

# Rio Tinto



## Rio Tinto Metal Powders PM Products Brochure

**FROM ORE TO POWDER,  
TO MEET YOUR REQUIREMENTS!**





# Rio Tinto Metal Powders

## Powder Metallurgy Products

Rio Tinto Metal Powders (RTMP, formerly QMP) is the only major ferrous powder producer in the world, to manufacture powder from iron that is entirely sourced from low residual ore. Consequently, RTMP powders offer exceptional cleanliness and consistency.

RTMP offers a full range of ferrous powder grades for virtually all Powder Metallurgy (PM) applications, and is committed to helping our customers produce value added and high performance components by ensuring that the powder is of the highest quality. In this PM Products Brochure, you will find a summary of the principal powder products; Iron, Pre-alloyed and Diffusion & Organic Bonded Grades supplied by RTMP. The product data reported by RTMP represents typical values obtained in our laboratories and is not intended to duplicate any specific customer's test results. RTMP strongly suggests that each customer thoroughly test the prospective RTMP product in their own manufacturing facility to validate RTMP product suitability in their specific application. Do not hesitate to contact your Regional Technical Representative at any time.

As part of Rio Tinto, a renowned large scale international mining and metallurgical company, RTMP benefits from access to resources, capital and expertise within the Group.

Our goal is to maintain a leading position in the marketplace by working in partnership with our customers and by using the significant business resources and infrastructure of the Rio Tinto Group to our mutual benefit.

Rio Tinto Metal Powders, your committed long term global business & technical partner.







Suzhou Powder Plant

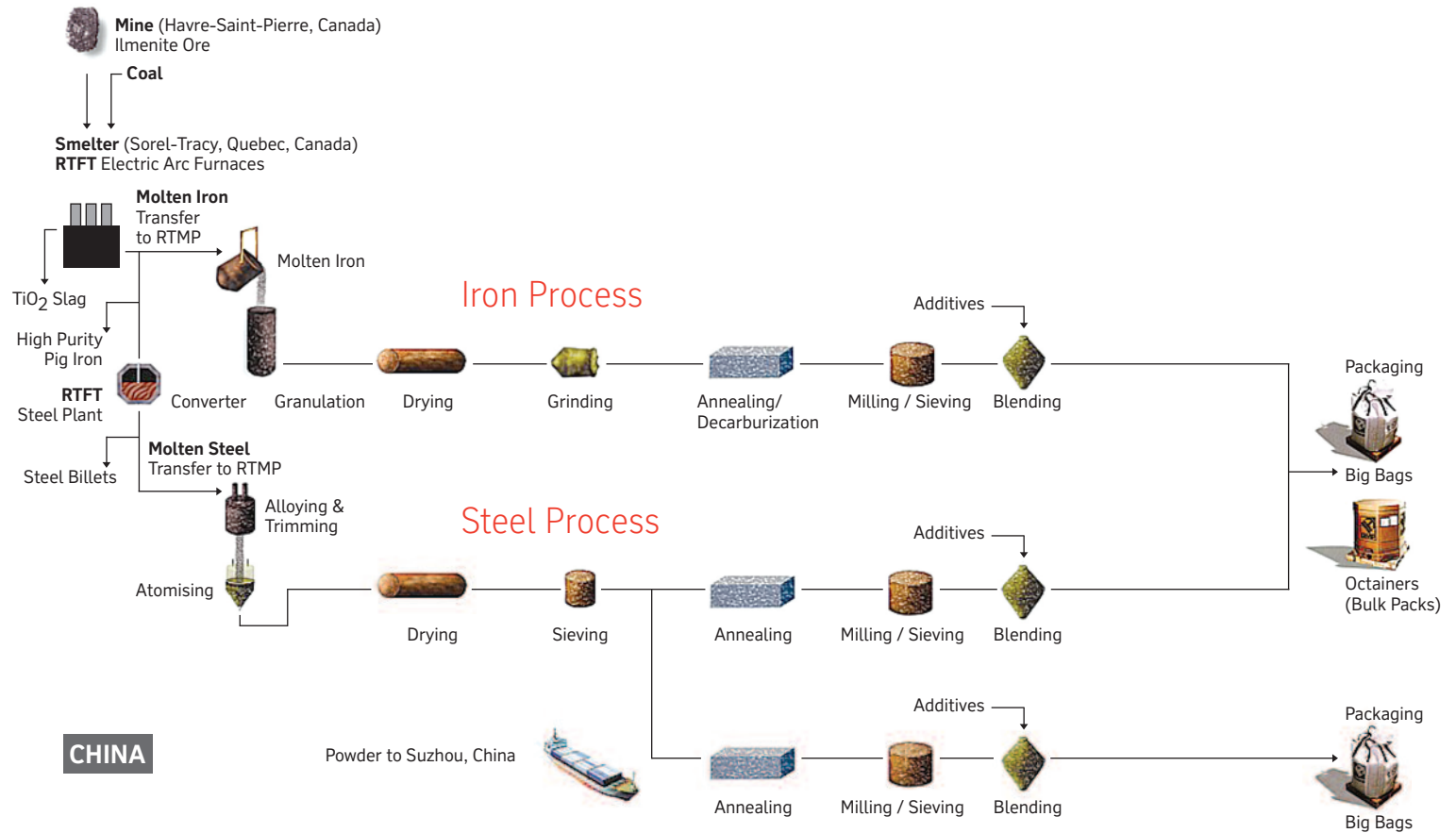
A Committed  
Long Term Global  
Business &  
Technical Partner





# Rio Tinto Metal Powders Process Summary

## CANADA



# Iron Grades

		ATOMET 22	ATOMET 24	ATOMET 25	ATOMET 28/29
		For low to medium density PM applications (6.0-6.6 g/cm³). Very high green strength for complex parts.	For low and medium density PM applications. High green strength for complex parts.	For low to medium density PM applications (6.2-6.5 g/cm³) requiring high green strength.	For medium density PM applications (6.4-6.8 g/cm³). Low growth characteristics and high green strength.
Apparent Density, g/cm³		2.52	2.47	2.52	2.8/2.9
Flow s/50g		30	30	29	27
Chemistry, wt%					
	Fe	99+	99+	99+	99+
	Mn	0.008	0.008	0.008	0.008
	Ni	-	-	-	-
	Mo	-	-	-	-
	Cr	-	-	-	-
	C	0.03	0.01	0.03	0.05
	O	0.18	0.20	0.20	0.17
	S	0.005	0.006	0.006	0.006
	P	-	-	-	-
	Cu	-	-	-	-
Particle Size Distribution, wt%					
	+250 µm	Trace	Trace	Trace	Trace
	250/150 µm	8	4	3	5
	150/45 µm	70	71	67	73
	-45 µm	22	25	30	22
Green Properties					
	Density, g/cm³ at 600 MPa	6.95	6.95	6.90	7.00
	Green Strength, MPa	30	26	25	25
Sintered Properties		2% Cu, 0.8% C	2% Cu, 0.8% C	2% Cu, 0.8% C	2% Cu, 0.8% C
	Sintered Density, g/cm³	6.70	6.70	6.70	6.70
	Transverse Rupture Strength, MPa	960	940	900	900
	Hardness, HRB	81	79	80	82
	Tensile Strength, MPa	560	530	500	430
	Dimensional Change, % from die size	+0.28	+0.22	+0.20	+0.26

All mixes contain 0.5% wax. Sintered in a 90% N<sub>2</sub> / 10% H<sub>2</sub> atmosphere at 1120°C for 25 minutes.

# Iron Grades

		ATOMET 29M For medium density PM applications (6.4-6.8 g/cm³). Provides superior machining properties. Increases machining tool life.	ATOMET 30 For medium to high density PM applications (6.6-7.0 g/cm³).	ATOMET 1001 For highest density PM applications (6.8-7.2 g/cm³). High strength, high compressibility water atomized iron powder.	ATOMET 1001HP Ultra pure iron powder for high density applications (>7.0 g/cm³) or soft magnetic PM applications. May be blended with ferro-phosphorus for enhanced properties.
Apparent Density, g/cm³		2.95	2.95	2.95	2.92
Flow s/50g		26	26	26	25
Chemistry, wt%					
	Fe	99+	99+	99+	99+
	Mn	0.008	0.12	0.20	0.04
	Ni	-	-	-	-
	Mo	-	-	-	-
	Cr	-	-	-	-
	C	0.05	0.02	0.003	0.004
	O	0.16	0.12	0.08	0.06
	S	0.006	0.008	0.009	0.009
	P	-	-	-	-
	Cu	-	-	-	-
Particle Size Distribution, wt%					
	+250 µm	Trace	Trace	Trace	Trace
	250/150 µm	5	8	10	14
	150/45 µm	73	68	65	66
	-45 µm	22	24	25	20
Green Properties					
	Density, g/cm³ at 600 MPa	7.00	7.05	7.10	7.15
	Green Strength, MPa	25	21	19	20
Sintered Properties					
	2% Cu, 0.8% C	2% Cu, 0.8% C	2% Cu, 0.8% C	2% Cu, 0.8% C	0.4-0.55% C
	Sintered Density, g/cm³	7.00	7.00	7.00	7.00
	Transverse Rupture Strength, MPa	1010 <sup>(1)</sup>	1170	1240	700
	Hardness, HRB	89 <sup>(1)</sup>	89	92	50
	Tensile Strength, MPa	520 <sup>(1)</sup>	540	590	280
	Dimensional Change, % from die size	+0.48 <sup>(1)</sup>	+0.35	+0.37	+0.20
Heat treated Properties				2% Cu, 0.7% C	
	Sintered Density, g/cm³			7.10	
	Transverse Rupture Strength, MPa			1710	
	Hardness, HRC			42	
	Tensile Strength, MPa			1110	

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Heat treatment: Austenitized for 15 minutes at 845°C. Oil quenched and tempered 60 minutes at 185°C.

(1) Cooling rate of 1.7°C/s from 870 to 700°C.

# Pre-alloyed Grades

	ATOMET 4001 For high performance, high strength powder metallurgy and powder forging applications. High compressibility Mo pre-alloyed powder.	ATOMET 4201 For improved as-sintered toughness and hardenability. High compressibility Ni-Mo pre-alloyed powder.	ATOMET 4401 For high density PM applications requiring extra strength and surface hardening for wear resistance. High compressibility Mo pre-alloyed powder.	ATOMET 4601 For exceptional as-sintered toughness and hardenability. High compressibility Ni-Mo pre-alloyed powder.	
Apparent Density, g/cm <sup>3</sup>	2.92	2.92	2.92	2.92	
Flow s/50g	27	26	26	26	
Chemistry, wt%					
Fe	bal.	bal.	bal.	bal.	
Mn	0.15	0.28	0.15	0.20	
Ni	-	0.45	-	1.80	
Mo	0.50	0.60	0.85	0.55	
Cr	-	-	-	-	
C	0.004	0.004	0.003	0.004	
O	0.10	0.10	0.08	0.10	
S	0.009	0.009	0.009	0.01	
P	-	-	-	-	
Cu	-	-	-	-	
Particle Size Distribution, wt%					
+250 µm	Trace	Trace	Trace	Trace	
250/150 µm	12	10	10	10	
150/45 µm	67	65	65	65	
-45 µm	21	25	25	25	
Green Properties					
Density, g/cm <sup>3</sup> at 600 MPa	7.10	7.05	7.10	6.95	
Green Strength, MPa	19	18	18	16	
Sintered Properties					
0.5% C	0.5% C	0.5% C	0.5% C	0.5% C	
Sintered Density, g/cm <sup>3</sup>	7.00	7.00	7.00	7.00	
Transverse Rupture Strength, MPa	825	840	980	1030	
Hardness, HRB	72	76	79	77	
Tensile Strength, MPa	385	440	490	490	
Dimensional Change, % from die size	+0.19	+0.04	+0.15	+0.08	
Heat treated Properties	0.4-0.55% C	0.4-0.55% C	0.4-0.55% C	0.4-0.55% C	
Sinter Hardened Properties				1.0% Cu, 0.6% C	
Sintered Density, g/cm <sup>3</sup>	7.10	7.05	7.10	6.95	6.95
Transverse Rupture Strength, MPa	1500	1806	1805	1570	1480
Hardness, HRC	39	37	32	41	33
Tensile Strength, MPa	866	897	905	1105	850
Dimensional Change, % from die size					+0.38

All mixes contain 0.5% wax. Sintered in a 90% N<sub>2</sub> / 10% H<sub>2</sub> atmosphere at 1120°C for 25 minutes.

Heat treatment: Austenitized for 15 minutes at 845°C. Oil quenched and tempered 60 minutes at 185°C.

Sinter hardening: Cooling rate of 1.5°C/s from 650 to 400°C, tempered 60 minutes at 200°C.

# Pre-alloyed Grades

	ATOMET 4701	ATOMET 4801	ATOMET 4901	
	Ni-Mo-Cr-Mn pre-alloyed sinter hardening powder for high strength parts without oil quenching, induction hardening or other post-sintering heat treatments.	Ni-Mo pre-alloyed sinter hardening powder for high strength applications requiring wear resistance. Optional tempering increases strength even further.	Mo pre-alloyed powder for the production of parts requiring high wear resistance and superior dynamic properties.	
Apparent Density, g/cm <sup>3</sup>	2.92	3.00	3.00	
Flow s/50g	26	25	25	
Chemistry, wt%				
	Fe bal.	bal.	bal.	
	Mn 0.45	0.20	0.15	
	Ni 0.90	4.00	-	
	Mo 1.00	0.50	1.50	
	Cr 0.45	-	-	
	C 0.01	0.01	0.01	
	O 0.25	0.15	0.15	
	S 0.009	0.009	0.009	
	P -	-	-	
	Cu -	-	-	
Particle Size Distribution, wt%				
+250 µm	Trace	Trace	Trace	
250/150 µm	12	10	10	
150/45 µm	67	62	62	
-45 µm	21	28	28	
Green Properties				
Density, g/cm <sup>3</sup> at 600 MPa	6.90	6.85	7.05	
Green Strength, MPa	16	12	13	
Sintered Properties	0.5% C	0.5% C	0.5% C	
Sintered Density, g/cm <sup>3</sup>	7.00	7.00	7.00	
Transverse Rupture Strength, MPa	1230	1220	1120	
Hardness, HRB	91	98	86	
Tensile Strength, MPa	620	610	570	
Dimensional Change, % from die size	+0.03	-0.05	+0.11	
Heat treated Properties			0.4-0.55% C	
Sinter Hardened Properties	1% Cu, 0.6% C	1% Cu, 0.6% C	1% Cu, 0.6% C	
Sintered Density, g/cm <sup>3</sup>	6.90	6.85	7.05	7.05
Transverse Rupture Strength, MPa	1620	1570	1405	1500
Hardness, HRC	35	33	44	27
Tensile Strength, MPa	875	850	995	725
Dimensional Change, % from die size	+0.30	+0.12		+0.35

All mixes contain 0.5% wax. Sintered in a 90% N<sub>2</sub> / 10% H<sub>2</sub> atmosphere at 1120°C for 25 minutes.  
Heat treatment: Austenitized for 15 minutes at 845°C. Oil quenched and tempered 60 minutes at 185°C.  
Sinter hardening: Cooling rate of 1.5°C/s from 650 to 400°C, tempered 60 minutes at 200°C.



# Diffusion & Organic Bonded Grades

		ATOMET DB46 Excellent consistency and dimensional control for high performance powder metallurgy applications.	ATOMET DB48 For demanding applications requiring excellent consistency and dimensional control in parts.	ATOMET DB49 For demanding applications requiring very high strength and dimensional control in parts.	FLOMET FD46 Organic-bonded powder (binder-treated) equivalent to the diffusion-alloyed grade DB46.	FLOMET FD48 Organic-bonded powder (binder-treated) equivalent to the diffusion-alloyed grade DB48.	FLOMET FY49 Organic-bonded powder (binder-treated) equivalent to the diffusion-alloyed grade DB49.
<b>Apparent Density, g/cm<sup>3</sup></b>		3.02	3.02	3.00	2.95	2.95	2.95
<b>Flow s/50g</b>		24	24	24	26	26	26
<b>Chemistry, wt%</b>							
	Fe	bal.	bal.	bal.	bal.	bal.	bal.
	Mn	0.15	0.15	0.15	0.15	0.15	0.15
	Ni	1.75	4.00	4.00	1.75	4.00	4.00
	Mo	0.50	0.50	1.50	0.50	0.50	1.50
	Cr						
	C	0.005	0.005	0.01	0.005	0.005	0.01
	O	0.10	0.10	0.09	0.1	0.1	0.09
	S	0.009	0.009	0.009	0.009	0.009	0.009
	P	-	-	-	-	-	-
	Cu	1.50	1.50	2.00	1.50	1.50	2.00
<b>Particle Size Distribution, wt%</b>							
	+250 µm	Trace	Trace	Trace	Trace	Trace	Trace
	250/150 µm	10	10	7	10	9	12
	150/45 µm	66	66	71	66	66	65
	-45 µm	24	24	22	24	25	23
<b>Green Properties</b>							
	Density, g/cm <sup>3</sup> at 600 MPa	7.10	7.07	7.05	7.12	7.10	7.07
	Green Strength, MPa	17	19	15	14	16	13
<b>Sintered Properties</b>							
	0.5% C	0.5% C	0.5% C	0.5% C	0.5% C	0.5% C	0.5% C
	Sintered Density, g/cm <sup>3</sup>	7.00	7.00	7.00	7.00	7.00	7.00
	Transverse Rupture Strength, MPa	1350	1490	1670	1325	1480	1580
	Hardness	89 HRB	21 HRC	31 HRC	89 HRB	21 HRC	31 HRC
	Tensile Strength, MPa	590	715	850	580	710	840
	Dimensional Change, % from die size	+0.15	0.00	+0.02	+0.13	-0.03	-0.05
<b>Heat treated Properties</b>		0.4- 0.55% C	0.4- 0.55% C	0.4- 0.55% C			
	Sintered Density, g/cm <sup>3</sup>	7.1	7.1	7.05			
	Transverse Rupture Strength, MPa	1828	1935	1680			
	Hardness, HRC	38	39	42			
	Tensile Strength, MPa	948	1150	985			

All mixes contain 0.5% wax. Sintered in a 90% N<sub>2</sub> / 10% H<sub>2</sub> atmosphere at 1120°C for 25 minutes.

Heat treatment: Austenitized for 15 minutes at 845°C. Oil quenched and tempered 60 minutes at 185°C.

# Rio Tinto Metal Powders

## Worldwide Locations



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ISO 9001



TS 16949

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