORMATION					
In solid form these alloys pose no special environmental problems. Metal powders or dusts may have significant impact on air, land and water quality. Airborne emissions, spills, and releases to the environment (discharge to streams, sewer systems, surface soil, etc.) should be controlled immediately. Manganese undergoes complex geochemical cycling, and can accumulate in the top layer of sediment in lakes. In water, molybdenum will precipitate out with natural calcium. Soil levels should not exceed 50 ppm to avoid problems with livestock. Molybdenum; (fathead minnow), LC50: 370 mg/L/96 hours. Terrestrial plants can contain enough molybdenum to be toxic to animals but still grow normally. Environmental Fate: In water, cobalt is adsorbed greatly to hydrolysate or oxidate sediments. It may be taken into solution in small amounts through bacteriological activity. In water, molybdenum will precipitate out with natural calcium. In water, chromium III oxide is expected to eventually precipitate to sediments. In air, chromium III oxide is primarily removed by fallout and precipitation. Soils with a high chromium content (>0.2%) are expected to be infertile.					
12. ECOLOGICAL INFORMATION (CONTINUED)					
Ecotoxicity: Few plants accumulate cobalt at greater than 100 ppm, the level at which severe phytotoxicity would occur. The potential for bioaccumulation of cobalt by aquatic and terrestrial organisms is low with trophic transfer factors less than 1. Little tendency for chromium III bioaccumulation in the food chain. The half-life of chromium in soils may be several years.					

13. DISPOSAL CONSIDERATIONS

Whenever possible, recover alloys for reuse or recycling. Solid metal is not a hazardous waste per U.S. E.P.A. If material has been processed, analyze and dispose of waste material in accordance with local, state, or federal regulations. For specific labeling, packing, storage, transportation, and disposal procedures, contact an Environmental Engineer or consultant familiar with waste disposal regulations.

14. TRANSPORT INFORMATION

As sold, these solid alloys are not regulated by the U.S. Department of Transportation and the International Air Transport Association. **Note:** metals transported in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may uncoil to try to lay flat in a long strip when banding is cut or other forces are released; uncoiling can be sudden and catastrophic and measures should be taken to ensure that uncoiling will not occur.

The following information should be used by individuals with "Function-specific Training" required by U.S. Department of Transportation 49 CFR 172.704, and Dangerous Goods Regulations published by the International Air Transport Association (IATA).

Shipping Name	None as sold, however, if dust or powder is created, it may be a flammable solid or spontaneously combustible material (DOT hazard class 4.1 and 4.2, respectively). A sample of metal powder should be tested according to the U.N. manual of tests and criteria. See 49 CFR 173.124 (a) and (b).
Identification	Not Available (Determine by test results)
Hazard Class	Not Available (Determine by test results)
Label(S) Required	Not Available (Determine by test results)

15. REGULATORY INFORMATION

SPECIFIC U.S. EPA REGULATIONS: Toxic Substance Control Act: Components of this material (see section 3) are listed in the TSCA inventory.

CERCLA: Components of this material (section 3) are listed as Hazardous Substances

EPA Superfund Amendment and Reauthorization Act (SARA) of 1986 Section 311/312(SARA Title III): Components of this material (section 3) are listed in SARA Title III, Section 311/312

EPA, SARA Section 313: Components of this material (section 3) are listed Section 313 and subject to Toxic Release Inventory reporting.

SARA Title III Hazard Categorization: Dust and fume are categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370. Product is not categorized as a fire hazard, reactivity hazard or pressure release hazard.

CALIFORNIA PROPOSITION 65: Listed components known by the state to cause cancer, including Nickel, and Cobalt (metal powder). As sold, nickel is in alloy form. See section 3 for other constituents. During welding, melting, etc., may produce oxides and other compounds of the metals listed in section 3 including hexavalent chromium compounds which are listed in California's "Safe Drinking Water and Toxic Enforcement Act of 1986" (Proposition 65).

16. OTHER INFORMATION

Revision Date: August 5, 2015

This information is designed only as guidance for safe handling, use, storage, transportation, and disposal and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Information contained herein is believed to be true and accurate at the date of its publication, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, and local laws and regulations remain the responsibility of the user.

HEXAVALENT CHROMIUM: Hexavalent Chromium is not a constituent component of uncoated Stainless Steels. Stainless Steels are iron-based alloys that contain chromium. It is this addition of chromium that gives stainless steel its unique corrosion resistant properties through the formation of an invisible and adherent chromium-rich oxide surface film. The vast majority of chromium in stainless and other specialty steels is in the metallic/elemental form *(zero valence state). A small amount of trivalent chromium (oxide) is formed on the surface of specialty steels and is crucial for protecting the alloy from corrosion. Hexavalent chromium, which is associated with certain adverse health effects, is not a constituent of stainless or other specialty steels. It can also be formed by welding on stainless steel. The high temperatures involved result in oxidation that converts the chromium to a hexavalent state.

WEEE/ROHS/ END OF LIFE VEHICLES, AND THE JAPANESE GREEN PROCUREMENT INITIATIVE: Uncoated stainless and specialty steels are generally in conformance with the requirements of the European Union's legislation on waste electrical and electronic equipment ("WEEE"; Directive 2002/53/EC) and its companion directive on the restriction on hazardous substances used in EEE ("RoHS": Directive 2002/95/EC & 2003/11/EC), as well as EU Directive 2000/53/EC on End of Life Vehicles, and the Japanese Green Procurement Initiative.

This information is designed only as guidance for safe handling, use, storage, transportation, and disposal and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Information contained herein is believed to be true and accurate at the date of its publication, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, and local laws and regulations remain the responsibility of the user.

Trademarks: Several materials described in these Safety Data Sheets are proprietary alloys produced under license from various manufacturers. They are identified by the following subscript numbers:

¹Registered Trademark of AK Steel Corporation

²Registered Trademark of Carpenter Technology Corporation

³Registered Trademark of Special Metals Corporation

⁴Registered Trademark of ATI Allegheny Companies

⁵Registered Trademark of Haynes International, Inc.

⁶Registered Trademark of United Technologies Corporation

Ulbrich Stainless Steels & Special Metals, Inc.
Safety Data Sheet (SDS) 002

SECTION 1: IDENTIFICATION


Product Identifier: Titanium, Aluminum, Tantalum, Niobium and Zirconium Based Alloys, **designated as follows:**
Titanium & Titanium Based Alloys: IA25/A35; Grade IIA40; Grade III A55; Grade IV A70/A75; 6A1-4V; 3A1-2.5V.
Aluminum Alloys: 1100, 1050, 1070, 3003, 3004, 3105, 5005, 5052, 5083, 5182, 5454, 5754, 6061
Zirconium, Niobium: (Synonym – Columbium)
Tantalum, and Sintered Tantalum
Product Form: Metal Alloy/Mixture
Intended Use of the Product: Solid metal products, various uses
Supplier's Details: **Ulbrich Stainless Steels & Special Metals, Inc.**
153 Washington Avenue, P.O. Box 294,
North Haven, CT USA, 06473-1191
Phone Number 203-239-4481 • 800-243-1676•
SDS Technical Contact Weekdays (203) 265-8299
FAX: (203) 239-7479 • E-Mail: information@ulbrich.com
Emergency Telephone Number 203- 239-4481; Chemtrec 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

Classification (GHS-US): Most products covered by this SDS are articles and, as such, are not considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1910.1200). Materials resulting from machining these products may be considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1910.1200).

Label Elements:

Signal word, hazard statement(s), symbols and precautionary statement(s):

Hazard Symbol	Hazard Classification	Signal Word	Hazard Statement(s)
	Single Target Organ Toxicity (STOT) Repeat Exposure -2	Warning	May cause damage to respiratory tract, liver and kidney through prolonged or repeated inhalation exposure. If converted to small particles during further processing, handling, or by other means, may form combustible dust concentrations in air.
NA	Eye Irritation Combustible Dust		Causes eye irritation. If converted to small particles during further processing, handling, or by other means, may form combustible dust concentrations in air.
Prevention	Do not breathe dusts / fume / mist. Wear protective gloves / protective clothing / eye protection / face protection. Contaminated work clothing must not be allowed out of the workplace. Do not handle until all safety precautions have been read and understood. Do not eat, drink or smoke when using this product.		
Response	Get medical advice/attention if you feel unwell.		
Storage	Store in accordance with federal, state and other regulations. Dust, powder and strips are combustible and may form explosive mixtures with air or fluids. Store locked up.		
Disposal	Metal scrap should be recycled whenever possible. Dispose of in accordance with federal, state and other regulations.		

Hazards not otherwise classified: None Known
Unknown acute toxicity statement (mixture): None Known

Primary Entry Routes	Not considered a physical or health hazard in the solid form that it is sold. However, operations such as abrading, burning, welding, sawing, brazing, grinding, cutting, polishing, and machining that results in the creation of dust or elevated temperatures may cause eye, skin, and respiratory tract irritation and other hazards described in this document. Entry Routes for Dust: Inhalation, Skin, Eye for all components; Ingestion for Molybdenum, Chromium & Vanadium
Target Organs	Target Organs for Dust - Respiratory System, Skin, Eyes, NOTE: Liver and Kidney for Molybdenum
Effects of Overexposure	EYES: Dust may cause mechanical irritation. DERMAL: Dust may cause mechanical irritation. Chromium, molybdenum and vanadium are skin irritants. INHALATION: Excessive exposure to high concentrations of dust may cause irritation to the mucous membranes of the upper respiratory tract. Excessive inhalation of fumes of freshly formed metal oxide particles sized below 1.5 microns from many metals can produce an acute reaction known as "metal fume fever". Symptoms consist of chills and fever (very similar to and easily confused with flu symptoms), metallic taste in the mouth, dryness and irritation of the throat followed by weakness and muscle pain. The symptoms come on in a few hours after excessive exposures and usually last from 12 to 48 hours. Titanium dioxide and Chromium may cause pulmonary fibrosis and permanent damage. Vanadium Pentoxide may cause green tongue, metallic taste, eczema, cough, fine rales, wheezing, bronchitis, and dyspnea (breathing difficulty). INGESTION: Ingestion of harmful amounts of this product as distributed is unlikely due to its solid insoluble form. Ingestion of dust may cause nausea or vomiting.
Acute	
Chronic	Titanium Dioxide: The signs and symptoms of chronic exposure to titanium dioxide include X-ray evidence of mild fibrosis, dyspnea, cough, and declines in pulmonary function.

Effects of Overexposure	Aluminum: Aluminum dusts/fines are a low health risk by inhalation and should be treated as a nuisance dust. Aluminum dust is a respiratory and eye irritant. Tin: Exposure to dust and fume of tin (oxide) is recognized to result in a benign pneumoconiosis called stannosis. Molybdenum: Certain handling operations, such as burning and welding, may generate both insoluble molybdenum compounds (metal and molybdenum dioxide) and soluble molybdenum compounds (molybdenum trioxide). Molybdenum compounds generally exhibit a low order of toxicity with the trioxide the more toxic. However, some reports
Carcinogenic References	Titanium dioxide: The International Agency for Research on Cancer (IARC) identifies Titanium Dioxide as Group 3 carcinogens, not classifiable as to their human carcinogenicity. Chromium: The International Agency for Research on Cancer (IARC) identifies chromium metal and trivalent chromium compounds as Group 3 carcinogens, not classifiable as to their human carcinogenicity. Hexavalent chromium is listed by IARC as Group 1 carcinogen that are carcinogenic to humans. Iron oxide: The International Agency for Research on Cancer (IARC) identifies Titanium Dioxide as Group 3 carcinogens, not classifiable as to their human carcinogenicity.
Medical Conditions Aggravated By Exposure	Chronic respiratory disease, impaired pulmonary function and conditions such as asthma, emphysema, chronic bronchitis, etc., may be aggravated or damaged by exposure to dust or fumes if excessive concentrations are inhaled. If prior damage or disease to the neurological, circulatory, hematologic or renal systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed.

SECTION 3: COMPOSITION/ INFORMATION ON INGREDIENTS

ALUMINUM ALLOY	UNS No.	CONSTITUTENT(S) % Maximum unless otherwise shown.									
		Mg	Mn	Cr	Cu	Al	Si	Fe	Zn	V	Other
1100	A91100				0.12	99.0 min.					
1050	A91050	0.05	0.05		0.05	99.1	0.25	0.4	0.07		Ti 0.05
1070	A91070	0.03	0.03		0.04	99.7	0.25	0.25	0.04	0.05	Ti 0.3
3003	A93003		1.2		0.12	98.6 min.					
3004	A93004	1.2	1.2			97.8					
3105	A93105	0.5	0.55			99.0					
5005	A95005	0.8				99.2 min.					
5052	A95052	2.5		0.25		97.2 min.					
5083	A95083	4.4	0.7		0.15	94.7					
5182	A95182	4.5	0.35			95.2					
5454	A95454	2.7	0.8	0.12		96.3					
5754	A95754	3.2	0.5			95.5	0.4	0.4			
6061	A96061	0.8/1.2	0.15	0.04/0.35	0.15/0.4	95.8/98.6			0.25		
CAS Number		7439-95-4	7439-96-5	7440-47-3	7440-50-8	7429-90-5	7440-21-3	7439-89-6	7440-66-6	7440-62-2	Ti 7440-32-6

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

TITANIUM BASED ALLOY	UNS No.	CONSTITUENT(S) %Maximum unless otherwise shown				Ti	V	Al	Tin	Other	Other
		C	N	Fe	H						
GRADE I-25A/35A		0.10	0.03	0.20	0.01	BAL					
GRADE II -40A	R50400	0.08	0.03	0.30	0.0125	BAL					
GRADE III -55A	R50550	0.08	0.05	0.30	0.015	BAL					
GRADE IV-70A/75A	R50700	0.08	0.05	0.50	0.015	BAL					
GRADE V-6A1-4V	R56400	0.08	0.05	0.25	0.015	BAL	3.5/4.5	5.75/6.75			
GRADE IX - 3-2.5	R56320	0.10	0.03	0.25	0.15	BAL	2.0/3.0	2.5/3.5			
GRADE 21-Beta 21S	R58210	0.05	0.05	0.4	0.015	BAL		2.5/3.5		Co 2.4/3.2	Mo 14/16
15-3-3-3	R58153	0.05	0.05	0.25	0.015	BAL	14.0/16.0	2.5/3.5	2.5/3.5	Cr 2.5/3.5	
15P		0.08	0.03	0.30	0.015	BAL					Pd 0.12/0.25
TITANIUM 6-2-4-2	R54620 R54621	0.08	0.01/0.013	0.25	0.015	BAL		5.5/6/5	1.8/2.2		Mo 1.8/2.2 Zr 3.60/4.40
NITINOL	N01555					44/45				Ni 55/56	
3Al-2.5V	R56320	0.05	0.02	0.30	0.015	BAL	2.0/3.0	2.5/3.5			
CAS Number		7440-44-0	7727-37-9	7439-89-6	1333-74-0	7440-32-6	7440-62-2	7429-90-5	7440-31-5	Co 7440-03-1 Cr 7440-47-3 Ni 7440-02-0	Mo 7439-98-7 Pd 7440-05-3 Sn 7440-31-5

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

ALLOY	UNS No.	CONSTITUENT(S)% Ranges unless otherwise shown							
		Zr	Niobium	Tantalum	Molybdenum	Iron	Titanium	Nickel	Tungsten
ZIRCONIUM 702	S20100	99/100							
NIObIUM TYPE I (SYNONYM-COLuMBIUM)	R04210		99/100						
NIObIUM TYPE II (SYNONYM-COLuMBIUM)	R04300		99/100						
TANTALUM	R05200		0.10	BAL	0.020	0.010	0.010	0.010	0.05
SINTERED TANTALUM	R05400		0.10	BAL	0.020	0.010	0.010	0.010	0.05
CAS Number		7440-67-7	7440-03-1	7440-25-7	7439-98-7	7439-89-6	7440-32-6	7440-02-0	7440-33-7

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

All commercial metals may contain small amounts of various elements (less than 0.1%), in addition to those specified. These small quantities frequently originate in the raw material used.

4. FIRST AID MEASURES

Description of necessary measures:

Inhalation: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned, experiencing respiratory symptoms, or feel unwell: Get medical advice/attention or call a poison center or doctor/physician.

Eye Contact: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with water for 15 minutes. Remove contact lenses, if present and easy to do. Do not allow victim to rub or keep eyes tightly shut. May cause conjunctivitis with repeated exposures. If eye irritation persists, get medical advice/attention.

Skin Contact: If on skin: Wash thoroughly after handling with plenty of water. If irritation or rash occurs, get medical advice/attention. Skin cuts and abrasions can be treated by first aid or medical treatment. Quickly remove dust contaminated clothing but do not shake clothing.

Ingestion: As sold/shipped in solid form, not a likely form of exposure. However during welding, grinding, burning, etc., if swallowed, call a poison center or physician if you feel unwell and rinse mouth. If exposed, concerned or feel unwell: Get medical advice/attention.

Most important symptoms/effects, acute and delayed (chronic):

Inhalation: As sold/shipped, solid metal is not likely to present an acute or chronic health effect.

Eye: As sold/shipped, solid metal is not likely to present an acute or chronic health effect. See component effects.

Skin: As sold/shipped, solid metal is not likely to present an acute or chronic health effect. See component effects.

Ingestion: As sold/shipped, solid metal is not likely to present an acute or chronic health effect. See component effects.

However, during further processing (welding, grinding, etc.) individual components may illicit an acute or chronic health effect.

Refer to Section 11-Toxicological Information.

Immediate Medical Attention and Special Treatment: None Known

5. FIRE FIGHTING MEASURES

Flash Point (With Test Method): None in solid form		FLAMMABLE (EXPLOSIVE) LIMITS V/V%: LEL: None UEL: None
Extinguishing Media	Not flammable in the form of this product as distributed. Flammable as finely divided pieces resulting from processing. Use Type D fire extinguisher. Carbon dioxide is not effective in extinguishing burning metals.	
Special Firefighting Procedures	Do not spray water on burning metal as an explosion may occur. To extinguish a metal fire, smother with dry sand, salt (NaCl) or other class "D" fire extinguishing powder.	
Unusual Fire and Explosion Hazards	Intense heat. Dust, chips, thin strips, etc. created by grinding or processing can ignite if a substantial number of small particles are dispersed or adequate ignition source is present. The hazard increases with finer particles. An explosion may follow a fire initiated in a mass of wet metal fines. The explosive characteristics of such material is caused by the steam and hydrogen generated within the burning mass. Do not allow dust, chips, thin strips, etc. to accumulate, it can be pyrophoric. Contact with water or steam above 704°C causes a violent reaction.	
Hazardous Combustion Products	Various metal oxides, carbon dioxide, carbon monoxide, sulfur compounds including titanium dioxide - an IARC Group 2B carcinogen; hexavalent chromium may cause lung, nasal, and/or sinus cancer; vanadium pentoxide affects eyes, skin, respiratory system; zinc, copper, magnesium, or cadmium fumes may cause metal fume fever. Soluble molybdenum compounds may cause lung irritation.	
Incompatibility (Materials To Avoid)	Reacts with acids, bases, oxidizing agents, alcohols, metal oxides, halogenated hydrocarbons, halogens, especially fluorine. Dangerous fire hazard in the form of dust when exposed to heat, flame or by chemical reaction with oxidizing agents. May be an explosion hazard in the form of dust by chemical reaction with air, alkali hydroxides, chromates, dichromates, molybdates, sulfates, tungstates, borax, CCl ₄ , copper oxide, lead, lead oxide, phosphorous, KClO ₃ , KNO ₃ , nitryl fluoride. Do not allow dusts or other fines to accumulate. Molten metal may react violently with water and liberate hydrogen. When heated above 200°C, reacts exothermically with chlorine, bromine, halocarbons, carbon tetrachloride, carbon tetrafluoride, Freon, acetylene, acids and oxidizers. In some cases, an ignitable corrosion product containing fine particulate forms on the surface of the metal. This film can be rendered non-flammable by oxidation treatments such as specific heat treatments.	

6. ACCIDENTAL MATERIAL RELEASE OR SPILL CONTROL MEASURES

In solid form this material poses no special clean-up problems. If this material is in powder or dust form, do not dry sweep. Notify safety personnel. Clean-up should be conducted with a grounded vacuum system utilizing high efficiency particulate air (HEPA) filtration. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air, land and water. Cleanup personnel should protect against dust inhalation and skin or eye contact, follow handling precautions and use non-sparking tools. Properly label all waste materials and follow applicable OSHA regulations (29 CFR), EPA regulations (40 CFR) and other regulatory requirements.

7. HANDLING AND STORAGE

Handling Precautions	Wear cut resistant gloves and clothing to avoid cuts. Metal in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may suddenly uncoil to try to lay flat in a long strip when banding is cut or forces are released. Ensure that uncoiling will not occur. Machining of alloys may result in fine turnings, chips, dust, or fumes. Small diameter materials may be combustible or flammable. Keep this material away from any source of ignition. Keep fines and turnings completely dry or very wet (more than 25% water content by weight) for handling safety. Explosions can result from ignition of powder or machining fines containing moisture. Fires and explosions can result from dispersing fines and dust in air, especially if confined. Avoid these conditions. Avoid dust inhalation and eye or skin contact, wear personal protective equipment (Section 8). Practice good personal hygiene after handling.
Storage Precautions	In solid form this material poses no special problems. Avoid breathing dust or fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment or both.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation	Local exhaust ventilation should be used to control exposure to airborne dust and fume emissions near the source (during crushing, grinding, welding, etc.). Assure exposure is less than regulatory limits.
Respiratory Protection	None required as shipped, if processing emits welding fumes airborne dusts or similar hazards use NIOSH approved respirators as specified by an industrial hygienist or safety professional. Obtain medical approval for users of negative pressure devices. Use a welding fume respirator or an air supplied respirator where local exhaust or ventilation does not keep exposure below overexposure limits.
Eye Protection	Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc. Contact lenses should not be worn if working with metal dusts and powders.
Skin Protection	Wear gloves as necessary to prevent metal cuts, skin abrasions and skin contact. Protective clothing such as arm, foot, body protection etc., may be required during handling operations as appropriate for the exposure.
Recommended Monitoring Procedures	No medical surveillance required while working with metal in massive form. If processing creates dust, fume or other hazard, conduct industrial hygiene evaluation of processes. Follow requirements for medical surveillance of product constituents, compounds and fume if welding fume, dust or other hazards are created by customer processing or handling.

Occupational Exposure Limits (OELs): This product in the physical form it is sold does not present an inhalation hazard. However, operations including, but not limited to, cutting, welding, and grinding may produce fumes and/or particulates. The following exposure limits are for the constituents of the materials under these and similar processes.

Constituents	OSHA PEL ¹	ACGIH TLV ²
OSHA ACGIH Particulate: No Limit Established	15 mg/m ³ , total dust (PNOR) 5.0 mg/m ³ , respirable fraction (PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as respirable fraction, PNOS)
Aluminum (Al)	15 mg/m ³ (as total dust) 5 mg/m ³ (as respirable fraction)	10 mg/m ³ (as metal dust) 5.0 mg/m ³ (as welding fume)
Cobalt (Co)	0.1 mg/m ³ (as dust & fume)	0.02 mg/m ³
Chromium (Cr)	0.5 mg/m ³ (as Cr II & III, inorganic compounds) 1.0 mg/m ³ (as Cr, metal) 0.005 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble) "AL" 0.0025 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m ³ (as Cr III, inorganic compounds) 0.5 mg/m ³ (as Cr, metal) 0.05 mg/m ³ (as Cr VI, inorganic compounds) 0.01 mg/m ³ (as Cr VI, inorganic compounds & certain water insoluble)
Copper (Cu)	0.1 mg/m ³ (as fume, Cu) 1.0 mg/m ³ (as dusts & mists, Cu)	0.1 mg/m ³ (as fume) 1.0 mg/m ³ (as dusts & mists, Cu)
Iron (Fe)	10 mg/m ³ (as iron oxide fume)	5.0 mg/m ³ (as iron oxide dust and fume)
Magnesium (Mg)	15 mg/m ³ (as magnesium oxide)	10 mg/m ³ (as magnesium oxide)
Manganese (Mn)	"C" 5.0 mg/m ³ (as Fume & Mn compounds)	0.2 mg/m ³
Molybdenum (Mo)	15 mg/m ³ (as total dust, soluble compounds) 5.0 mg/m ³ (as respirable fraction)	10 mg/m ³ (as Mo insoluble compounds, inhalable fraction) 3.0 mg/m ³ (as Mo insoluble compounds, respirable fraction) 0.5 mg/m ³ (as Mo soluble compounds, respirable fraction)
Nickel (Ni)	1.0 mg/m ³ (as Ni metal & insoluble compounds)	1.5 mg/m ³ (as inhalable fraction Ni metal) 0.2 mg/m ³ (as inhalable fraction Ni inorganic only insoluble and soluble)
Niobium (Nb)/ Columbium (Cb)	10 mg/m ³ (PNOR)	10 mg/m ³ (PNOS)
Silicon (Si)	15 mg/m ³ (total dust, PNOR) 5.0 mg/m ³ (as respirable fraction, PNOR)	10 mg/m ³
Titanium (Ti)	NE	NE
Tin, inorganic compounds (Sn)	2 mg/m ³	2 mg/m ³
Vanadium (V)	"C" 0.5 mg/m ³ (as V2O5 respirable dust) "C" 0.1 mg/m ³ (as V2O5 fume)	0.05 mg/m ³ (as V2O5, inhalable fraction)
Zinc (Zn)	5 mg/m ³	2 mg/m ³
Zirconium (Zr)	5 mg/m ³	5 mg/m ³ STEL: 10 mg/m ³

NE - None Established, if none established, see "Particulate Where No Limit Has Been Established" in first row or specific compounds created by welding, etc.

Notes:

1. OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a Ceiling Limit, which should not be exceeded during any part of the workday unless otherwise noted. A Short Term Exposure Limit (STEL) is a 15-minute exposure, which should not be exceeded.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL): Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
4. Inhalable fraction. The concentration of inhalable particulate is to be determined from the fraction passing a size-selector per OSHA, ACGIH and other regulatory agencies.
5. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit.
6. Respirable fraction - The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH 2014 TLVs® and BEIs® Appendix D, paragraph C
7. PNOS (Particles Not Otherwise Specified). Particles not specified are covered by the PNOS limit.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid -	APPEARANCE AND COLOR: Silver /Gray Color
ODOR: None	ODOR THRESHOLD: Not Available
pH: Not Available	EVAPORATION RATE: Not Available
BOILING Range: Not Available	INITIAL BOILING POINT: Not Available
MELTING POINT: 900°F - 3200°F	VAPOR PRESSURE (mmHg): Not Available
SPECIFIC GRAVITY (H2O=1): >3	VAPOR DENSITY (AIR=1): Not Available
EVAPORATION RATE: Not Available	% VOLATILES BY VOLUME: None

9. PHYSICAL AND CHEMICAL PROPERTIES (CONTINUED)	
FLASH POINT: None	FLAMMABLE LIMITS V/V% LEL: None UEL: None
RELATIVE DENSITY: Not Available	PARTIAL COEFFICIENT: N-OCTANOL/ WATER: Not Available
SOLUBILITY IN WATER = Negligible	AUTO-IGNITION TEMPERATURE: Not Available
VISCOSITY: Not Available	DECOMPOSITION TEMPERATURE: Not Available
10. STABILITY AND REACTIVITY	
REACTIVITY	Hazardous reactions should not occur with solid product under normal conditions.
STABILITY/ CHEMICAL STABILITY	These alloys are stable materials under normal handling and storage conditions.
CONDITIONS TO AVOID	Avoid strong acids or bases. Avoid creating or spreading dust. Sparks, heat, open flame and other sources of ignition. Avoid contact with carbon monoxide, particularly at temperatures between 50°C and 300° C, to prevent formation of nickel carbonyl which is toxic and a carcinogen. Halogenated hydrocarbons can react violently with finely divided aluminum.
INCOMPATIBLE MATERIALS	If dusts or finely divided materials are produced, avoid strong oxidizers – violent reaction with heat generation. Acids and Alkalis – reacts to generate hydrogen. Water and aluminum mixtures may be hazardous when confined due to hydrogen generation. If corrosion occurs, hydrogen might be evolved, causing a potentially explosive environment in confined areas. Hydrofluoric acid or hydrofluoric-nitric acid mixtures rapidly dissolve alloys. Niobium and Zirconium alloys will ignite in cold fluorine and above 200°C will react exothermically with chlorine, bromine, fluorine, iodine, and halocarbons such as carbon tetrachloride, carbon tetrafluoride and freons. Nitryl-fluoride, FNO ₂ will initiate a reaction at room temperature to produce a glowing or white incandescence.
HAZARDOUS DECOMPOSITION PRODUCTS	Solid metal will not decompose without combustion and/or chemical reaction. Products include elemental metals, metal oxides, metal compounds including products listed in handling precautions (section 7) and decomposition products (directly above).
POSSIBILITY OF HAZARDOUS REACTIONS	Should not occur with solid metal.
11. TOXICOLOGICAL INFORMATION	
TOXICITY DATA	Eye: Rabbit (cobalt) unknown amount produced severe reaction with abscess involving lens, ciliary body, vitreous humor and retina.
	Skin: No data.
	Ingestion: Guinea Pig (nickel): LD ₅₀ : 5 mg/kg Mouse (boron): LD ₅₀ : 560 mg/kg Rat (cobalt): LD ₅₀ : 6,171 mg/kg Rabbit (cobalt): LD ₅₀ : 750 mg/kg Human (copper): TD _{Lo} : 120 µg/kg, affects the gastrointestinal tract (nausea or vomiting). Human (chromium): LD _{Lo} : 71 mg/kg Rat (Iron): LD ₅₀ : 30,000 mg/kg Rat (manganese) LD ₅₀ : 9,000 mg/kg Rabbit (Silicon Dioxide): LD ₅₀ : >5,000 mg/kg Rat (Titanium): LD ₅₀ : >5,000 mg/kg
	Inhalation: Rabbit (nickel): TC _{Lo} : 130 µg/m ³ 35 weeks (intermittent) - 6 hours Human (chromium VI): TC _{Lo} : 110 µg/m ³ 3 years (continuous) tumorigenic (carcinogenic per RTECS) Pig (cobalt): TC _{Lo} : 100 µg/m ³ /6 hours for 13 weeks (intermittent) Human (manganese): TC _{Lo} : 2300µg/m ³ Rat (titanium): LC ₅₀ : >6,820 mg/ m ³
	Subchronic: Rat (molybdenum) inhalation: 12-16 g/m ³ /1 hour/30 days, resulted in slight growth depression, and thickening of the intra-alveolar septa, which contained connective tissue fibers.
	Other: Dog (nickel) Intravenous: LD _{Lo} : 10 mg/kg Rat (chromium), Implant: TD _{Lo} : 1200 µg/kg intermittent over 6 weeks. Rat (cobalt) intramuscular: 126 mg/kg, tumorigenic at site of application. Rabbit (molybdenum) intra-tracheal: LD _{Lo} : 70 mg/kg produced focal fibrosis (pneumoconiosis).
	Nickel alloys and hexavalent chromium compounds are listed as carcinogens by IARC. Detailed information from these sources may be obtained from the following: IARC Monographs on the evaluation of carcinogenic risk of Chemicals to Man; and the NTP annual report on carcinogens, NTP Public Information Office, MD B204 Box 12233, Research Triangle Park, North Carolina 27709.
	Welding Fumes: Follow OSHA and NIOSH methods for monitoring of welding fumes to determine exposure potential.
	Teratology: Rat (nickel) oral: TDLo: 158 mg/kg Rat (molybdenum) oral: 5800 µg/kg given to female 30 weeks prior to mating and during days 1-20 of pregnancy caused specific musculoskeletal system development abnormalities.
	Reproduction: Rat (molybdenum) oral: 6050 µg/kg given to female 35 weeks prior to mating produced pre-, and post-implantation mortality. Rat (cobalt) unspecified exposure route, 0.05 mg/kg continuous, administered throughout gestation to female was embryotoxic.
	Mutagenicity: Hamster (chromium III) lung cell: 34 mg/L caused sister chromatid exchange. Human (cobalt) DNA damage: Human Leukocyte 3mg/L. Human (Chromium VI) DNA damage: Human Leukocyte 50µmol/L.

12. ECOLOGICAL INFORMATION

In solid form these alloys pose no special environmental problems. Metal powders or dusts may have significant impact on air, land and water quality. Airborne emissions, spills, and releases to the environment (discharge to streams, sewer systems, surface soil, etc.) should be controlled immediately.

Ecotoxicity: Few plants accumulate cobalt at greater than 100 ppm, the level at which severe phytotoxicity would occur. The potential for bioaccumulation of Cobalt by both aquatic and terrestrial organisms is low with trophic transfer factors less than 1. There is little tendency for chromium III bioaccumulation along the food chain. Terrestrial plants can contain enough molybdenum to be toxic to animals but still grow normally.

Molybdenum; (fathead minnow), LC₅₀: 370 mg/L/96 hours. Terrestrial plants can contain enough molybdenum to be toxic to animals but still grow normally.

Environmental Fate: In water, cobalt is adsorbed greatly to hydrolysate or oxidate sediments. It may be taken into solution in small amounts through bacteriological activity. In water, molybdenum will precipitate out with natural calcium. In water, chromium III oxide is expected to eventually precipitate to sediments. In air, chromium III oxide is primarily removed by fallout and precipitation. Soils with a high chromium content (>0.2%) are expected to be infertile. The half-life of chromium in soils may be several years.

Manganese undergoes complex geochemical cycling, and can accumulate in the top layer of sediment in lakes. In water, molybdenum will precipitate out with natural calcium. Soil levels should not exceed 50 ppm to avoid problems with livestock.

13. DISPOSAL CONSIDERATIONS

Whenever possible, recover alloys for reuse or recycling. Solid metal is not a hazardous waste per U.S. E.P.A. If material has been processed, analyze and dispose of waste material in accordance with local, state, or federal regulations. For specific labeling, packing, storage, transportation, and disposal procedures, contact an Environmental Engineer or consultant familiar with waste disposal regulations.

14. TRANSPORT INFORMATION

As sold, these solid alloys are not regulated by the U.S. Department of Transportation and the International Air Transport Association. Note: metals transported in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may uncoil to try to lay flat when banding is cut or forces are released; this can be sudden and catastrophic and measures should be taken to ensure that uncoiling will not occur.

The following information should be used by individuals with "Function-specific Training" required by U.S. Department of Transportation 49 CFR 172.704, and Dangerous Goods Regulations published by the International Air Transport Association (IATA).

Shipping Name	Not applicable, however, if alloy dust or powder is created, it may be a flammable solid or spontaneously combustible material (DOT hazard class 4.1 and 4.2, respectively). A sample of metal powder should be tested according to the U.N. manual of tests and criteria. See 49 CFR 173.124 (a) and (b).
Identification Number	Not Available (Determine by test results)
Hazard Class	Not Available (Determine by test results)
Label(S) Required	Not Available (Determine by test results)

15. REGULATORY INFORMATION

SPECIFIC U.S. EPA REGULATIONS: Toxic Substance Control Act: Components of this material (see section 3) are listed in the TSCA inventory.

CERCLA: Components of this material (section 3) are listed as Hazardous Substances

EPA Superfund Amendment and Reauthorization Act (SARA) of 1986 Section 311/312(SARA Title III): Components of this material (section 3) are listed in SARA Title III, Section 311/312

EPA, SARA Section 313: Components of this material (section 3) are listed Section 313 and subject to Toxic Release Inventory reporting.

SARA Title III Hazard Categorization: Dust and fume are categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370. Product is not categorized as a fire hazard, reactivity hazard or pressure release hazard.

CALIFORNIA PROPOSITION 65: Listed components known by the state to cause cancer, including Nickel, and Cobalt (metal powder). As sold, nickel is in alloy form. See section 3 for other constituents. During welding, melting, etc., may produce oxides and other compounds of the metals listed in section 3 including hexavalent chromium compounds which are listed in California's "Safe Drinking Water and Toxic Enforcement Act of 1986" (Proposition 65).

16. OTHER INFORMATION

Revision Date: August 5, 2015

This information is designed only as guidance for safe handling, use, storage, transportation, and disposal and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Information contained herein is believed to be true and accurate at the date of its publication, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, and local laws and regulations remain the responsibility

Trademarks: Several materials described in these Safety Data Sheets are proprietary alloys produced under license from various manufacturers. They are identified by the following subscript numbers:

¹Registered Trademark of AK Steel Corporation

²Registered Trademark of Carpenter Technology Corporation

³Registered Trademark of Special Metals Corporation

⁴Registered Trademark of ATI Allegheny Companies

⁵Registered Trademark of Haynes International, Inc.

⁶Registered Trademark of United Technologies Corporation

Ulbrich Stainless Steels & Special Metals, Inc.
Safety Data Sheet (SDS) 003

SECTION 1: IDENTIFICATION

Product Identifier: Carbon Steels designated as follows: AISI-SAE 1050; 1006; 1008; 1010; 1040; 1065; 1070; 1074; 1075; 1095
 Notice on Coated Materials: This SDS is for uncoated materials. Ulbrich occasionally has material coated for customers. Purchasers of coated materials should assure that they have the SDS for the coated material that they purchase.

Product Form: Metal Alloy/Mixture

Intended Use of the Product: Carbon steel, various uses



Supplier's Details: [Ulbrich Stainless Steels & Special Metals, Inc.](#)

153 Washington Avenue, P.O. Box 294,
 North Haven, CT USA, 06473-1191
 Phone Number (203) 239-4481 • (800) 243-1676
 SDS Technical Contact Weekdays (203) 265-8299
 FAX: (203) 239-7479 • E-Mail: information@ulbrich.com
 Chemtrec 800-424-9300
 Emergency Telephone Number (203) 239-4481

SECTION 2: HAZARDS IDENTIFICATION

Classification (GHS-US): Most products covered by this SDS are articles and, as such, are not considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1910.1200). Materials resulting from machining these products may be considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1200).

Label Elements: **Signal word, hazard statement(s), symbols and precautionary statement(s):**

SYMBOLS	HAZARD CLASSIFICATION	SIGNAL WORD	HAZARD STATEMENTS
	Carcinogenicity - 2 Specific Target Organ Toxicity (STOT) Repeat Exposure -1	Danger	Dust/fumes suspected of causing cancer via inhalation. Inhalation of dust/fumes causes damage to respiratory tract through prolonged or repeated exposure.
	Skin Sensitization - 1		Dust/fumes may cause an allergic skin reaction.
NA	Eye Irritation - 2B		Causes Eye Irritation

PRECAUTIONARY STATEMENT(S)

Do not handle until all safety precautions have been read and understood.

Avoid breathing dust/fumes.

Use personal protective equipment as required.

If exposed or concerned: Get medical advice/attention.

STORAGE	DISPOSAL
Store locked up. Store away from strong oxidizers, acids and incompatible materials. Dust and/or powders may form explosive mixtures with air or fluids. Store in accordance with federal/ provincial/state or local regulations.	Metal scrap should be recycled whenever possible Dispose of in accordance with federal, state and other regulations

Medical Conditions Aggravated By Exposure: If excessive concentrations of dust or welding fume are inhaled, individuals with impaired pulmonary function, disease, respiratory condition, etc. may incur further damage. Individuals who may have an allergy or sensitivity to metals may encounter skin rash or dermatitis. If prior damage or disease to neurological, circulatory, hematologic or renal systems has occurred, proper screening/examinations should be conducted on exposed individuals.

Hazards not otherwise classified: None Known, No data available

Unknown acute toxicity statement (mixture): None Known, No data available

SECTION 3: COMPOSITION/ INFORMATION ON INGREDIENTS

STANDARD CARBON STEELS

ALLOY	UNS No.	CONSTITUENT(S)		% Maximum unless otherwise shown.			
AISI-SAE		C	Mn	Fe	P	Other	Other
1006	G10060	0.08	0.25/0.40	BAL	P 0.04		
1008	G10080	0.10	0.30/0.50	BAL	P 0.05		
1010	G10100	0.08/0.13	0.30/0.60	BAL	P 0.04		
1040	G10400	0.36/ .44	0.60/0.90	BAL	P 0.04		
1050	G10500	0.4/0.55	0.60/0.90	BAL			
1065	G10650	0.60/0.70	0.60/0.90	BAL			
1070	G10700	0.65/0.75	0.60/0.90	BAL			
1074	G10740	0.70/0.80	0.50/0.80	BAL			
1075	61 0750	0.70/0.80	0.40/0.70	BAL			
1095	G10950	0.90/1.03	0.30/0.50	BAL			
CAS Number		7440-44-0	7439-96-5	7439-89-6	7723-14-0		

BAL = Balance Min = minimum Max = maximum x/x = minimum to maximum

All commercial metals may contain trace amounts of various elements (less than 0.1%) in addition to those specified. These small quantities frequently originate in the raw material used.

4. FIRST AID MEASURES

Description of necessary measures:

Inhalation: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned, experiencing respiratory symptoms, or feel unwell: Get medical advice/attention or call a poison center or doctor/physician.

Eye Contact: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with water for 15 minutes. Remove contact lenses, if present and easy to do. Do not allow victim to rub or keep eyes tightly shut. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin Contact: If on skin: Wash thoroughly after handling. Wash with plenty of water. If irritation or rash occurs: Get medical advice, attention. Skin cuts and abrasions can be treated by standard first aid or medical treatment. Quickly remove dust contaminated clothing but do not shake clothing.

Ingestion: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if swallowed: Call a poison center or doctor/physician if you feel unwell. Rinse mouth. If exposed, concerned or feel unwell: Get medical advice/attention.

Most important symptoms/effects, acute and delayed (chronic):

Symptoms: May cause allergic skin reaction. May cause acute gastrointestinal effects if swallowed.

Note to Physicians: Treat symptomatically

5. FIRE FIGHTING MEASURES

FLASH POINT (WITH TEST METHOD)

None

FLAMMABLE (EXPLOSIVE) LIMITS V/V%

LEL: None

UEL: None

Suitable (and unsuitable) Extinguishing Media: Not Applicable for solid carbon steel as sold/shipped. Use extinguishers appropriate for surrounding materials.

Specific Hazards arising from the chemical: Not Applicable for solid carbon steel as sold/shipped. When burned, toxic smoke, fume and vapor may be emitted.

Special protective equipment and precautions for fire-fighters: Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

6. ACCIDENTAL MATERIAL RELEASE OR SPILL CONTROL MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Not Applicable for solid carbon steel as sold/shipped. For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. If material is in a dry state, avoid inhalation of dust.

Methods and materials for containment and clean up: Not Applicable for solid carbon steel as sold/shipped. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

7. HANDLING AND STORAGE

Handling Precautions	Wear cut resistant gloves and clothing to avoid cuts. Metal in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may suddenly uncoil to try to lay flat in a long strip when banding is cut or other forces are released. Measures should be taken to ensure that uncoiling will not occur. Machining of alloys may result in fine turnings, chips, dust, or fumes. Small diameter materials may be combustible or flammable. Keep this material away from any source of ignition. Keep fines and turnings completely dry or very wet (more than 25% water content by weight) for handling safety. Explosions can result from ignition of powder or machining fines containing moisture. Fires and explosions can result from dispersing fines and dust in air, especially if confined. Avoid these conditions. Avoid dust inhalation and eye or skin contact. Wear personal protective equipment to prevent contact with skin and eyes (Section 8). Practice good personal hygiene after handling, especially before eating, drinking, smoking, or applying cosmetics.
Storage Precautions	In solid form this material poses no special problems. Avoid breathing dust or fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment or both.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation Local exhaust ventilation should be used to control exposure to airborne dust and fume emissions near the source (during crushing, grinding, welding, etc.). Assure exposure is less than regulatory limits.

Respiratory Protection None required as shipped, if processing emits welding fumes, airborne dusts or other hazards use NIOSH approved respirator as specified by an industrial hygienist or safety professional. Obtain medical approval for users of respirators. Use a welding fume respirator or air supplied respirator where local exhaust or ventilation does not keep exposure below overexposure limits.

Eye Protection Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc. Contact lenses should not be worn if working with metal dusts and powders.

Skin Protection Wear gloves as necessary to prevent metal cuts, skin abrasions and skin contact. Protective clothing such as arm, foot, body protection etc., may be required during handling operations as appropriate for the exposure.

Recommended Monitoring Procedures No medical surveillance required while working with metal in massive form. If processing creates dust, fume or other hazard, conduct industrial hygiene evaluation of processes. Follow requirements for medical surveillance of product constituents, compounds and fume if welding fume, dust or other hazards are created by customer processing or handling.

Occupational Exposure Limits (OELs): This product in the physical form it is sold does not present an inhalation hazard. However, operations including, but not limited to, cutting, welding, and grinding may produce fumes and/or particulates. The following exposure limits are for the constituents of the materials under these and similar processes.

Constituents	OSHA PEL ¹	ACGIH TLV ²
OSHA ACGIH Particulate:	15 mg/m ³ , total dust (PNOR)	10 mg/m ³ (as inhalable fraction, PNOS)
No Limit Established	5.0 mg/m ³ , respirable fraction (PNOR)	3.0 mg/m ³ (as respirable fraction, PNOS)
Carbon (C)	N/A	N/A
Iron (Fe)	10 mg/m ³ (as iron oxide fume)	5.0 mg/m ³ (as iron oxide dust and fume)
Manganese (Mn)	"C" 5.0 mg/m ³ (as Fume & Mn compounds)	0.2 mg/m ³
Phosphorus elemental (P)	0.1 mg/m ³	0.02 ppm (0.1mg/m ³)

NE - None Established, if none established, see "Particulate Where No Limit Has Been Established" in first row or specific compounds created by welding, etc.

Notes:

1. OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a Ceiling Limit, which should not be exceeded during any part of the workday unless otherwise noted. A Short Term Exposure Limit (STEL) is a 15-minute exposure, which should not be exceeded.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL): Compendium of Policy and Statements. NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
4. Inhalable fraction. The concentration of inhalable particulate is to be determined from the fraction passing a size-selector per OSHA, ACGIH and other regulatory agencies.
5. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit.
6. Respirable fraction - The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH 2014 TLVs® and BEIs® Appendix D, paragraph C
7. PNOS (Particles Not Otherwise Specified). Particles not specified are covered by the PNOS limit.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid	APPEARANCE AND COLOR: Metallic Gray Color
ODOR: Odorless	ODOR THRESHOLD: Not Available
pH: Not Available	EVAPORATION RATE: Not Available
BOILING Range: Not Available	INITIAL BOILING POINT: Not Available
MELTING POINT: 1000°F - 3200°F	VAPOR PRESSURE (mmHg): Not Available
SPECIFIC GRAVITY (H ₂ O=1): 7.5 - 8.0	VAPOR DENSITY (AIR=1): Not Available
EVAPORATION RATE: Not Available	% VOLATILES BY VOLUME: None
FLASH POINT: None	FLAMMABLE LIMITS V/V% LEL: None UEL: None
RELATIVE DENSITY: Not Available	PARTIAL COEFFICIENT: N-OCTANOL/ WATER: Not Available
SOLUBILITY IN WATER = None	AUTO-IGNITION TEMPERATURE: Not Available
VISCOSITY: Not Available	DECOMPOSITION TEMPERATURE: Not Available

10. STABILITY AND REACTIVITY

REACTIVITY	Hazardous reactions should not occur under normal conditions.
STABILITY/ CHEMICAL STABILITY	These alloys are stable materials under normal handling and storage conditions.
CONDITIONS TO AVOID	Avoid strong acids or bases. Avoid creating or spreading dust. Sparks, heat, open flame and other sources of ignition.
INCOMPATIBLE MATERIALS	Strong acids, strong bases, strong oxidizers. Alkalis. Metal oxides. Water, humidity. Corrosive substances in contact with metals may produce flammable hydrogen gas.
HAZARDOUS DECOMPOSITION PRODUCTS	Solid metal will not decompose without combustion and/or chemical reaction. Elemental metals, metal oxides, metal compounds including chromium compounds, acids.
POSSIBILITY OF HAZARDOUS REACTIONS	Should not occur.

11. TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product LD50 and LC50 Data: Not available Skin Corrosion/Irritation: Not classified Aspiration Hazard: Not classified Carcinogenicity: Not classified. Reproductive Toxicity: Not classified. Germ Cell Mutagenicity: Not classified Teratogenicity: Not classified Serious Eye Damage/Irritation: Not classified Respiratory or Skin Sensitization: Not classified.	Specific Target Organ Toxicity (Single Exposure): Not classified Symptoms/injuries after inhalation: Inhalation of dusts/fumes can cause metal fume fever. Symptoms include metallic or sweet taste in the mouth, sweating, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath. Dust may cause irritation to, nose, throat and lungs. Symptoms/Injuries After Skin Contact: May cause an allergic skin reaction. Dust from physical alteration of this product causes skin irritation. Causes severe skin burns. Contact with fumes or metal powder will irritate skin. Contact with hot, molten metal will cause thermal burns. Dust may cause irritation in skin folds or by contact in combination with tight clothing. Danger from flying particles or slag is possible. Symptoms/injuries after eye contact: dust may cause mechanical eye & other irritation.
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Symptoms/injuries after ingestion: Ingestion is likely to be harmful or have adverse effects. Specific Target Organ Toxicity (Repeated Exposure): Not classified.	Chronic Symptoms: In massive form, no hazard exists. If physically altered to present slivers, dusts, fumes, etc.: Inhalation of iron oxide fumes undergoing decomposition may cause irritation and flu-like symptoms. Manganese: Chronic exposure can cause inflammation and scarring of the lungs.
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12. ECOLOGICAL INFORMATION

In solid form these alloys pose no special environmental problems. Metal powders or dusts may have an impact on air, land and water quality. Airborne emissions, spills, and releases to the environment (discharge to streams, sewer systems, surface soil, etc.) should be controlled immediately.

Manganese undergoes complex geochemical cycling, and can accumulate in the top layer of sediment in lakes. In water, molybdenum will precipitate out with natural calcium. Soil levels should not exceed 50 ppm to avoid problems with livestock.

13. DISPOSAL CONSIDERATIONS

Whenever possible, recover alloys for reuse or recycling. Solid metal is not a hazardous waste per U.S. E.P.A. If material has been processed, analyze and dispose of waste material in accordance with local, state, or federal regulations. For specific labeling, packing, storage, transportation, and disposal procedures, contact an Environmental Engineer or consultant familiar with waste disposal regulations.

14. TRANSPORT INFORMATION

As sold, these solid alloys are not regulated by the U.S. Department of Transportation or the International Air Transport Association. Note: metals transported in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may uncoil to try to lay flat when banding is cut or other forces are released; measures should be taken to ensure that uncoiling will not occur.

The following information should be used by individuals with "Function-specific Training" required by U.S. Department of Transportation 49 CFR 172.704, and Dangerous Goods Regulations published by the International Air Transport Association (IATA).

SHIPPING NAME	Not Available for solid alloys. If alloy dust or powder is created, it may be a flammable solid or spontaneously combustible material (DOT hazard class 4.1 and 4.2, respectively). A sample of metal powder should be tested according to the U.N. manual of tests and criteria. See 49 CFR 173.124 (a) and (b).
IDENTIFICATION NUMBER	Not Available (Determine by test results)
HAZARD CLASS	Not Available (Determine by test results)
LABEL(S) REQUIRED	Not Available (Determine by test results)

15. REGULATORY INFORMATION

SPECIFIC U.S. EPA REGULATIONS	Toxic Substance Control Act: Components of this material (see section 3) are listed in the TSCA inventory. CERCLA: Components of this material (section 3) are listed as Hazardous Substances EPA Superfund Amendment and Reauthorization Act (SARA) of 1986 Section 311/312(SARA Title III): Components of this material (section 3) are listed in SARA Title III, Section 311/312 EPA, SARA Section 313: Components of this material (section 3) are listed Section 313 and subject to Toxic Release Inventory reporting. SARA Title III Hazard Categorization: Dust and fume are categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370. Product is not categorized as a fire hazard, reactivity hazard or pressure release hazard.
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16. OTHER INFORMATION

Revision Date: August 5, 2015

This information is designed only as guidance for safe handling, use, storage, transportation, and disposal and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Information contained herein is believed to be true and accurate at the date of its publication, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, and local laws and regulations remain the responsibility of the user.

Trademarks: Several materials described in these Safety Data Sheets are proprietary alloys produced under license from various manufacturers. They are identified by the following subscript numbers:

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⁵Registered Trademark of Haynes International, Inc.

⁶Registered Trademark of United Technologies Corporation

Ulbrich Stainless Steels & Special Metals, Inc.
Safety Data Sheet (SDS) 004

SECTION 1: IDENTIFICATION

Product Identifier: Copper, Brass and Phosphor Bronze Alloys, designated as follows: ETP Copper and OFHC Copper (UNS C11000 and UNS C10200); Brass (UNS C21000, C22000, C22600, C23000 C24000 C26000 C27200); Phosphor Bronze (UNS C50500, C50700, C51000, C51100, C51900, C52100 and C52400)

Intended Use of the Product: Metal products, various uses

Supplier's Details: Ulbrich Stainless Steels & Special Metals, Inc.

153 Washington Avenue, P.O. Box 294,
 North Haven, CT USA, 06473-1191
 Phone Number (203) 239-4481 • (800) 243-1676
 FAX: (203) 239-7479 • E-Mail: information@ulbrich.com
 Emergency Telephone Number (203) 239-4481; Chemtrec 800-424-9300

SECTION 2: HAZARDS IDENTIFICATION

Classification (GHS-US): Most products covered by this SDS are articles and, as such, are not considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1910.1200). Materials resulting from machining these products may be considered hazardous under the 2012 OSHA Hazardous Communications Standard (29 CFR 1200).

Specific Target Organ Toxicity (Repeated Exposure) - Category 1

Eye Damage/Irritation - Category 2B

Respiratory Sensitizer - Category 1

Skin Sensitizer - Category 1

Germ Cell Mutagenicity - Category 2

Carcinogenicity - Category 1B

Toxic to Reproduction - Category 1A

Label Elements:

Emergency Overview

Signal Word: Danger

Hazard statements:

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

May cause an allergic skin reaction.

Suspected of causing genetic defects.

May cause cancer.

May damage fertility or the unborn child.

Causes damage to respiratory system through prolonged or repeated exposure.

Harmful if swallowed

Causes eye irritation.



Appearance Various massive product

Physical state Solid

Odor Odorless

Precautionary Statements - Prevention

Wear protective gloves/protective clothing/eye protection/face protection.

Do not breathe dust/fume.

In case of inadequate ventilation wear respiratory protection.

Contaminated work clothing should not be allowed out of the workplace.

Obtain special instructions before use

Do not handle until all safety precautions have been read and understood

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

Avoid release to the environment

Take off and wash contaminated clothing before reuse.

Precautionary Statements - Response

In case of fire: Use Class D agent to extinguish.

IF IN EYES: Rinse cautiously with water for several minutes.

Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists get medical advice/attention.

IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a poison center/doctor.

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

If exposed or concerned: Get medical advice/attention.

Get medical advice/attention if you feel unwell.

STORAGE

Store locked up. Store away from acids and incompatible materials.

Store in accordance with federal/state or other regulations.

Dust and/or powders may form explosive mixtures with air or fluids.

DISPOSAL

Metal scrap should be recycled whenever possible

Dispose of in accordance with applicable federal, state and other regulations

Hazards not otherwise classified: None Known, No data available

Unknown acute toxicity statement (mixture): None Known, No data available

SECTION 3: COMPOSITION/ INFORMATION ON INGREDIENTS

ALLOY	UNS No.	CONSTITUTENT(S) % Nominal unless otherwise shown.				
		Cu	Sn	Zn	Pb	P
Phosphor Bronze 505	C50500	98.75	1.25	<0.3	0.0-0.05	<0.35
Phosphor Bronze 507	C50700	98	2	<0.3	0.0-0.05	<0.35
Phosphor Bronze 510	C51000	95	5	<0.3	0.0-0.05	<0.35
Phosphor Bronze 511	C51100	96	4	<0.3	0.0-0.05	<0.35
Phosphor Bronze 519	C51900	94	6	<0.2	0.0-0.05	<0.15
Phosphor Bronze 521	C52100	92	8	<0.2	0.0-0.05	<0.35
Phosphor Bronze 524	C52400	90	10	<0.2	0.0-0.05	<0.35
ETP Copper	C11000	>99.9				
Oxygen Free Copper	C10200	>99.9				
Brass 210	C21000	95		4-6	0.0-0.05	
Brass 220	C22000	90		9-11	0.0-0.05	
Brass 226	C22600	88		11-14	0.0-0.05	
Brass 230	C23000	85		14-16	0.0-0.05	
Brass 240	C24000	80		18.5-21.5	0.0-0.05	
Brass 260	C26000	70		30	0.04-0.07	
Brass 272	C27200	63		37	0.05-0.08	
CAS Number		7440-50-8	7440-31-5	7440-66-6	7439-92-1	7723-14-0

>Greater Than

< Less Than

x-x = minimum to maximum

All commercial metals may contain trace amounts of various elements (less than 0.1%) in addition to those specified. These small quantities frequently originate in the raw material used.

4. FIRST AID MEASURES

Eye Contact:	Immediately flush out fume and dust particles with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If eye irritation develops, call a physician at once.
Skin Contact:	If exposed to dust or fumes, wash skin with plenty of water. Remove contaminated clothing and shoes and launder before reuse. If skin irritation or rash develops and persists or recurs, get medical advice/attention.
Inhalation:	If symptoms of lung irritation occur (coughing, wheezing or breathing difficulty), remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep affected person warm and at rest. Get medical advice/attention.
Ingestion:	Not a likely route of exposure for finished metal alloy. If dust is ingested, immediately drink water to dilute. Consult a physician if symptoms develop.

Description of necessary measures:

Inhalation: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned, experiencing respiratory symptoms, or feel unwell: Get medical advice/attention or call a poison center or doctor/physician.

Eye Contact: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with water for 15 minutes. Remove contact lenses, if present and easy to do. Do not allow victim to rub or keep eyes tightly shut. Continue rinsing. If eye irritation persists, get medical advice/ attention.

Skin Contact: If on skin: Wash thoroughly after handling. Wash with plenty of water. If irritation or rash occurs: Get medical advice/ attention. Skin cuts and abrasions can be treated by standard first aid or medical treatment. Quickly remove dust contaminated clothing but do not shake clothing.

Ingestion: As sold/shipped material is in solid form, not a likely form of exposure. However during processing (welding, grinding, burning, etc.), if swallowed: Call a poison center or doctor/physician if you feel unwell. Rinse mouth. If exposed, concerned or feel unwell: Get medical advice/attention.

Note to Physicians: There is no specific antidote to the active ingredients in this product; use symptomatic treatment. Refer to Section 11-TOXICOLOGY INFORMATION.

Immediate Medical Attention and Special Treatment: None Known

5. FIRE FIGHTING MEASURES

FLASH POINT (WITH TEST METHOD)	None
FLAMMABLE (EXPLOSIVE) LIMITS V/V%	LEL: None UEL: None
EXTINGUISHING MEDIA	Not flammable in the form of this product as distributed. Flammable as finely divided pieces resulting from processing of this product. Type D fire extinguisher. Carbon dioxide is not effective in extinguishing burning metals.
SPECIAL FIREFIGHTING PROCEDURES	Do not spray water on burning metal as an explosion may occur. To extinguish a metal fire, smother with dry sand, salt (NaCl) or other class "D" fire extinguishing powder.
UNUSUAL FIRE AND EXPLOSION HAZARDS	No unusual fire or explosion hazards from solid alloys in massive form. Dust, chips, thin strips, etc. created by grinding or processing can ignite if a substantial number of small particles are dispersed or adequate ignition source is present. The hazard increases with finer particles. An explosion may follow a fire initiated in a mass of wet metal fines. The explosive characteristics of such material is caused by the steam and hydrogen generated within the burning mass. Metals may react exothermically with acids and oxidizers. Do not spray water on burning metal as a violent explosion may result. In molten state: reacts violently with water (moisture).
HAZARDOUS COMBUSTION PRODUCTS	Various metal oxides are hazardous. Also, may cause metal fume fever.
INCOMPATIBILITY (MATERIALS TO AVOID)	Strong acids, strong bases, strong oxidizers. Alkalis. Metal oxides. Water, humidity. Corrosive substances in contact with metals may produce flammable hydrogen gas.

6. ACCIDENTAL MATERIAL RELEASE OR SPILL CONTROL MEASURES

In solid form this material poses no special clean-up problems. If this material is in powder or dust form, do not dry sweep. Clean-up should be conducted with a grounded vacuum system utilizing high efficiency particulate air (HEPA) filtration. Caution should be taken to minimize airborne generation of powder or dust and avoid contamination of air, land and water. Prevent entry to sewers and public waters. Cleanup personnel should protect against dust inhalation and skin or eye contact, follow handling precautions below, and use non-sparking tools. Properly label all materials collected in waste container. Follow applicable OSHA regulations (29 CFR), EPA regulations (40 CFR), Canadian Workplace Hazardous Materials Information System (WHMIS) Regulations, and other regulatory requirements.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS	<p>Wear cut resistant gloves and clothing to avoid cuts. Metal in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may suddenly uncoil to try to lay flat in a long strip when banding is cut or other forces are released. Measures should be taken to ensure that uncoiling will not occur. Machining of alloys may result in fine turnings, chips, dust, or fumes. Small diameter materials may be combustible or flammable. Keep this material away from any source of ignition.</p> <p>Explosions can result from ignition of powder or machining fines containing moisture. Fires and explosions can result from dispersing fines and dust in air, especially if confined. Avoid these conditions. Avoid dust inhalation and eye or skin contact. Wear personal protective equipment to prevent contact with skin and eyes (Section 8). Practice good personal hygiene after handling, especially before eating, drinking, smoking, or applying cosmetics.</p>
STORAGE PRECAUTIONS	In solid form this material poses no special problems. Avoid breathing dust or fume. If the use of this material produces dust or fume, use appropriate ventilation controls, personal protective equipment or both.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION	Local exhaust ventilation should be used to control exposure to airborne dust and fume emissions near the source (during crushing, grinding, welding, etc.). Assure exposure is less than regulatory limits.
RESPIRATORY PROTECTION	None required as shipped, if processing emits welding fumes, airborne dusts or similar hazards use NIOSH approved respirator as specified by an industrial hygienist/safety professional. Obtain medical approval for respirator users. Use a welding or air supplied respirator where local exhaust or ventilation does not keep exposure below overexposure limits.
EYE PROTECTION	Wear safety glasses when risk of eye injury is present particularly during machining, grinding, welding, powder handling, etc. Contact lenses should not be worn if working with metal dusts and powders.
SKIN PROTECTION	Wear gloves as necessary to prevent metal cuts, skin abrasions and skin contact. Protective clothing such as arm, foot, body protection etc., may be required during handling operations as appropriate for the exposure.
RECOMMENDED MONITORING PROCEDURES	No medical surveillance required while working with metal in massive form. If processing creates dust, fume or other hazard, conduct industrial hygiene evaluation of processes. Follow requirements for medical surveillance of product constituents, compounds and fume if welding fume, dust or other hazards are created by customer processing or handling.

Occupational Exposure Limits (OELs): This product in the physical form it is sold does not present an inhalation hazard. However, operations including, but not limited to, cutting, welding, and grinding may produce fumes and/or particulates. The following exposure limits are for the constituents of the materials under these and similar processes.

Constituents	OSHA PEL ¹	ACGIH TLV ²
OSHA ACGIH Particulate: No Limit Established	15 mg/m ³ , total dust (PNOR) 5 mg/m ³ , respirable fraction (PNOR)	10 mg/m ³ (as inhalable fraction, PNOS) 3.0 mg/m ³ (as respirable fraction, PNOS)
Copper (Cu)	0.1 mg/m ³ (as fume, Cu) 1.0 mg/m ³ (as dusts & mists, Cu)	0.1 mg/m ³ (as fume) 1.0 mg/m ³ (as dusts & mists, Cu)
Lead (Pb)	50 µg/m ³ TWA (as Pb) 30 µg/m ³ Action Level (as Pb)	0.05 mg/m ³
Phosphorus elemental (P)	0.1 mg/m ³	0.02 ppm (0.1mg/m ³)
Tin, inorganic compounds(Sn)	2 mg/m ³	2 mg/m ³
Zinc (Zn)	5 mg/m ³	2 mg/m ³

NE - None Established, if none established, see "Particulate Where No Limit Has Been Established" in first row or specific compounds created by welding, etc.

Notes:

1. OSHA PELs (Permissible Exposure Limits) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A ("C") designation denotes a Ceiling Limit, which should not be exceeded during any part of the workday unless otherwise noted. A Short Term Exposure Limit (STEL) is a 15-minute exposure, which should not be exceeded.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
3. Inhalable fraction. The concentration of inhalable particulate is to be determined from the fraction passing a size-selector per OSHA, ACGIH and other regulatory agencies.
4. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts not listed specifically by substance name are covered by the PNOR limit which is the same as the inert or nuisance dust limit.
5. Respirable fraction - The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs® and BEIs®.
6. PNOS (Particles Not Otherwise Specified). Particles not specified are covered by the PNOS limit.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid	APPEARANCE AND COLOR: Reddish/Brown Metal Color
ODOR: No Odor	ODOR THRESHOLD: Not Available
pH: Not Available	EVAPORATION RATE: Not Available
BOILING Range: Not Available	INITIAL BOILING POINT: Not Available
MELTING POINT: 800°F - 2000°F	VAPOR PRESSURE (mmHg): Not Available
SPECIFIC GRAVITY (H2O=1): 8.0 - 9.0	VAPOR DENSITY (AIR=1): Not Available
EVAPORATION RATE: Not Available	% VOLATILES BY VOLUME: None

9. PHYSICAL AND CHEMICAL PROPERTIES (CONTINUED)				
FLASH POINT: None		FLAMMABLE LIMITS V/V% LEL: None UEL: None		
RELATIVE DENSITY: Not Available		PARTIAL COEFFICIENT: N-OCTANOL/ WATER: Not Available		
SOLUBILITY IN WATER = None		AUTO-IGNITION TEMPERATURE: Not Available		
VISCOSITY: Not Available		DECOMPOSITION TEMPERATURE: Not Available		
10. STABILITY AND REACTIVITY				
REACTIVITY		Hazardous reactions should not occur under normal conditions.		
STABILITY/ CHEMICAL STABILITY		These alloys are stable materials under normal handling and storage conditions.		
CONDITIONS TO AVOID		Avoid strong acids or bases. Avoid creating or spreading dust. Sparks, heat, open flame and other sources of ignition.		
INCOMPATIBLE MATERIALS		The corrosion-resistant alloys were designed for use in, and possess outstanding resistance to, mineral acids. To a lesser extent, the high temperature alloys also withstand these acids. Be aware, however, that if corrosion does occur, hydrogen might be evolved, causing a potentially explosive environment in confined, closed systems.		
HAZARDOUS DECOMPOSITION PRODUCTS		Solid metal will not decompose without combustion and/or chemical reaction. Various elemental metals, metal oxides, metal compounds including chromium compounds, acids.		
POSSIBILITY OF HAZARDOUS		Should not occur.		
11. TOXICOLOGICAL INFORMATION				
POTENTIAL EXPOSURE ROUTES: For dust: ingestion, inhalation, and eye contact. For fume: inhalation and eye contact. The finished alloy metal is not hazardous.				
For Product: The toxicological properties of this product have not been thoroughly investigated.		For Components, Dusts or Fumes		
		Copper	Lead	Zinc
Oral LD ₅₀	Believed to be moderately toxic	3.5 mg/kg (mouse, intraperitoneal)	No data	No data
Dermal LD ₅₀	Believed to be > 2 g/kg	375 mg/kg (rabbit, subcutaneous)	No data	No data
Inhalation LC ₅₀	Believed to be slightly to moderately toxic	No data	No data	No data
Irritation	Believed to be an eye and respiratory irritant	Respiratory irritant	Not irritating	Eye irritant
SUBCHRONIC/ CHRONIC TOXICITY: No information for product. Lead has caused blood, kidney and nervous system damage in laboratory animals.				
CARCINOGENICITY: This product is not known or reported to be carcinogenic. The International Agency for Research on Cancer (IARC) lists lead as possibly carcinogenic to humans, group 2B.				
MUTAGENICITY: This product is not known or reported to be mutagenic. Lead has been shown to be mutagenic in several in vitro assays.				
REPRODUCTIVE, TERATOGENICITY, OR DEVELOPMENTAL EFFECTS: This product is not known or reported to cause reproductive or developmental effects. Lead has been shown to affect fetal development including birth defects and reduce male reproductive function in laboratory animals.				
NEUROLOGICAL EFFECTS: This product is not known or reported to cause neurological effects. Lead has caused peripheral and central nervous system damage and behavioral effects in laboratory animals.				
INTERACTIONS WITH OTHER CHEMICALS WHICH ENHANCE TOXICITY: None known or reported.				
12. ECOLOGICAL INFORMATION				
In solid form these alloys pose no special environmental problems. Metal powders or dusts may have significant impact on air, land and water quality. Airborne emissions, spills, and releases to the environment (discharge to streams, sewer systems, surface soil, etc.) should be controlled immediately.				
ECOTOXICITY: No data is available on this product. Individual constituents are as follows:				
Copper: The toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water, such as its temperature, hardness, turbidity and carbon dioxide content. Copper concentrations varying from 0.1 to 1.0 mg/l have been found by various investigators to be not toxic for most fish. However, concentrations of 0.015 to 3.0 mg/l have been reported as toxic, particularly in soft water to many kinds of fish, crustaceans, mollusks, insects, and plankton.				
Lead: LC50 (48 hrs.) to bluegill (Lepomis macrochirus) is reported to be 2-5 mg/l. Lead is toxic to waterfowl.				
MOBILITY: Dissolved lead may migrate through soil.				
PERSISTENCE/DEGRADABILITY: Lead may persist and accumulate in the environment.				
BIOACCUMULATION: No data				
13. DISPOSAL CONSIDERATIONS				
Whenever possible, recover alloys for reuse or recycling. Solid metal is not a hazardous waste per U.S. E.P.A. If material has been processed, analyze and dispose of waste material in accordance with local, state, or federal regulations. For specific labeling, packing, storage, transportation, and disposal procedures, contact an Environmental Engineer or consultant familiar with waste disposal regulations.				
14. TRANSPORT INFORMATION				
As sold, these solid alloys are not regulated by the U.S. Department of Transportation and the International Air Transport Association.				
Note: metals transported in coiled form may be under tension and represent a source of potential energy due to the tension induced by coiling; it may uncoil to try to lay flat in a long strip when banding is cut or other forces are released; uncoiling can be sudden and catastrophic and measures should be taken to ensure that uncoiling will not occur.				
The following information should be used by individuals with "Function-specific Training" required by U.S. Department of Transportation 49 CFR 172.704, and Dangerous Goods Regulations published by the International Air Transport Association (IATA).				

Shipping Name	If alloy dust or powder is created, it may be a flammable solid or spontaneously combustible material (DOT hazard class 4.1 and 4.2, respectively). A sample of metal powder should be tested according to the U.N. manual of tests and criteria. See 49 CFR 173.124 (a) and (b).
Identification Number	Not Available (Determine by test results)
Hazard Class	Not Available (Determine by test results)
Label(S) Required	Not Available (Determine by test results)
15. REGULATORY INFORMATION	
<p>SPECIFIC U.S. EPA REGULATIONS: Toxic Substance Control Act: Components of this material (see section 3) are listed in the TSCA inventory.</p> <p>CERCLA: Components of this material (section 3) are listed as Hazardous Substances</p> <p>EPA Superfund Amendment and Reauthorization Act (SARA) of 1986 Section 311/312(SARA Title III): Components of this material (section 3) are listed in SARA Title III, Section 311/312</p> <p>EPA, SARA Section 313: Components of this material (section 3) are listed Section 313 and subject to Toxic Release Inventory reporting.</p> <p>SARA Title III Hazard Categorization: Dust and fume are categorized as an immediate (acute) health hazard and a delayed (chronic) health hazard as defined by 40 CFR 370. Product is not categorized as a fire hazard, reactivity hazard or pressure release hazard.</p> <p>CALIFORNIA PROPOSITION 65: Listed components known by the state to cause cancer, including Nickel, and Cobalt (metal powder). As sold, nickel is in alloy form. See section 3 for other constituents. During welding, melting, etc., may produce oxides and other compounds of the metals listed in section 3 including hexavalent chromium compounds which are listed in California's "Safe Drinking Water and Toxic Enforcement Act of 1986" (Proposition 65).</p>	
16. OTHER INFORMATION	
Revision Date: August 5, 2015	
<p>This information is designed only as guidance for safe handling, use, storage, transportation, and disposal and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Information contained herein is believed to be true and accurate at the date of its publication, but all statements or suggestions are made without warranty, expressed or implied, regarding accuracy of the information, the hazards connected with the use of the material, or the results to be obtained from the use thereof. Compliance with all applicable Federal, State, and local laws and regulations remain the responsibility of the user.</p> <p>WEEE/ROHS/ END OF LIFE VEHICLES, AND THE JAPANESE GREEN PROCUREMENT INITIATIVE: Uncoated stainless and specialty steels are generally in conformance with the requirements of the European Union's legislation on waste electrical and electronic equipment ("WEEE"; Directive 2002/53/EC) and its companion directive on the restriction on hazardous substances used in EEE ("RoHS": Directive 2002/95/EC & 2003/11/EC), as well as EU Directive 2000/53EC on End of Life Vehicles, and the Japanese Green Procurement Initiative.</p>	



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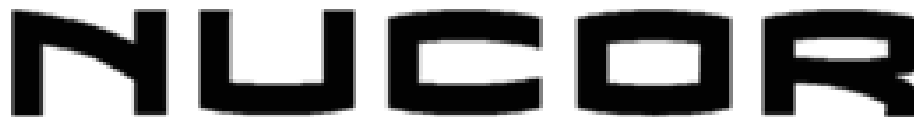
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SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: Sheet Steel

CAS Number: Not applicable

Synonyms: Hot Band, Cold Rolled, P&O, Galvanized

Use/Description: Steel for thin gauge products and sheet steel for Castrip®

Company Identification:

Nucor Steel – Arkansas
7301 E. County Road 142
Blytheville, AR 72315

Nucor Steel – Berkeley
1455 Hagan Avenue
Huger, SC 29450

Nucor Steel Decatur, LLC
4301 Iverson Boulevard
Trinity, AL 35673

Nucor Steel – Indiana Castrip
4537 South Nucor Road
Crawfordsville, IN 47933

Nucor Steel Gallatin
4831 U.S. Hwy 42 West
Ghent, KY 41045

24 Hour Contact – CHEMTREC 1-800-424-9300

Safety Officer [8:00 am – 5:00 pm]: 1-(870) 762-2100

Safety Officer [8:00 am – 5:00 pm]: 1-(843) 336-6000

Safety Officer [8:00 am – 5:00 pm]: 1-(256) 301-3500

Safety Officer [8:00 am – 5:00 pm]: 1-(765) 364-1323

Safety Officer [8:00 am – 5:00 pm]: 1-(859) 567-3100

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

STEEL PRODUCTS AS SOLD BY NUCOR ARE NOT HAZARDOUS PER OSHA GHS 29 CFR 1910, 1915, 1926. However, individual customer processes, (such as welding, sawing, brazing, grinding, abrasive blasting, and machining) may result in the formation of fumes, dust (combustible or otherwise), and/or particulate that may present the following hazards:

OSHA Hazards:

Carcinogen
Skin Sensitizer
Target Organ Effect – Lungs

GHS Classification:

Carcinogenicity (Category 2)
Skin Sensitization (Category 1)
Specific Target Organ Toxicity-Repeated Exposure (Category 1)

Pictogram(s):



Signal Word:

Danger

Sheet Steel

Hazard Statement(s)

H317: Dust/fumes may cause an allergic skin reaction.

H351: Dust/fumes suspected of causing cancer via inhalation.

H372: Inhalation of dust/fumes causes damage to respiratory tract through prolonged or repeated exposure

Precautionary Statement(s)

P202: Do not handle until all safety precautions have been read and understood.

P261: Avoid breathing dust/fumes.

P281: Use personal protective equipment as required.

P308+P313: If exposed or concerned: Get medical advice/attention.

Potential Health Effects

Eye Contact

Dusts or particulates may cause mechanical irritation including pain, tearing, and redness. Scratching of the cornea can occur if eye is rubbed. Fumes may be irritating. Contact with the heated material may cause thermal burns.

Skin Contact

Dusts or particulates may cause mechanical irritation due to abrasion. Coated steel may cause skin irritation in sensitive individuals (see Section 16 for additional information.) Some components in this product are capable of causing an allergic reaction, possibly resulting in burning, itching and skin eruptions. Contact with heated material may cause thermal burns.

Inhalation

Dusts may cause irritation of the nose, throat, and lungs. Excessive inhalation of metallic fumes and dusts may result in metal fume fever, an influenza-like illness. It is characterized by a sweet or metallic taste in the mouth, accompanied by dryness and irritation of the throat, cough, shortness of breath, pulmonary edema, general malaise, weakness, fatigue, muscle and joint pains, blurred vision, fever and chills. Typical symptoms last from 12 to 48 hours.

Ingestion

Not expected to be acutely toxic via ingestion based on the physical and chemical properties of the product. Swallowing of excessive amounts of the dust may cause irritation, nausea, and diarrhea.

Potential Fire and Explosion Hazards

Under normal conditions, steel products do not present fire or explosion hazards, and dust generated by handling steel products is oxidized and not combustible. Processing of steel product by some individual customers may produce potentially combustible dust that may represent a fire or explosion hazard.

Chronic or Special Toxic Effects

Repeated exposure to fine dusts may inflame the nasal mucosa and cause changes to the lung. In addition, a red-brown pigmentation of the eye and/or skin may occur. Welding fumes have been associated with adverse health effects. Contains components that may cause cancer or reproductive effects. The following components are listed by NTP, OSHA, or IARC as carcinogens: Nickel, chromium (hexavalent), cobalt, lead, cadmium, antimony (trioxide), arsenic, beryllium. See Section 11, for additional, specific information on effects noted above.

Target Organs

Overexposure to specific components of this product that are generated in dusts or fumes may cause adverse effects to the following organs or systems: eyes, skin, liver, kidney, central nervous system, cardiovascular system, respiratory system,.

Medical Conditions Aggravated by Exposure

Diseases of the skin such as eczema may be aggravated by exposure. Also, disorders of the respiratory system including asthma, bronchitis, and emphysema. Long-term inhalation exposure to agents that cause pneumoconiosis (e.g. dust) may act synergistically with inhalation of oxide fumes or dusts of this product.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS No.	% Weight	Exposure Limits			
			ACGIH TLV (mg/m ³)		OSHA PEL (mg/m ³)	
<u>Base Metal:</u>						
Iron (Fe)	7439-89-6	Balance	5	Oxide Dust/Fume	10	Oxide Dust/Fume

Sheet Steel

Components		CAS No.	% Weight	Exposure Limits			
				ACGIH TLV (mg/m³)		OSHA PEL (mg/m³)	
<u>Alloying Elements</u>							
Aluminum	(Al)	7429-90-5	0-3.0	10 5	Dust Fume	15 5	Dust Respirable fraction
Antimony	(Sb)	7440-36-0	<0.9	0.5	As Antimony	0.5	As Antimony
Arsenic	(As)	7440-38-2	<0.09	0.01	As Arsenic (A1 Carcinogen)	0.01	As Arsenic
Beryllium	(Be)	7440-41-7	<0.09	0.002 0.01	As Beryllium (A1 Carcinogen) As Beryllium (STEL)	0.002 0.005	As Beryllium As Beryllium (Ceiling)
Boron	(B)	7440-42-8	<1.1	10	Oxide Dust	15	Oxide Dust
Cadmium	(Cd)	7440-43-9	<0.01	0.01 0.002	As Cadmium (A2 Carcinogen) Respirable fraction	0.005 0.0025	As Cadmium As Cadmium (Action Level)
Calcium	(Ca)	1305-78-8	<0.9	2	Oxide Dust	5	Oxide Dust
Carbon	(C)	7440-44-0	<1.0		Not Established		Not Established
Chromium	(Cr)	7440-47-3	0.01-12.5	0.5	Metal	1	Metal
Cobalt	(Co)	7440-48-4	<0.09	0.02	As Cobalt (A3 Carcinogen)	0.1	Metal/Dust/Fume
Copper	(Cu)	7440-50-8	<3.5	1 0.2	Dust Fume	1 0.1	Dust Fume
Lead	(Pb)	7439-92-1	0.0-0.04	0.05	Dust / Fume (A3 Carcinogen)	0.05	Dust / Fume
Magnesium	(Mg)	7439-95-4	<0.9		Not Established		Not Established
Manganese	(Mn)	7439-96-5	<12.5	0.2	Elemental Mn and Inorg Compounds	5	Fume (Ceiling)
Molybdenum	(Mo)	7439-98-7	<1.1	10	Insoluble Compounds	15	Insoluble Compounds
Niobium	(Nb)	7440-03-1	<0.9		Not Established		
Nickel	(Ni)	7440-02-0	0.01-3.0	1.5	Metal	1	Metal and Insoluble Compounds
Nitrogen	(N)	7727-37-9	<0.9		Simple Asphyxiant		Simple Asphyxiant
Phosphorus	(P)	7723-14-0	<0.9	0.1	Phosphorus	0.1	Phosphorus
Selenium	(Se)	7782-49-2	<0.9	0.2	Selenium	0.2	Selenium
Silicon	(Si)	7440-21-3	0.0-5.0	10	Dust	15	Dust
Sulfur	(S)	7446-09-05	<0.9	5.2 13	Sulfur Dioxide Sulfur Dioxide (STEL)	13	Sulfur Dioxide
Tin	(Sn)	7440-31-5	<0.9	2	Metal,Oxide and Inorganic Compounds	2	Inorganic Compounds
Titanium	(Ti)	7440-32-6	<0.9		Not Established		Not Established
Tungsten	(W)	7440-33-7	<0.9	5 10	Insoluble Compounds as W Insoluble Compounds as W (STEL)		Not Established
Vanadium	(V)	7440-62-2	<0.9	0.05	Oxide Dust/Fume	0.5 0.1	Oxide Dust (Ceiling) Oxide Fume (Ceiling)
Zinc	(Zn)	7440-66-6	0.0-0.1	10 5 10	Oxide Dust OxideFume Oxide Fume (STEL)	5 10	Oxide Fume Oxide Dust
<u>Coatings and Finishing Treatments:</u>							
Hydrochloric Acid	(HCl)	7647-01-0	<3				
Petroleum, Natural or Synthetic oils		Mixture	<0.1	5	Mist	5	Mist
Anhydrous Potassium Hydroxide		1310-58-3	<0.01	2	Ceiling	2	Ceiling
Glycine,nn-1,2-		60-00-4	<0.01				

Sheet Steel

Components	CAS No.	% Weight	Exposure Limits			
			ACGIH TLV (mg/m ³)		OSHA PEL (mg/m ³)	
ethanediylbis Polyalkylene glycol Sodium nitrite	Mixture 7632-00-0	<0.01 <0.01	10	Oxide Dust		
Zinc (galvanized)	7440-66-6	0.4 - 10	5	Oxide Fume	5	Oxide Fume
			10	Oxide Fume (STEL)	10	Oxide Dust

NOTE: No permissible exposure limits (PEL) or threshold limit values (TLV) exist for steel over all. The above listing is a summary of elements used in normal Nucor Steel Products. **Various grades of steel will contain different combinations of these elements and/or trace materials. Exact specifications for specific products may be available upon request.**

4. FIRST AID MEASURES

Eye Contact- In case of overexposure to dusts or fumes, immediately flush eyes with plenty of water for at least 15 minutes occasionally lifting the eye lids. Get medical attention if irritation persists. Thermal burns should be treated as medical emergencies.

Skin Contact - In case of overexposure to dusts or particulates, wash with soap and plenty of water. Get medical attention if irritation develops or persists. If thermal burn occurs, flush area with cold water and get immediate medical attention.

Inhalation - In case of overexposure to dusts or fumes, remove to fresh air. Get immediate medical attention if symptoms described in this SDS develop.

Ingestion - Not considered an ingestion hazard. However, if excessive amounts of dust or particulates are swallowed, treat symptomatically and supportively. Get medical attention.

Notes to Physician - Inhalation of metal fume or metal oxides may produce an acute febrile state, with cough, chills, weakness, and general malaise, nausea, vomiting, muscle cramps, and remarkable leukocytosis. Treatment is symptomatic, and condition is self limited in 24-48 hours. Chronic exposure to dusts may result in pneumoconiosis of mixed type.

5. FIRE FIGHTING MEASURES

Flash Point (Method) - Not applicable

Flammable Limits (% volume in air) - Not applicable

Auto ignition Temperature - Not applicable

Extinguishing Media - For molten metal, use dry powder or sand. For steel dust use or dry sand, water, foam, argon or nitrogen.

Special Fire Fighting Procedures - Do not use water on molten metal. Do not use Carbon Dioxide (CO₂). Firefighters should not enter confined spaces without wearing NIOSH/MSHA approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

Unusual Fire or Explosion Hazards - Steel products do not present fire or explosion hazards under normal conditions. Any non-oxidized fine metal particles/ dust generated by grinding, sawing, abrasive blasting, or individual customer processes may produce materials that the customer should test for combustibility and other hazards in accordance with applicable regulations. High concentrations of combustible metallic fines in the air may present an explosion hazard.

6. ACCIDENTAL RELEASE MEASURES

Precautions if Material is Spilled or Released - Emergency response is unlikely unless in the form of combustible dust. Avoid inhalation, eye, or skin contact of dusts by using appropriate precautions outlined in this SDS (see section 8). Fine turnings and small chips should be swept or vacuumed and placed into appropriate disposable containers. Keep fine dust or powder away from sources of ignition. Scrap should be reclaimed for recycling. Prevent materials from entering drains, sewers, or waterways.

Fire and Explosion Hazards - Some customer processes may generate combustible dust that may require specific precautions when cleaning spills or releases of dust.

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Environmental Precautions - Some grades of steel may contain reportable quantities of alloying elements. See Section 15 for additional information.

Waste Disposal Methods - Dispose used or unused product in accordance with applicable Federal, State, and Local regulations. Please recycle.

7. HANDLING AND STORAGE

Storage Temperatures - Stable under normal temperatures and pressures.

Precautions to be Taken in Handling and Storing - Store away from strong oxidizers. Dusts and/or powders, alone, or combined with process specific fluids, may form explosive mixtures with air. Applicable Federal, state and local laws and regulations may require testing dust generated from processing of steel products to determine if it represents a fire or explosion hazard and to determine appropriate protection methods. Avoid breathing dusts or fumes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Operations with potential for generating high concentrations of airborne particulates or fumes should be evaluated and controlled as necessary.

Eye Protection - Use safety glasses. Dust resistant safety goggles are recommended under circumstances where particles could cause mechanical injury such as grinding or cutting. Face shield should be used when welding or cutting.

Skin - Appropriate protective gloves should be worn as necessary. Good personal hygiene practices should be followed including cleansing exposed skin several times daily with soap and water, and laundering or dry cleaning soiled work clothing.

Respiratory Protection - NIOSH/MSHA approved dust/fume/mist respirator should be used to avoid excessive exposure. See Section 3 for component material information exposure limits. If such concentrations are sufficiently high that this respirator is inadequate, or high enough to cause oxygen deficiency, use a positive pressure self-contained breathing apparatus (SCBA). Follow all applicable respirator use, fitting, and training standards and regulations.

Ventilation - Provide general and/or local exhaust ventilation to control airborne levels of dust or fumes below exposure limits.

Exposure Guidelines - No permissible exposure limits (PEL) or threshold limit values (TLV) exist for steel. See Section 3 for component materials. Various grades of steel will contain different combinations of these elements. Trace elements may also be present in minute amounts.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor - Silver grey to grey black with metallic luster.

Boiling Point - Not applicable

Melting Point - Approximately 2800 °F

pH - Not applicable

Specific Gravity (at 15.6°C) - Not applicable

Density (at 15.6 °C) - Not applicable

Vapor Pressure - Not applicable

Vapor Density (air = 1) - Not applicable

% Volatile, by Volume - Not applicable

Solubility in Water - Insoluble.

Evaporation Rate (Butyl Acetate = 1) - Not applicable

Other Physical and Chemical Data - None

10. STABILITY AND REACTIVITY

Stability - Stable

Conditions to Avoid - Steel at temperatures above the melting point may liberate fumes containing oxides of iron and alloying elements. Avoid generation of airborne fume.

Hazardous Polymerization - Will not occur.

Incompatibility (Materials to Avoid) - Reacts with strong acids to form hydrogen gas. Do not store near strong oxidizers.

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Hazardous Decomposition Products - Metallic fumes may be produced during welding, burning, grinding, and possibly machining or any situation with the potential for thermal decomposition. Refer to ANSI Z49.1

11. TOXICOLOGICAL INFORMATION

The primary component of this product is iron. Long-term exposure to iron dusts or fumes can result in a condition called siderosis which is considered to be a benign pneumoconiosis. Symptoms may include chronic bronchitis, emphysema, and shortness of breath upon exertion. Penetration of iron particles in the skin or eye may cause an exogenous or ocular siderosis which may be characterized by a red-brown pigmentation of the affected area. Ingestion overexposures to iron may affect the gastrointestinal, nervous, and hematopoietic system and the liver. Iron and steel founding, but not iron or iron oxide, has been listed as carcinogenic (Group 1) by IARC.

When this product is welded, fumes are generated. Welding fumes may be different in composition from the original welding product, with the chief component being ordinary oxides of the metal being welded. Chronic health effects (including cancer) have been associated with the fumes and dusts of individual component metals (see above), and welding fumes as a general category have been listed by IARC as a carcinogen (Group 2B). There is also limited evidence that welding fumes may cause adverse reproductive and fetal effects. Evidence is stronger where welding materials contain known reproductive toxins, e.g., lead which may be present in the coating material of this product.

Breathing fumes or dusts of this product may result in metal fume fever, which is an illness produced by inhaling metal oxides. These oxides are produced by heating various metals including cadmium, zinc, magnesium, copper, antimony, nickel, cobalt, manganese, tin, lead, beryllium, silver, chromium, aluminum, selenium, iron, and arsenic. The most common agents involved are zinc and copper.

This product may contain small amounts of manganese. Prolonged exposure to manganese dusts or fumes is associated with "manganism", a Parkinson-like syndrome characterized by a variety of neurological symptoms including muscle spasms, gait disturbances, tremors, and psychoses.

This product may contain small amounts of cadmium. Primary target organs for cadmium overexposure are the lung and the kidney. Because of its cumulative nature, chronic cadmium poisoning can cause serious disease which takes many years to develop and may continue to progress despite cessation of exposure. Progression of the disease may not reflect current exposure conditions. It is also capable of causing a painful osteomalacia called "Itai-Itai" in postmenopausal women, and has caused developmental effects and/or reproductive effects in male and female animals. Cadmium is a listed carcinogen by NTP, OSHA, and IARC (Group 1).

This product may contain small amounts of chromium. Prolonged and repeated overexposure to chromium dusts or fumes may cause skin ulcers, nasal irritation and ulceration, kidney damage and cancer of the respiratory system. Chromium is skin sensitizer. Cancer is generally attributed to the hexavalent (+6) form of chromium which is listed as a carcinogen by NTP and IARC (Group 1).

This product may contain small amounts of nickel. Prolonged and repeated contact with nickel may cause sensitization dermatitis. Inhalation of nickel compounds has caused lung damage as well as sinus, nasal and lung cancer in laboratory animals. Nickel is a listed carcinogen by NTP and IARC (Group 1).

This product may contain small amounts of vanadium. Adverse effects from dermal, inhalation or parenteral exposure to various vanadium compounds have been reported. The major target for vanadium pentoxide toxicity is the respiratory tract. Fumes or dust can cause severe eye and respiratory irritation, and systemic effects. Chronic bronchitis, green tongue, conjunctivitis, pharyngitis, rhinitis, rales, chronic productive cough, and tightness of the chest have been reported following overexposure. Allergic reactions resulting from skin and inhalation exposures have also been reported. A statistical association between vanadium air levels and lung cancer has been suggested, but vanadium currently is not regarded as a human carcinogen.

This product may contain small amounts of lead. Lead can accumulate in the body. Consequently, exposure to fumes or dust may produce signs of polyneuritis, diminished vision and peripheral neuropathy, such as tingling and loss of feeling in fingers, arms and legs. Lead is a known reproductive and developmental toxin.

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It is also associated with central nervous system disorders, anemia, kidney dysfunction and neurobehavioral abnormalities. The brain is a major target organ for lead exposure. Elemental lead is listed as an IARC 2B carcinogen.

The product may contain small amounts of copper. Copper dust and fumes can irritate the eyes, nose and throat causing coughing, wheezing, nosebleeds, ulcers and metal fume fever. Other effects from repeated inhalation of copper fumes include a metallic or sweet taste, and discoloration of skin, teeth or hair. Copper also may cause an allergic skin reaction. Overexposure to copper can affect the liver.

12. ECOLOGICAL INFORMATION

Aquatic Ecotoxicological Data - No specific information available on this product.

Environmental Fate Data - No specific information available on this product.

13. DISPOSAL CONSIDERATIONS

Recovery and reuse, rather than disposal, should be the ultimate goal of handling efforts. Dispose in accordance with federal, state, and local health and environmental regulations. Prevent materials from entering drains, sewers, or waterways.

14. TRANSPORT INFORMATION

DOT Proper Shipping Name - Not regulated

DOT Hazard Classification - Not regulated

UN/NA Number - Not applicable

DOT Packing Group - Not applicable

Labeling Requirements - Not applicable

Placards - Not applicable

DOT Hazardous Substance - Not applicable

DOT Marine Pollutant - Not applicable

15. REGULATORY INFORMATION

This product is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. However, dusts and fumes from this product may be combustible or hazardous and require protection to comply with applicable Federal, state and local laws and regulations.

California Proposition 65: This product contains chemicals (antimony [oxide], arsenic, beryllium, chromium [hexavalent], cobalt, cadmium, lead, nickel) known to the State of California to cause cancer and chemicals (cadmium, lead) known to the State of California to cause birth defects or other reproductive harm.

Massachusetts Substance List: Aluminum, Antimony, Arsenic, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Hydrochloric acid, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrogen, Phosphorus, Selenium, Silicon, Sulfur, Tin, Titanium, Tungsten, Vanadium, Zinc

Pennsylvania Hazardous Substance List: Aluminum, Antimony, Arsenic, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Hydrochloric acid, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrogen, Phosphorus, Selenium, Silicon, Sulfur, Tin, Titanium, Tungsten, Vanadium, Zinc

New Jersey Hazardous Substance List: Aluminum, Antimony, Arsenic, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Hydrochloric acid, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrogen, Phosphorus, Selenium, Silicon, Sulfur, Tin, Titanium, Tungsten, Vanadium, Zinc

Toxic Substances Control Act (TSCA)

Components of this product are listed on the TSCA Inventory.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Steel is not reportable, however, it contains hazardous substances that may be reportable if released in pieces with diameters less than or equal to 0.004 inches (RQ marked with a “*”).

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<u>Chemical Name</u>	<u>Reportable Quantity (in lb)</u>
Antimony	5000*
Arsenic	1*
Beryllium	10*
Cadmium	10*
Chromium	5000*
Copper	5000*
Lead	10*
Nickel	100*
Phosphorus	1
Selenium	100*
Zinc	1000*

Superfund Amendments and Reauthorization Act of 1986 (SARA), Title III

SECTION 311/312 HAZARD CATEGORIES: Immediate Health Effect, Delayed Health Effect

This product contains the following EPCRA Section 313 chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right – To – Know Act of 1986 (40 CFR 372):

SECTION 313 REPORTABLE INGREDIENTS:

<u>Chemical Name</u>	<u>CAS Number</u>	<u>Concentration (% by weight)</u>	<u>Reportable</u>
Aluminum	7429-90-5	0.0-0.01 Some grades up to 3.0%	Yes – Greater than 1%
Antimony	7440-36-0	<0.9	No – Less than 1%
Arsenic	7440-38-2	<0.09	No – Less than 0.1%
Beryllium	7440-41-7	<0.09	No – Less than 0.1%
Cadmium	7440-43-9	<0.01	No – Less than 0.1%
Chromium	7440-47-3	0.01-1.0 Some grades up to 12.5%	Yes – Greater than 0.1%
Cobalt	7440-48-4	<0.09	No – Less than 0.1%
Copper	7440-50-8	<0.9 Some grades up to 3.5%	Yes – Greater than 1%
Lead	7439-92-1	0.0-0.04	Yes
Manganese	7439-96-5	0.2-2 Some grades up to 12.5%	Yes – Greater than 1%
Nickel	7440-02-0	0.01-0.1 Some grades up to 3.0%	Yes – Greater than 0.1%
Phosphorus	7723-14-0	<0.9	No – Less than 1%
Selenium	7782-49-2	<0.9	No – Less than 1%
Vanadium	7440-62-2	<0.9	No – Less than 1%
Zinc	7440-66-6	<0.01	No – Less than 1%

Concentrations based on analytical data and process knowledge of typical products distributed by the facility.

16. OTHER INFORMATION

This SDS covers Nucor product as delivered from the Nucor facility, but does not include chemicals that may be applied by subsequent handlers and/or distributors of this product. This could include a variety of materials including oils, paints, galvanization, etc. that are not included in this SDS. Additionally, specialty orders may require application of coating material not listed in this SDS. SDSs for any Nucor-applied specialty coating will be provided separately. During welding, precautions should be taken for airborne contaminants that may originate from components of the welding rod. Arc or spark generated when welding or burning could be a source of ignition for combustible and/or flammable materials. The information in this Safety Data Sheet (SDS) was obtained from sources which we believe are reliable; however, the information is provided without any representation or warranty, expressed or implied, regarding the accuracy or correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of this product.



Ritchey Metals Company • 30 Georgetown Road • Canonsburg, PA 15317

MATERIAL SAFETY DATA SHEET

Special High Grade Zinc

Identification and Use

Chemical Name	Zinc
Trade Name	SHG
Chemical Formula	Zn

Manufacturer

Mailing Address	Ritchey Metals Company, Inc. 30 Georgetown Road Canonsburg, PA 15317
Contact Numbers:	Phone: (724) 745-7700 Fax: (724) 745-8040

Hazardous Ingredients of Material

		<u>OSHA PEL</u>	<u>CAS</u>
Zinc	(99.995% typical)	5.0 mg/m ³ -Fume	7440-66-6
		15.0 mg/m ³ -Dust	

<u>Physical Data for Material</u>	
Appearance	Solid
Odor and Appearance	No Odor – Silvery Grey Color
Odor Threshold(p.p.m)	None
Specific Gravity	7.1
Vapor Pressure	Not Applicable
Vapor Density	Not Applicable
Evaporation Rate	Not Applicable
Solubility in Water	Insoluble
% Volatile (by volume)	Not Applicable
Boiling Point	907°C
Freezing Point	420°C
pH	Not Applicable
Density (g/ml)	Not Available
Coefficient of water/oil distribution	Not Applicable
<u>Fire and Explosion Hazard of Material</u>	
Flash Point (°C) and Method	Not Applicable
Flammability	Metal ingot not flammable, Dust or Powder may be flammable or explosive.
Lower Explosive Limit	Not Applicable
Upper Explosive Limit	Not Applicable
Auto Ignition Temp.	Not Applicable
Means of Extinction	Do not use water or foam. Use dry chemical, sand or special powder.

Special Procedures	Self contained respirators should be worn when fighting fires.
TDG Flammability Classification	Not Applicable
Hazardous Combustion Products	Zinc Oxide Fume
Sensitivity to Chemical Impact	None
Rate of Burning	None
Explosive Power	None
Sensitivity to Static Discharge	Yes, as dust or powder.
<u>Reactivity Data</u>	
Stability	Metal in Ingot form is stable.
Incompatibility	Sulfur, Halogens and strong Oxidizing agents, mineral acids and bases.
Reactivity	Acids and Alkalis will generate hydrogen gas. Accumulated hydrogen gas is flammable and explosive.
Hazardous Decomposition Products	Heating of this product may generate zinc oxide fumes. Generally over 900°C.
<u>Toxicological Properties of Product</u>	
Acute	Contact of zinc fume or dust may cause local irritation to the eyes. Inhalation of freshly generated zinc fume may cause zinc fume fever resulting in flu-like symptoms.
Chronic	Special High Grade Zinc is relatively non toxic and has no history of causing chronic effects.
Routes of Entry	Eye contact, inhalation and ingestion.
LD ₅₀ of Product (Specify Species and Route)	Not Available

Irritancy of Product	No reports found
Exposure limits of Product	Not Available
LD ₅₀ of Product (Specify Species)	Not Available
Sensitization to Product	No reports found
Synergistic Materials	No reports found
Carcinogenicity, Reproductive effects, Teratogenicity, Mutagenicity	Does not meet WHMIS criteria for these effects.
<u>Preventative Measures</u>	
Precautions in Handling and Storage	Keep dust levels low. Keep in dry, cool, well ventilated area away from heat.
Personal Protective Equipment	If fume or dust is generated, use an approved fume/dust respirator and eye protection.
Gloves (Specify)	Heat Resistant
Respiratory (Specify)	Approved Respirator
Eye (Specify)	With molten metal use glasses or face shield.
Footwear (Specify)	Safety Boots
Clothing (Specify)	Suitable to protect hot metal splash
Other (Specify)	Avoid use of contact lenses in dusty areas
Engineering Controls (e.g. ventilation, enclosed process, specify)	Local ventilation when fume is generated.
Leak and Spill Procedure	Collect spilled material and return to process or supplier.
Waste Disposal	As above for spilled material.
Handling Procedures and Equipment	Only dry metal should be added to molten bath
Storage Requirements	Store in dry covered area. Do not store near acids.

Special Shipping Information	Not Applicable
<u>First Aid Measures</u>	
Skin	Remove contaminated clothing. Wash affected areas with soap and water.
Eye	Flush with water. If irritation persists, seek medical attention.
Inhalation	If exposed to excessive fume, remove to fresh air administer oxygen if needed. Keep patient warm and seek medical assistance.
Ingestion	Generally not considered toxic if ingested.
General advice	Practice good personal hygiene. Wash hands before eating or smoking.
<u>Preparation Date of M.S.D.S.</u>	
Additional Information/Comments	This Material Safety Data Sheet is offered solely for your information, consideration and investigation.
Disclaimer	Ritchey Metals Company provides no warranties either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein.
Prepared by	Ritchey Metals Company
Approval Date	Reapproved January 2010