Rio Tinto

Finding better ways to provide the materials the world needs

Rio Tinto Metal Powders Products Brochure

Rio Tinto Metal Powders

Powder Metallurgy Products

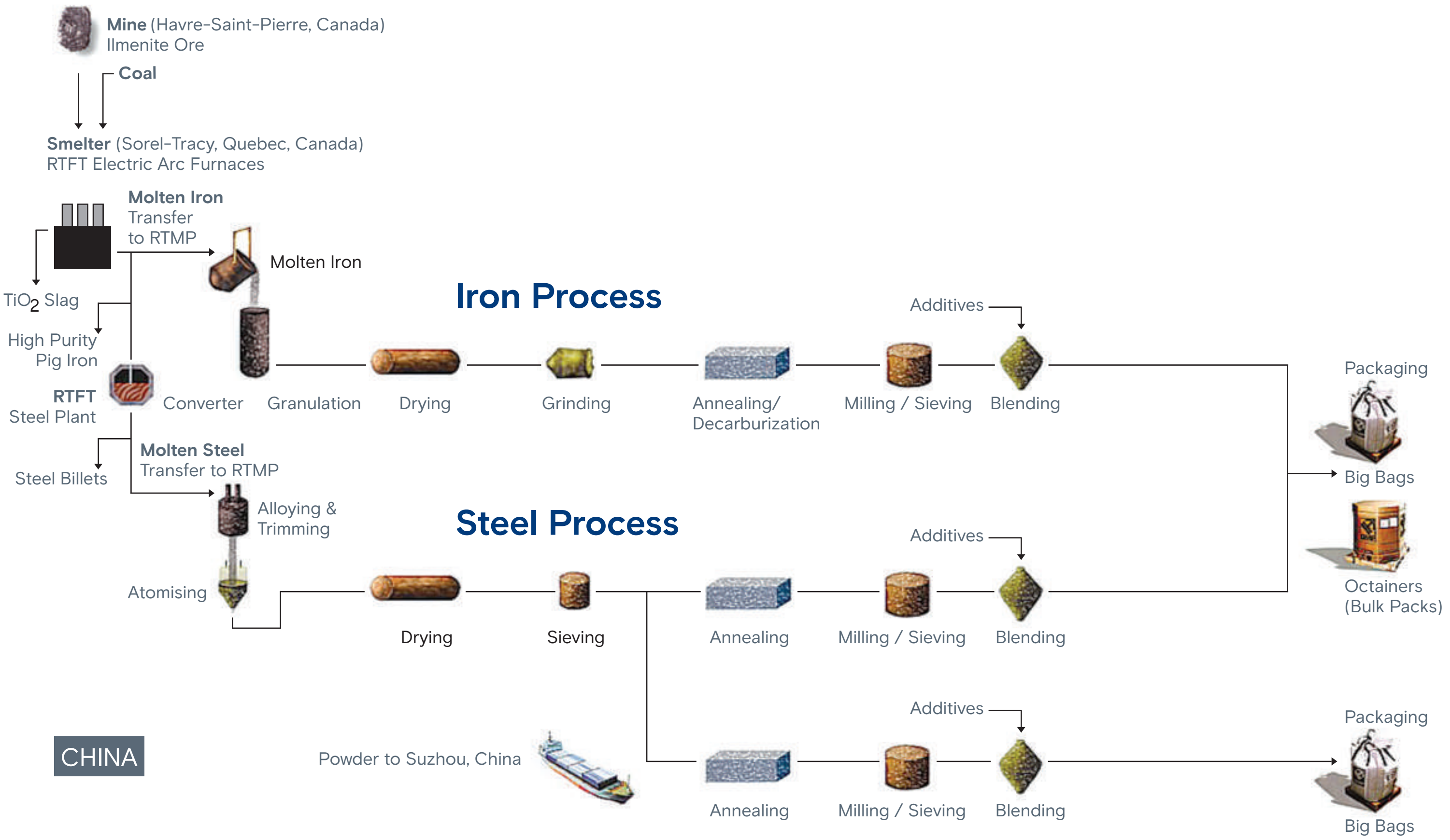
At Rio Tinto Metal Powders (RTMP, formerly QMP) we manufacture powder from iron that is entirely sourced from low residual ore. Because of this, our powders are exceptionally clean and consistent.

As a part of Rio Tinto, RTMP has production facilities in Sorel-Tracy, Quebec, Canada; and Suzhou, China. We produce iron, pre-alloyed, and diffusion and organic bonded grade powders. Our metal powders are helping customers in a variety of industries, including new applications for the energy transition market.

We have a full range of ferrous powder grades for virtually all powder metallurgy applications. Our high-quality powders can help you produce high-performance components. As your committed, long-term partner, RTMP offers you decades of technical expertise and knowledge as well as the significant resources and infrastructure of Rio Tinto, an international mining and metallurgical company.

Rio Tinto Metal Powders

Process summary



About Rio Tinto and our operations

Rio Tinto is one of the world's leading metals and mining companies with a global workforce of **more than 50,000 and an extensive portfolio of operating assets** spanning across Australia, Asia, North and South America, Europe, and Africa.

We mine ore to produce iron, aluminium, copper, molybdenum, gold, silver, tellurium, selenium, scandium, and industrial diamonds and minerals. Many of our materials are essential for the low-carbon transition, and for advancing human progress.

As a part of Rio Tinto, Rio Tinto Iron and Titanium (RTIT) has production facilities in Sorel-Tracy, Canada; Richard's Bay, South Africa; and Madagascar. Rio Tinto Metal Powders (RTMP) has an additional facility in Suzhou, China.

Sustainability

At Rio Tinto, sustainability is more than a catch phrase. Aligning our business strategy and daily practices around sustainability enables us to strengthen our operations and products, build enduring communities, and provide lasting benefit to customers, employees, and stakeholders.

Companywide, we have committed to achieving net zero emissions by 2050 and target a **15% reduction of scope 1 and 2 emissions by 2025, with a 50% reduction by 2030*.**

Our RTIT operations in Quebec are run entirely on renewable hydropower, and we are actively pursuing additional sustainability initiatives. We developed ilmenite smelting in Sorel-Tracy, Quebec in the 1950s and through a joint agreement with the Canadian Government, we are investing **$537 million (C$737 million) into reducing emissions at our RTIT operations by up to 70%**. Early in 2023, RTIT started our BlueSmelting™ demonstration plant in Sorel-Tracy. The BlueSmelting™ project involves an ilmenite reduction technology that **could produce 95% less greenhouse gas emissions (GHG)** than the current process. This innovative technology was developed by scientists at Rio Tinto's Critical Minerals and Technology Centre in Sorel-Tracy. The demo plant can process up to 40,000 tonnes of ilmenite per year, making it the largest in the world based on this type of technology. This would enable us to produce titanium dioxide, steel, and metal powders with significantly lower carbon footprints. Furthermore, our iron products, including metal powders, are generated from the residual iron of our smelting process to produce titanium dioxide, without the need for any additional mining.

The GHG reduction initiative at RTMP operations involves modernising control systems for more efficient gas consumption in annealing furnaces and converting three annealing furnaces from natural gas to electric.

Safety

Safety is our number one priority at Rio Tinto. Our goal is for everyone to go home safe at the end of each day. We have global safety standards which address key areas of risks, and they provide consistency in safety management and performance across our global operations and projects. Our businesses are audited internally against these standards and are expected to meet safety performance requirements and targets.

Our commitment to safety has enabled us to achieve a safety performance which is higher than the industry average for all injury frequency rates.

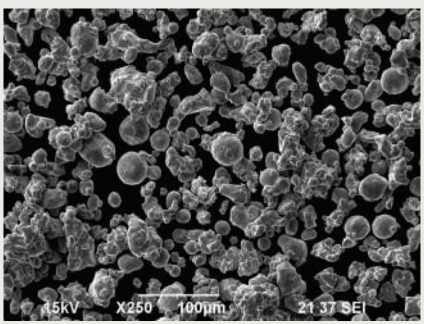
info.qmp@riotinto.com • www.qmp-powders.com

References

* Visit https://www.riotinto.com/en/sustainability/climate-change to learn more about Rio Tinto's sustainability commitments.

Additive Manufacturing

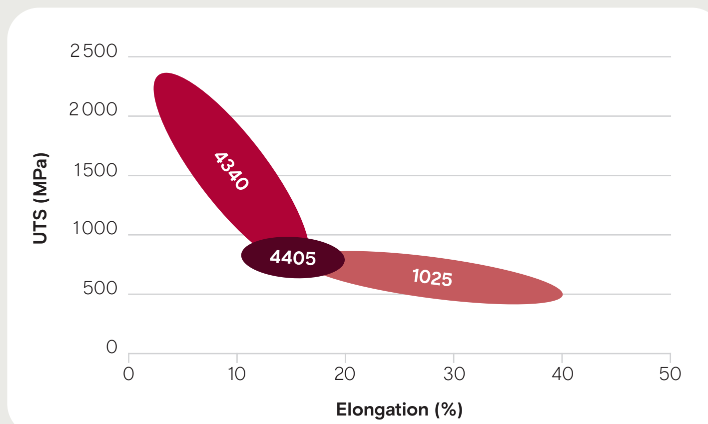
Metal additive manufacturing is going through a significant growth in capabilities with an increasing interest in industrial markets. Our mission is to help industries adopt this disruptive technology, even where cost is a key driver. Our low-cost ferrous water atomized powders are the real solution for industrial adoption of additive manufacturing.



Low-cost solutions for industrial applications Chemical composition

Grade	C	Mn	Mo	Cr	Ni	Si
ATOMET 1025	0,20-0,35	0,70-0,90	-	-	-	0,10-0,25
ATOMET 4340	0,38-0,43	0,60-0,80	0,20-0,30	0,70-0,90	1,60-2,00	0,10-0,25
ATOMET 4405	0,55-0,60	0,15-0,20	0,80-0,90	-	-	-

Range of mechanical properties based on the applied heat treatment



Additive Manufacturing

Examples of mechanical properties measured on LPBF samples

Mechanical Properties	ATOMET 1025		ATOMET 4340		ATOMET 4405
	As-Built*	Annealed at 700 °C	As-Built**	Quench & Temper (200 °C)	As-Built*
Relative Density (%)	> 99,2	> 99,2	> 99.2	> 99,2	> 99,5
Ultimate Tensile Strength (MPa)	780 ± 11	530 ± 10	990 ± 8	1520 ± 8	1350 ± 26
Yield Strength (MPa)	755 ± 11	480 ± 7	900 ± 10	1220 ± 13	1240 ± 24
Elongation (%)	18 ± 1	35 ± 3	15 ± 3	9 ± 2	5 ± 1
Hardness (HRC)	30 ± 3	10 ± 2	43 ± 3	53 ± 1	50 ± 2

- Any supplementary or different post processing can result in different values. Results of other heat treatment are also available upon request.
- Parameters developed to obtain these results could be provided with the powders.

* Printed 0° direction to z axis
** Printed 45° direction to z axis

We have you covered for different technologies!

Technology	PSD (µm)
Laser Powder Bed Fusion	18-53
Powder Bed Binder Jetting	18-53
Direct Energy Deposition	53-150
Cold Spray Additive Manufacturing	18-53
E-Beam Additive Manufacturing	53-150

Synergy® Series

Standard compaction

High performance powder mixes for enhanced productivity suitable for your most demanding powder metallurgy applications

Basic physical powder mixes properties

Lubricant	Apparent density	Hall flow rate	Compressibility	Green strength
	g/cm^3	s/50g	MPa	MPa
Synergy® (0,60 %)	3,14	33	382	11
EBS wax (0,80 %)	3,03	37	374	9

Synergy® powder mixes are the newest introduction to the Rio Tinto Metal Powders family of press-ready mixes.

Expand the possibilities of your process with exceptional lubrication performance even at reduced lubricant loading level. Achieve clean sintered parts without residues from delubrication thanks to a fully organic composition, free of zinc or other metals.

Compared to conventional PM lubricants, Synergy® Series mixes have improved apparent density and more stable flow properties. Enjoy the benefits of a well controlled and more stable manufacturing process such as reduced scrap rates and tighter dimensional tolerances.

+22% green strength

Compared to regular premixes with EBS wax

100% clean sintering

Fully organic
Zinc-free

+20% productivity

Higher stroke rate provides increased productivity

Indicative results based on standard formulations.
Individual results may differ based on specific process differences.

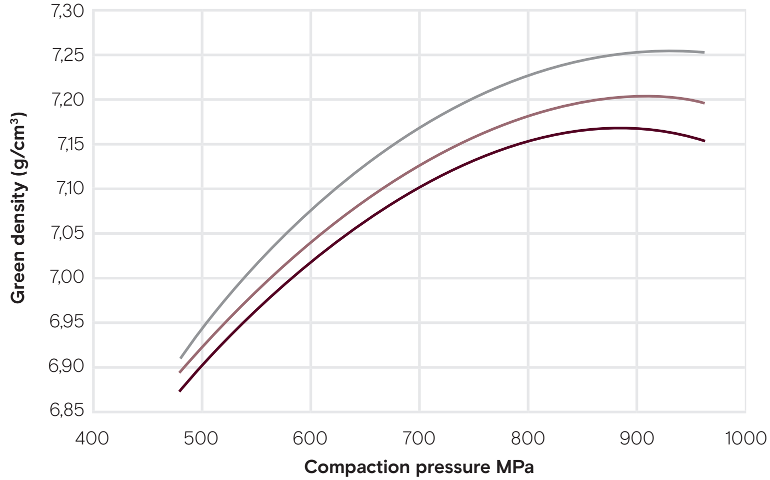
Synergy® Series

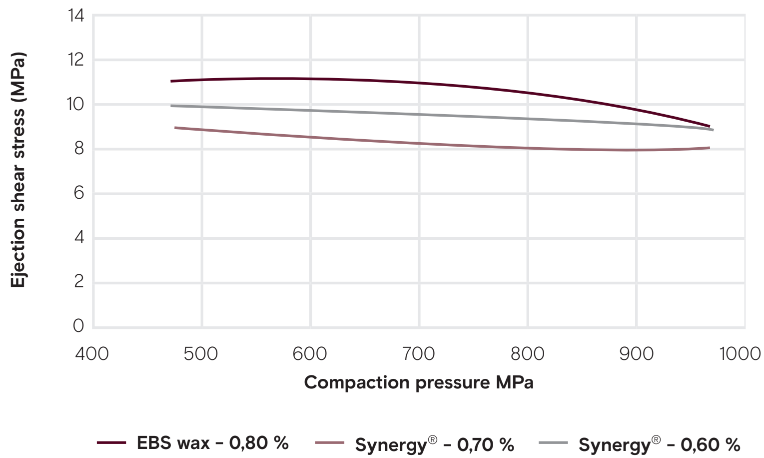
With excellent lubrication properties, Synergy® powder mixes can help achieve unparalleled process performance. The lubricant loading level can be reduced while preserving the ejection performance. This improves compressibility, flow behaviour and the mix apparent density.

Superior surface finishes can be achieved at even low lubricant loads which reduces die wear and can reduce the need for secondary operations. In addition, Synergy® powder mixes lead to perfectly clean parts post sintering.

In comparison to regular PM lubricants, Synergy® allows for the compaction of taller parts due to a higher apparent density.

Mix composition:
ATOMET 1001HP + 1,80 % Cu + 0,70 % C + lubricant





Basic physical powder mixes properties

Lubricant	Synergy (0,60 %)	EBS wax (0,80 %)
Apparent density (g/cm^3)	3,14	3,03
Hall flow rate (s/50g)	33	37
Compressibility (MPa)	382	374
Green strength (MPa)	11	9

Iron Grades

	ATOMET 24	ATOMET 25	ATOMET 28/29	ATOMET 1001	ATOMET 1001HP
	For low and medium density PM applications. Very high green strength for more complex parts.	For low to medium density PM applications (6,2–6,5 g/cm^3) requiring high green strength.	For medium density PM applications (6,4–6,8 g/cm^3). Low growth characteristics and high green strength.	For highest density PM applications (6,8–7,2 g/cm^3). High strength, high compressibility water atomized steel powder.	For soft magnetic PM applications which require an ultra pure steel powder. May be blended with ferro phosphorus for enhanced properties.
Apparent density, g/cm^3	2,46	2,53	2,80/2,90	2,95	2,92
Flow, s/50g	30	29	27	26	25
Chemistry, wt%					
Fe	99+	99+	99+	99+	99+
Mn	0,008	0,008	0,008	0,20	0,05
Ni	–	–	–	–	–
Mo	–	–	–	–	–
Cr	–	–	–	–	–
C	0,01	0,03	0,05/0,03	0,004	0,004
O	0,15	0,18	0,14/0,20	0,08	0,05
S	0,006	0,006	0,006	0,009	0,009
Cu	–	–	–	–	–
Particle Size Distribution, wt%					
+250 µm	Trace	Trace	Trace	Trace	Trace
250/150 µm	4	3	5	10	14
150/45 µm	71	67	73	65	66
-45 µm	25	30	22	25	20
Green Properties					
Density, g/cm^3 at 600 MPa	6,90	6,95	7,00	7,10	7,15
Green Strength, MPa	25	25	25	19	20
Sintered Properties, g/cm^3	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/cm^3	6,70	6,70	6,70	7,00	7,00
Transverse Rupture Strength, MPa	940	900	900	1240	700
Hardness, HRB	79	80	82	92	50
Tensile Strength, MPa	530	500	430	590	280
Dimensional Change, % from die size	+0,22	+0,20	+0,27	+0.37	+0,20

	ATOMET 24	ATOMET 25	ATOMET 28/29	ATOMET 1001	ATOMET 1001HP
Heat treated Properties *				2 % Cu, 0,7 % C	
Sintered Density, g/cm^3				7,1	
Transverse Rupture Strength, MPa				1710	
Hardness, HRC				42	
Tensile Strength, MPa				1110	

All mixes contain 0,5% wax. Sintered in a 90% nitrogen based 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.**

Iron Grades – Consumables

	ATOMET 57	ATOMET 56	ATOMET 68	ATOMET 86	ATOMET 1001 ASN/ ATOMET 1001HP ASN	ATOMET 195SP
	Coarse iron powder for alloying, chemical applications, cementation, and environmental remediation (PRBs, soil mixing, etc).	Coarse iron powder for alloying, chemical applications, cementation, and environmental remediation (PRBs, soil mixing, etc).	High purity coarse iron powder for welding, alloying, and other applications.	High purity iron powder for oxygen lance cutting, environmental remediation (Injection), and other applications.	Iron powder for various battery, energy storage, and other application .	High purity fine Iron powder (sub 45μm) for seed cleaning, pharmaceutical, magnetic additive, chemical, and other applications.
Apparent density, g/cm³	–	3,70	3,27	2,90	3,10/3,21	3,07
Chemistry, wt%						
Fe	–	bal.	bal.	bal.	bal.	bal.
Mn	–	–	–	–	0,18/0,04	–
Ni	–	–	–	–	–	–
Mo	–	–	–	–	–	–
Cr	–	–	–	–	–	–
C	3,17	3,30	0,05	0,05	0,11/0,08	0,01
O	2,64	2,57	0,25	0,18	0,40	0,08
S	0,008	0,010	0,008	0,008	0,010/0,004	0,007
Cu	–	–	–	–	–	–
Particle Size Distribution, wt%						
+600 μm	21	0,10	Trace			
600/150 μm	55	72	57			
-150 μm	24	27,9	43			
+250 μm				Trace	Trace	Trace
250/150 μm				6	11/15	Trace
150/45 μm				71	59	2
-45 μm				23	30/26	98

Prealloyed Grades

	ATOMET 4001	ATOMET 4201	ATOMET 4401	ATOMET 4601	
	For high performance, high strength powder metallurgy and powder forging applications. High compressibility Mo-prealloy powder.	**For improved as-sintered toughness and hardenability. High compressibility Ni-Mo prealloy powder.**	**For high density PM applications requiring extra strength and surface hardening for wear resistance. High compressibility Mo-prealloy powder.**	**For exceptional as-sintered toughness and hardenability. High compressibility Ni-Mo prealloy powder.**	
Apparent density, g/cm³	2,94	2,93	2,93	2,91	
Flow, s/50g	25	26	25	25	
Chemistry, wt%					
Fe	bal.	bal.	bal.	bal.	
Mn	0,14	0,29	0,16	0,20	
Ni	–	0,46	–	1,80	
Mo	0,53	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	0,008	0,009	0,008	0,01	
Cu	–	–	–	–	
Particle Size Distribution, wt%					
+250 µm	Trace	Trace	Trace	Trace	
250/150 µm	12	13	13	11	
150/45 µm	66	66	66	66	
-45 µm	22	21	21	23	
Green Properties					
Density, g/cm³ at 600 MPa	7,10	7,05	7,10	6,95	
Green Strength, MPa	19	1,8	18	15,5	
Sintered Properties, g/cm³	0,5%C	0,5%C	0,5%C	0,5%C	
Sintered Density, g/cm³	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/cm³	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% nitrogen based 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.**

Prealloyed Grades

	ATOMET 4701	ATOMET 4801	ATOMET 4901
	Sinter hardening powder for high strength parts without oil quenching, induction hardening or other post-sintering heat treatments.	**Sinter hardening powder for high strength applications requiring wear resistance. Optional tempering increases strength even further.**	**For the production of parts requiring high wear resistance and superior dynamic properties.**
Apparent density, g/cm³	2,96	2,91	2,99
Flow, s/50g	26	25	24
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	0,21	0,10	0,10
S	0,008	0,009	0,007
Cu	–	–	–
Particle Size Distribution, wt%			
+250 µm	Trace	Trace	Trace
250/150 µm	14	10	12
150/45 µm	66	66	66
-45 µm	20	24	22
Green Properties			
Density, g/cm³ at 600 MPa	6,90	6,85	7,05
Green Strength, MPa	16	11,5	1,3
Sintered Properties, g/cm³	0,5%C	0,5%C	0,5%C
Sintered Density, g/cm³	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

	ATOMET 4701	ATOMET 4801	ATOMET 4901	ATOMET 4901
Heat treated Properties *			0,4-0,55%C	
Sinter Hardened Properties **	1,0%Cu, 0,6%C	1,0%Cu, 0,6%C		1,0%Cu, 0,6%C
Sintered Density, g/cm³	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

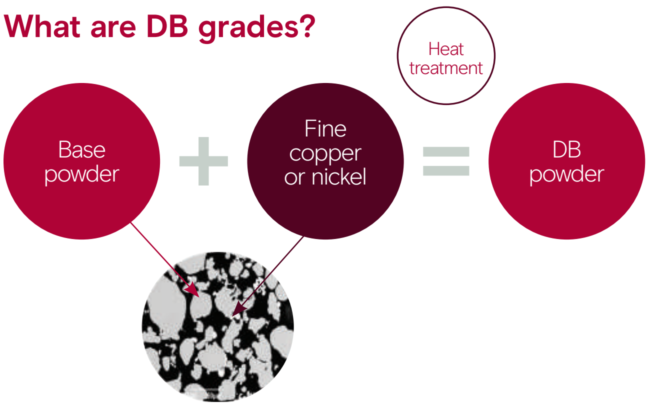
All mixes contain 0,5% wax. Sintered in a 90% nitrogen based atmosphere at 1120°C for 25 minutes.

*** 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 bonded (DB) grades for improved part-to-part stability

What are DB grades?



Why DB grades?

- Improved dimensional stability
- Reduced segregation of fine constituents and improved homogeneity
- More controlled and stable production process
- Reduced scrap rate

Two families of grades

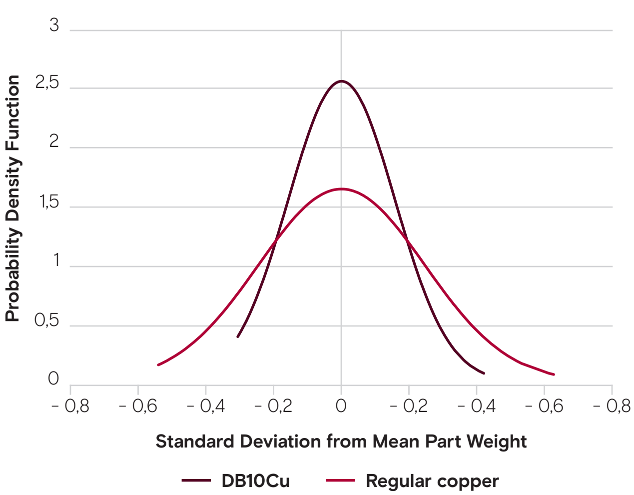
		Base	Nickel	Copper
Diffusion bonded base grades	DB46	AT. 4001 (0,5% Mo)	1,75 %	1,5 %
	DB48	AT. 4001 (0,5% Mo)	4 %	1,5 %
	DB49	AT. 4901 (1,5% Mo)	4 %	2 %
Copper rich diffusion bonded grade (to be added in premixes)	DB10Cu	AT. 1001 (0% Mo)	0 %	10 %

Example of improved performance

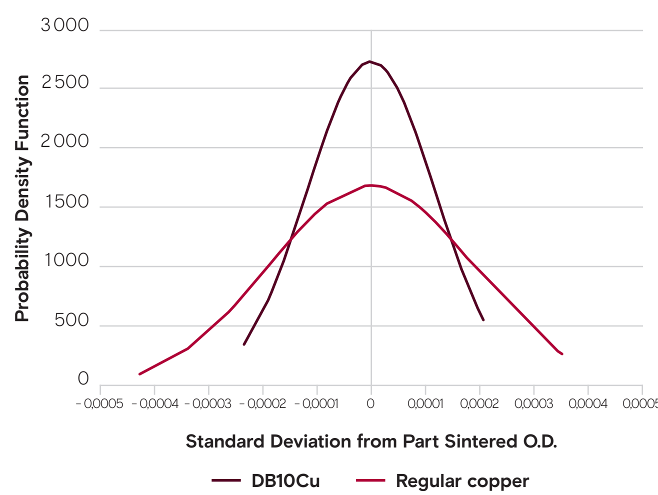
DB10Cu	1001	20% DB10Cu	0,6% graphite	0,7% lube
Reg. Cu	1001	2% Reg. Cu	0,6% graphite	0,7% lube

- Production of 2500 parts of each mix
- Evaluation of weight and dimensional stability

Weight normal distribution



Sintered O.D. normal distribution



Diffusion and Organic Bonded Grades

	ATOMET DB46	ATOMET DB48	ATOMET DB49	FLOMET F49-Cu	FLOMET F49-Ni
	Excellent consistency and dimensional control for high performance powder metallurgy applications.	**For demanding applications requiring excellent consistency and dimensional control in parts.**	**For demanding applications requiring very high strength and dimensional control in parts.**	**For demanding applications requiring direct hardening and very high strength parts.**	**For demanding applications requiring excellent fatigue properties and dimensional control in parts.**
Apparent density, g/cm^3	3,01	3,01	3,04	2,96	3,04
Flow, s/50g	24	24	24	30	31
Chemistry, wt%					
Fe	bal.	bal.	bal.	bal.	bal.
Mn	0,15	0,15	0,15	0,15	0,15
Ni	1,75	4,00	4,00	–	2,00
Mo	0,50	0,50	1,50	1,50	1,50
Cr					
C	0,005	0,006	0,02	0,01	0,01
O	0,09	0,09	0,09	0,1	0,1
S	0,008	0,008	0,008	0,007	0,007
Cu	1,50	1,50	2,00	2,00	–
Particle Size Distribution, wt%					
+250 µm	Trace	Trace	Trace	Trace	Trace
250/150 µm	12	12	12	12	12
150/45 µm	65	65	62	66	66
-45 µm	23	23	26	22	22
Green Properties					
Density, g/cm^3 at 600 MPa	7,10	7,10	7,05	7,04	7,09
Green Strength, MPa	17	19	15	11	11
Sintered Properties, g/cm^3	0,5% C	0,5% C	0,5% C	0,7% C	0,6% C
Sintered Density, g/cm^3	7,00	7,00	7,00	7,00	7,00
Transverse Rupture Strength, MPa	1440	1590		1400	1325
Hardness	89 HRB	21 HRC	30 HRC	97 HRB	93 HRB
Tensile Strength, MPa	605	750		850	715
Dimensional Change, % from die size	+0,23	+0,04		+0,11	-0,11
Heat treated Properties *	0,4- 0,55%C	0,4- 0,55%C	0,4- 0,55%C		
Sintered Density, g/cm^3	7,10	7,10	7,05		
Transverse Rupture Strength, MPa	1400	1935	1680		
Hardness, HRC	39	38	42		
Tensile Strength, MPa	950	1150	985		

Dimensional change, % from die size

All mixes contain 0,5% wax. Sintered in a 90% nitrogen based 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.**

SMC applications

Soft Magnetic Composites (SMC) represent a class of powder metallurgy products that are responsible for a transformation in the field of electric motors. SMC, which are Fe-based powders that have been coated with an electrically insulating coating, are now a material option available to motor designers.

Laminated steels and permanent magnets both have unique properties that are highly desirable. However, SMC with their low cost and high degree of flexibility for the fabrication of complex shaped parts, allow for the design of highly efficient motors with high torque density.

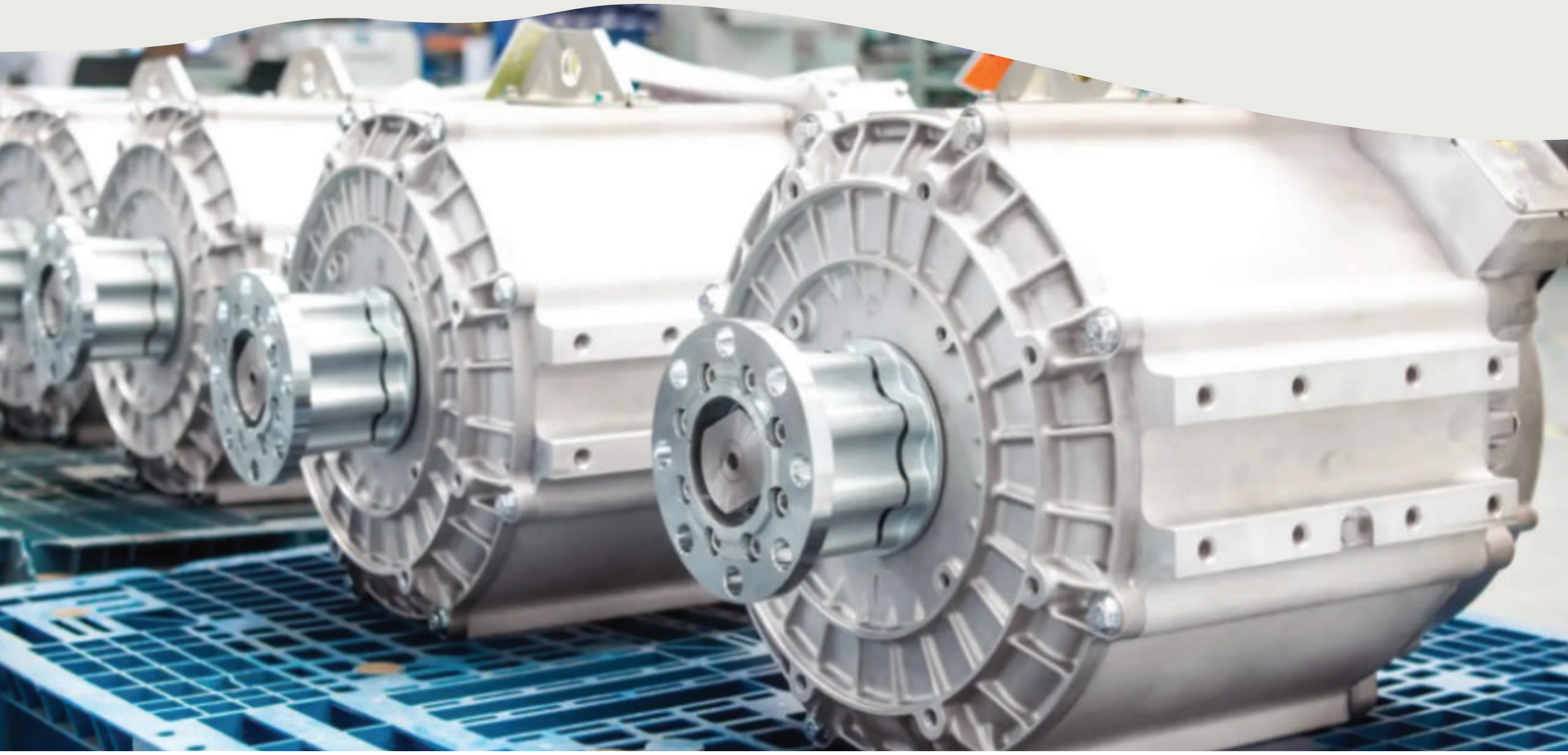
In some instances, replacing a laminated component with one made by SMC, formed into a more complex shape, can result in a significant decrease in the quantity of Cu wire used to have the motor turning. This change alone would directly translate into important weight and cost savings for the end user.

Non-moving components, such as cores, can also benefit from the unique properties conferred by SMC.

SMC properties

The mechanical and magnetic properties of a SMC can be adjusted by first selecting the proper material, by compacting it to the desired density, and then by performing the adequate thermal treatment. On that last point, SMC can be subdivided into two general families of materials; those which are heat treated and those which are steam treated; the later resulting in significantly higher strength but slightly higher losses.

Rio Tinto offers several SMC products in each of these categories. Technical representatives are available across the world to help you select the SMC material that is best suited for your application.



SMC

Heat treated SMC – low losses

Typical Properties

SMC Product	Density [g/cm³]	Treatment	TRS [MPa]	Electrical Resistivity [μΩ·m]	B [T]		μ max	H_c [A/m]	Total Fe losses @ 1T [W/kg]				Total Fe losses @ 1,5T [W/kg]			
					10 kA/m	12 kA/m			50/60Hz	400Hz	1000Hz	2000Hz	60Hz	400Hz	1000Hz	2000Hz
EM-300	7,30 689MPa-60°C	515°C N_2-30min	45	1360	1,44	1,49	324	257	5,6 / 6,8	50	131	269	13	101	257	525
	7,41 827MPa-80°C		29	1350	1,50	1,56	355	232	5,2 / 6,3	46	120	249	12	94	241	496
EM-301	7,15 510MPa-60°C	530°C Air-N_2-30min	40	90	1,35	1,40	297	261	6,0 / 7,2	54	150	327	12	105	286	674
	7,43 758MPa-60°C	515°C N_2-30min	20	2100	1,49	1,54	309	232	5,2 / 6,3	46	122	250	12	95	245	515
EM-106	7,37 758MPa-80°C	515°C N_2-30min	24	940	1,44	1,51	310	262	5,8 / 6,9	50	132	271	13	103	262	532
	7,43 827MPa-80°C		40	120	1,50	1,56	335	258	5,6 / 6,8	51	140	312	13	105	282	617
EM-501	7,15 503MPa-60°C	480°C Air-N_2-30min	49	500	1,39	1,44	367	292	6,7 / 8,0	57	151	317	14	115	307	570
	7,30 696MPa-60°C	500°C N_2-60min	26	90	1,53	1,56	380	234	5,1 / 6,2	48	140	330	13	99	311	576

Heat treated SMC – low losses at very high frequencies and low applied field

Typical Properties

SMC Product	Density [g/cm³]	Treatment	TRS [MPa]	Electrical Resistivity [μΩ·m]	B [T]		μ max	H_c [A/m]	Total Fe losses [W/kg]							
									@ 0,05 T				@ 0,1 T			
					10 kA/m	12 kA/m			5kHz	10kHz	20kHz	30kHz	5kHz	10kHz	20kHz	30kHz
EM-301	7,30 758MPa-60°C	515°C N_2-30min	21	3850	1,48	1,53	465	257	4,5	10	26	47	15	38	91	164

Steam treated SMC – high strength – low losses

Typical Properties

SMC Product	Density [g/cm³]	Treatment	TRS [MPa]	Electrical Resistivity [μΩ·m]	B [T]		μ max	H_c [A/m]	Total Fe losses [W/kg]						
									@ 1 T				@ 1,5 T		
					10 kA/m	12 kA/m			50/60Hz	400Hz	1000Hz	2000Hz	60Hz	400Hz	1000Hz
EM-306	7,30 689MPa-60°C	Steam	143	510	1,55	1,61	540	276	5,9 / 7,0	50	144	320	14	113	286

Steam treated SMC – high strength – high permeability

Typical Properties

SMC Product	Density [g/cm³]	Treatment	TRS [MPa]	Electrical Resistivity [μΩ·m]	B [T]		μ max	H_c [A/m]	Total Fe losses [W/kg]					
									@ 1 T			@ 1,5 T		
					10 kA/m	12 kA/m			50/60Hz	400Hz	1000Hz	60Hz	400Hz	1000Hz
EM-703	7,30 689MPa-60°C	Steam	165	1360	1,57	1,63	901	272	7,5 / 9,8	156	759	20	334	1192

N.B.: Data shown reflects actual results obtained either by Rio Tinto or by independent external laboratories. Fluctuations of the order of +/- 5% are expected depending on the thermal/steam treatment parameters used.

Rio Tinto Metal Powders
Worldwide Locations

RTIT Quebec Operations
Sorel-Tracy, Canada

1655, route Marie-Victorin
Sorel-Tracy (Québec) J3R 4R4
Canada
Tel +1 450 746 5050

Chicago, USA

200 E Randolph Street
Suite 7100
Chicago, IL 60601
USA
Tel +1 773 270 6500

Eschborn, Germany

Alfred-Herrhausen-Allee 3-5,
65760 Eschborn
Germany
Tel +49 6196 96 000

Pune, India

Gat No. 246 ,Barge Wasti,
Chimbali Road, Chimbali
Tal : Khed, Dist : Pune 410501
India
Tel +91 7567106767

Suzhou, China

418 Nanshi Street
Suzhou Industrial Park
Suzhou 215021
P.R. China
Tel +86 512 6283 6100

ISO 9001 TS 16949

CERTIFIED SYSTEM BNQ ISO 14001:2015

info.qmp@riotinto.com
qmp-powders.com