

SULZER

Sulzer Metco

WOKA™ Carbide Powder Materials for Thermal Spray

Bulletin #10-698



The Secret of Staying Ahead

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(The following thermal spray guns are mentioned in this publication: Top Gun is a product of UTP and is distributed by GTV, K2 is a product of GTV, Jet Kote is a product of Deloro Stellite, JP 5000 and HV 2000 are products of Praxair/Tafa, CJS is a product of Thermico. WokaJet, WokaStar, DiamondJet and Water-Cooled are product brands of Sulzer Metco)



Thermal spray materials are tested for sprayability using modern, in-house facilities.

Introduction

WOKA carbides are produced using the most modern manufacturing techniques currently available. Carbide size is tightly controlled. Sintering is performed in chargeable vacuum furnaces, which produce large lots at a constant sintered grade. Every step of the manufacturing process is designed to minimize the potential for oxidation and contamination. Much of our manufacturing process is computer-controlled, which results in excellent reproducibility and lot to lot consistency. State-of-the-art quality control equipment and processes meet ISO 9001 and ensure that these high standards are met.

Product Availability

Product information provided in this bulletin represents thermal spray carbide products which are stocked as standard items on a global basis.

Particle Size Distributions

Standard particle size distributions are listed within this bulletin. Customers should choose a particle size distribution that is appropriate to the process and spray gun to be used.

We can supply other distributions to meet specific needs, upon request. Please contact your Sulzer Metco Sales Representative for further information.

Apparent Density and Hall Flow

The apparent density and Hall flow depends largely on the particle size distribution of a given material. If required, this information can be provided.

Container Sizes

Standard container sizes are stocked appropriately for each region, with ten pound containers in the Americas and five kilogram containers being the standard stock container size for Europe. Customers in other regions should specify which of these container sizes is appropriate for their needs.

European Standards

Where appropriate, the European Norm standard has been listed for the product. Certification for all materials can be supplied in accordance with EN 10 204 3.1 B.

Customized Products

Our talented staff of engineers are prepared to work with you to develop hardfacing material solutions that meet your exact application requirements.



Chemistry and metallography testing is performed in well-equipped, in-house laboratories.

WOKA 88% Tungsten Carbide - 12% Cobalt Powder

Description

A spheroidal, agglomerated and sintered powder that produces coatings with high resistance to abrasion, erosion and sliding wear. Oxidation and corrosion resistance is low. Coatings are tough and dense and may be used at service temperatures up to 480 °C (900 °F).

Spray Processes

High velocity oxy-fuel spray (HVOF) and other thermal spray processes. Please select the particle size appropriate for the process and spray gun to be used.

Chemical Composition (weight %)

Tungsten	balance
Cobalt	11.0 – 13.0
Carbon	5.1 – 5.7
Iron	0.2 max

Morphology

Spheroidal

European Standard

EN 1274 - 11.11
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3101	1041095	5 kg	Europe	-53 +20	K2, Jet Kote
	1041049	10 lb	Americas		
WOKA 3102	1041096	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041050	10 lb	Americas		
WOKA 3103	1041097	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041051	10 lb	Americas		
WOKA 3104	1041177	5 kg	Europe	-30 +10	CJS
	1041189	10 lb	Americas		
WOKA 3105	1041098	5 kg	Europe	-38 +10	---
	1041052	10 lb	Americas		
WOKA 3106	1041099	5 kg	Europe	-53 +15	---
	1041053	10 lb	Americas		
WOKA 3107	1041100	5 kg	Europe	-45 +20	---
	1041054	10 lb	Americas		
WOKA 3108	1042831	5 kg	Europe	-90 +45	---
WOKA 3110	1042701	10 lb	Americas	-25 +5	---
WOKA 3111	1041101	5 kg	Europe	-20 +5	---
	1041055	10 lb	Americas		
WOKA 3114	1041102	5 kg	Europe	-106 +53	---
	1041056	10 lb	Americas		
WOKA 3115	1041103	5 kg	Europe	-106 +45	---
	1041057	10 lb	Americas		
WOKA 3116	1041104	5 kg	Europe	-90 +53	---
	1041058	10 lb	Americas		
WOKA 3118	1042911	10 lb	Americas	-75 +45	---
WOKA 3120	1041105	5 kg	Europe	-106 +32	---
	1041059	10 lb	Americas		
WOKA 3123	1061110	5 kg	Europe	-53 + 10	---
	1061164	10 lb	Americas		

WOKA 83% Tungsten Carbide - 17% Cobalt Powder

Description

A spheroidal, agglomerated and sintered powder that generates coatings with high resistance to sliding wear, abrasion and fretting. Oxidation and corrosion resistance is low. Coatings can be used at service temperatures up to 480 °C (900 °F).

Chemical Composition (weight %)

Tungsten	balance
Cobalt	16.0 – 18.0
Carbon	4.8 – 5.3
Iron	0.2 max

Morphology

Spheroidal

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for the spray gun to be used.

European Standard

EN 1274 - 11.13
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3201	1041106	5 kg	Europe	-53 +20	K2, Jet Kote
	1041060	10 lb	Americas		
WOKA 3202	1041168	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041155	10 lb	Americas		
WOKA 3203	1041107	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041061	10 lb	Americas		
WOKA 3206	1041108	5 kg	Europe	-53 +15	---
	1041062	10 lb	Americas		
WOKA 3207	1041368	5 kg	Europe	-45 +20	---
	1041327	10 lb	Americas		
WOKA 3208	1035978	5 kg	Europe	-90 +45	---
	1042910	10 lb	Americas		
WOKA 3210	1049662	10 lb	Americas	-25 +5	---
WOKA 3221	1041109	5 kg	Europe	-63 +38	---
	1041063	10 lb	Americas		
WOKA 3232	1049661	10 lb	Americas	-30 +5	---

WOKA 90% Tungsten Carbide - 10% Nickel Powder

Description

A spheroidal, agglomerated and sintered powder that generates abrasion resistant coatings that are hard and dense and resist oxidation and corrosion. Coatings can be used at service temperatures up to 480 °C (900 °F).

Chemical Composition (weight %)

Tungsten	balance
Nickel	9.0 – 11.0
Carbon	5.3 – 5.8
Iron	0.2 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for the spray gun to be used.

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3301	1041110	5 kg	Europe	-53 +20	K2, Jet Kote
	1041064	10 lb	Americas		
WOKA 3302	1041111	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041065	10 lb	Americas		
WOKA 3303	1041148	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041183	10 lb	Americas		
WOKA 3304	1049842	10 lb	Americas	-30 +10	---
WOKA 3307	1050650	10 lb	Americas	-45 +20	---
WOKA 3332	1049840	10 lb	Americas	-30 +5	---

WOKA 83% Tungsten Carbide - 17% Nickel Powder

Description

A spheroidal, agglomerated and sintered powder with a uniform distribution of tungsten carbide and nickel. Coatings generated are resistant to fretting under impact and frictional loading at service temperatures up to 480 °C (900 °F). Coatings can be used in radioactive environments.

Chemical Composition (weight %)

Tungsten	balance
Nickel	16.0 – 18.0
Carbon(total)	4.8 – 5.2
Carbon(free)	0.2 max
Iron	0.2 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Morphology

Spheroidal

European Standard

EN 1274 - 11.20
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3501	1041638	5 kg	Europe	-53 +20	K2, Jet Kote
	1041586	10 lb	Americas		
WOKA 3506	1049660	10 lb	Americas	-53 +16	---
WOKA 3534	1042909	10 lb	Americas	-105 +75	---

WOKA 85% Tungsten Carbide - 9% Cobalt - 5% Chrome - 1% Nickel Powder

Description

A spheroidal, agglomerated and sintered powder that produces coatings with good resistance to erosion, abrasion, sliding wear and corrosion. Coatings are smooth, tough and dense and may be used at service temperatures up to 450 °C (840 °F).

Chemical Composition (weight %)

Tungsten	balance
Cobalt	8.5 – 9.5
Carbon	5.1 – 5.8
Chrome	4.5 – 5.5
Nickel	0.8 – 1.2
Iron	0.3 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3601	1041169	5 kg	Europe	-53 +20	K2, Jet Kote
	1041157	10 lb	Americas		
WOKA 3602	1041112	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041066	10 lb	Americas		
WOKA 3603	1041149	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041184	10 lb	Americas		
WOKA 3604	1041113	5 kg	Europe	-30 +10	CJS
	1041067	10 lb	Americas		
WOKA 3606	1049659	10 lb	Americas	-53 +16	---
WOKA 3607	1041114	5 kg	Europe	-45 +20	---
	1041068	10 lb	Americas		
WOKA 3610	1041115	5 kg	Europe	-25 +5	---
	1041069	10 lb	Americas		
WOKA 3622	1041116	5 kg	Europe	-25 +10	---
	1041070	10 lb	Americas		
WOKA 3632	1042982	10 lb	Americas	-30 +5	---

WOKA 86% Tungsten Carbide - 10% Cobalt - 4% Chrome

Description

A spheroidal, agglomerated and sintered powder that produces coatings with good resistance to erosion and abrasion. Coatings are smooth, tough and dense and may be used in aqueous corrosion environments at service temperatures up to 450 °C (840 °F).

Chemical Composition (weight %)

Tungsten	balance
Cobalt	9.0 – 10.5
Carbon	5.1 – 5.8
Chrome	3.5 – 4.5
Iron	0.3 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3651	1041264	5 kg	Europe	-53 +20	K2, Jet Kote
	1041253	10 lb	Americas		
WOKA 3652	1041265	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041254	10 lb	Americas		
WOKA 3653	1041266	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041255	10 lb	Americas		
WOKA 3654	1041267	5 kg	Europe	-30 +10	CJS
	1041256	10 lb	Americas		
WOKA 3657	1041268	5 kg	Europe	-45 +20	---
	1041257	10 lb	Americas		
WOKA 3660FC	1042434	10 lb	Americas	-25 +5	---

WOKA Tungsten Carbide - 20% Chrome Carbide - 7% Nickel Powder

Description

A spheroidal, agglomerated and sintered powder that generates dense, smooth coatings with excellent oxidation and corrosion resistance. Coatings of this product may be used at service temperatures up to 500 °C (930 °F).

Chemical Composition (weight %)

Tungsten	balance
Chrome	18.6 – 22.1
Nickel	6.6 – 8.1
Carbon	4.9 – 7.4
Iron	0.3 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3701	1041170	5 kg	Europe	-53 +20	K2, Jet Kote
	1041158	10 lb	Americas		
WOKA 3702	1041117	5 kg	Europe	-45 +15	WokaJet, JP 5000, Top Gun, HV 2000
	1041071	10 lb	Americas		
WOKA 3703	1041150	5 kg	Europe	-45 +11	Water-Cooled DJ
	1041185	10 lb	Americas		
WOKA 3704	1041178	5 kg	Europe	-30 +10	CJS
	1041190	10 lb	Americas		
WOKA 3707	1041118	5 kg	Europe	-45 +20	---
	1041072	10 lb	Americas		

WOKA 85% Tungsten Carbide - 15% Nickel Powder

Description

A spheroidal, agglomerated and sintered powder that generates hard, abrasion resistant coatings that resist oxidation and corrosion at service temperatures up to 480 °C (900 °F).

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Chemical Composition (weight %)

Tungsten	balance
Nickel	14.0 – 16.0
Carbon ^(total)	5.0 – 5.4
Iron	0.2 max

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 3807	1049784	10 lb	Americas	-45 +20	---

WOKA 80% Chrome Carbide - 20% Nickel Chrome Powder

Description

A spheroidal, agglomerated and sintered powder that generates coatings with good abrasion and wear resistance and excellent oxidation and corrosion resistance. Coatings of this product may be used at service temperatures up to 850 °C (1560 °F).

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Chemical Composition (weight %)

Chrome	balance
Nickel	16.0 – 18.0
Carbon	9.5 – 11.5
Iron	0.3 max

Morphology

Spheroidal

European Standard

EN 1274 - 11.32
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 7102	1041171	5 kg	Europe	-45 +15	WokaJet, K2, JP 5000, Jet Kote
	1041159	10 lb	Americas		
WOKA 7103	1041119	5 kg	Europe	-45 +11	---
	1041073	10 lb	Americas		
WOKA 7104	1041179	5 kg	Europe	-30 +10	CJS
	1041191	10 lb	Americas		
WOKA 7105	1041151	5 kg	Europe	-38 +10	Water-Cooled DJ, Top Gun, HV 2000
	1041186	10 lb	Americas		
WOKA 7107	1050651	10 lb	Americas	-45 +20	---

WOKA 75% Chrome Carbide - 25% Nickel Chrome Powder

Description

A spheroidal, agglomerated and sintered powder, which generates hard, dense coatings that provide protection from abrasion and cavitation. Oxidation and corrosion resistance is excellent. Coatings can be used at service temperatures up to 850 °C (1560 °F)..

Chemical Composition (weight %)

Chrome	balance
Nickel	18.0 – 22.0
Carbon	9.2 – 10.8
Iron	0.3 max

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Morphology

Spheroidal

European Standard

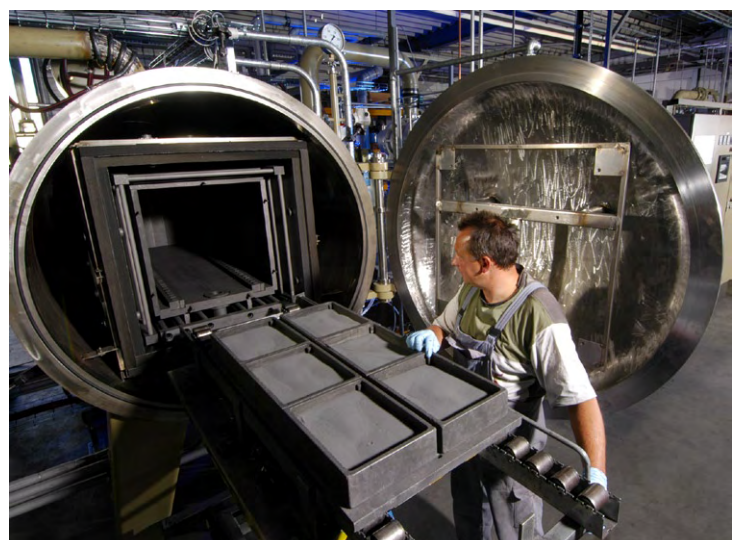
EN 1274 - 11.31
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 7201	1041120	5 kg	Europe	-53 +20	---
	1041074	10 lb	Americas		
WOKA 7202	1041121	5 kg	Europe	-45 +15	WokaJet, K2, JP 5000, Jet Kote
	1041075	10 lb	Americas		
WOKA 7203	1049664	10 lb	Americas	-45 +11	---
WOKA 7204	1041180	5 kg	Europe	-30 +10	CJS
	1041192	10 lb	Americas		
WOKA 7205	1041122	5 kg	Europe	-38 +10	Water-Cooled DJ, Top Gun, HV 2000
	1041076	10 lb	Americas		
WOKA 7207	1041123	5 kg	Europe	-45 +20	---
	1041077	10 lb	Americas		
WOKA 7210	1049657	10 lb	Americas	-25 +5	---
WOKA 7218	1042908	10 lb	Americas	-75 +45	---
WOKA 7233	1042700	10 lb	Americas	-75 +32	---



The sintering process is computerized and can be customized for specific requirements.

The constituents of a carbide material are homogenously agglomerated using the spray drying process.



WOKA 75% Chrome Carbide - 25% Nickel Chrome HIP-Densified Powder

Description

A spheroidal, agglomerated and HIP-densified powder, which generates coatings that provide protection from abrasion and cavitation. Oxidation and corrosion resistance is excellent. Coatings can be used at service temperatures up to 850 °C (1560 °F).

Chemical Composition (weight %)

Chrome	balance
Nickel	18.0 – 22.0
Carbon	9.2 – 10.8
Iron	0.3 max

Morphology

Spheroidal

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

European Standard

EN 1274 - 11.31
agglomerated / sintered

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 7301	1041125	5 kg	Europe	-53 +20	---
	1041079	10 lb	Americas		
WOKA 7302	1041172	5 kg	Europe	-45 +15	WokaJet, K2, JP 5000, Jet Kote
	1041160	10 lb	Americas		
WOKA 7303	1049665	10 lb	Americas	-45 +11	---
WOKA 7304	1041181	5 kg	Europe	-30 +10	CJS
	1041193	10 lb	Americas		
WOKA 7305	1041152	5 kg	Europe	-38 +10	Water-Cooled DJ, Top Gun, HV 2000
	1041187	10 lb	Americas		
WOKA 7307	1049658	10 lb	Americas	-45 +20	---
WOKA 7310	1050674	10 lb	Americas	-25 +5	---

WOKA Chromium-Iron Carbide - 20% Nickel Powder

Description

A spheroidal, agglomerated and sintered complex chromium-iron carbide powder designed for the replacement of galvanic chromium plating. Oxidation and corrosion resistance is fairly good in most aqueous and atmospheric environments and comparable to galvanically deposited chromium, as is hardness and wear resistance. Coatings can be used at service temperatures up to 800 °C (1475 °F).

Chemical Composition (weight %)

Chrome	balance
Nickel	18.0 – 22.0
Iron	13.0 – 17.0
Carbon	6.8 – 7.6

Morphology

Spheroidal

European Standard

No EN classification

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 7402	1059868	5 kg	Europe	-45 +15	WokaJet, K2, JP 5000, Jet Kote
	1059871	10 lb	Americas		
WOKA 7403	1059866	5 kg	Europe	-45 +11	---
	1059872	10 lb	Americas		

WOKA Chrome Carbide - 37% Tungsten Carbide - 18% Metal Alloy Powder

Description

A spheroidal, agglomerated and sintered WC/Cr₃C₂ powder, which generates coatings that provide high abrasion, sliding wear and fretting protection. Oxidation and corrosion resistance is excellent. Coatings can be used at service temperatures up to 700 °C (1292 °F)

Spray Processes

High velocity oxy-fuel spray (HVOF). Please select the particle size appropriate for process and spray gun to be used.

Chemical Composition (weight %)

Tungsten	balance
Chrome	39.5 – 43.5
Nickel	10.5 – 12.5
Carbon	7.8 – 8.8
Cobalt	3.0 – 5.0
Iron	0.5 max

Morphology

Spheroidal

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Spray Gun
WOKA 7502	1041173	5 kg	Europe	-45 +15	WokaJet, K2, JP 5000, Jet Kote
	1041161	10 lb	Americas		
WOKA 7503	1059865	5 kg	Europe	-45 +11	---
	1059870	10 lb	Americas		
WOKA 7504	1041182	5 kg	Europe	-30 +10	CJS
	1041194	10 lb	Americas		
WOKA 7505	1041153	5 kg	Europe	-38 +10	Water-Cooled DJ, Top Gun, HV 2000
	1041188	10 lb	Americas		
WOKA 7507	1041128	5 kg	Europe	-45 +20	---
	1041082	10 lb	Americas		

WOKA Nickel-Based Self-Fluxing Alloy / Tungsten Carbide Cobalt Blend

Description

A spheroidal, agglomerated and sintered complex cA blend consisting of nickel-chromium-iron self-fluxing alloy (matrix metal) and a sintered tungsten carbide-cobalt material (hard phase). This material produces coatings with a high resistance to abrasive wear and with fair impact resistance. Phase transformation of the carbide during fusing with an oxy-acetylene flame is negligible, thus no embrittlement of the matrix occurs. This material can be applied using the combustion powder spray (Thermospray®) process and fused to form very dense, essentially porosity free coatings. Compatible substrate materials include mild steels, heat treatable steels, stainless steels and nickel-based alloys.

Spray Processes

Combustion powder spray (Thermospray®)

Chemical Composition

WCCo / NiCrFeSiB
Please refer to the table below for the ratio of hardphase to metal matrix

Morphology

Blend

European Standard

No EN classification

Product Name	Stock No.	Container Size	Distribution	Particle Size Distribution (µm)	Ratio of Hardphase to Matrix Metal	Spray Gun
WOKA 7701	1051139	5 kg	Europe	-106 +45	35 / 65	5P-II, 6P-II
WOKA 7702	1051140	5 kg	Europe	-106 +45	40 / 60	5P-II, 6P-II

Advanced Technology Solutions and Services

Perfect Solutions through Optimum Materials and Innovative Technologies

Sulzer Metco is a global leader in surface engineering solutions and services offering:

- A broad range of thermal spray, thin film and other advanced surface technology equipment, integrated systems and materials
- Specialized coating and surface enhancement services
- Manufactured components for the turbine, automotive and other industries
- Customer support services

Sulzer Metco provides a comprehensive manufacturing, distribution and service network, catering to aerospace, power generation, automotive and other strategic growth industries.

To take control of your surface engineering challenges, contact your Sulzer Metco sales office, visit our website at www.sulzermetco.com or email us at info@sulzermetco.com.

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