RGP BALLS®

PRECISION BALLS

www.rgpballs.com

Welcome

COMPANY PROFILE

WELCOME TO OUR WORLD: PRECISION.

For over fifty years, we have been among Europe's leading companies in the manufacturing, trading and distribution of precision balls, rollers and ball transfer units.

WE MOVE MOUNTAINS TO GET THE DETAILS PERFECT

Over 70 people working together since long time in our headquarter in Cinisello Balsamo: at Rgpballs we have about 10,000 m2 of know-how and expertise. We consistently work on innovations to stay at the forefront. With us, everything is about quality.

CHOOSING RGPBALLS® MEANS CHOOSING EXPERTISE, ...

Nothing says more than time. We have over 50 years of efforts, breakthroughs, and expertise under our belts. And we keep improving everyday.

METHOD, ...

Science pushes us far, a consultative spirit keeps us close to your needs.
And this is how we manage to handle the broadest range of inquiries.

SPEED.

Time is valuable, exactly like our warehouse.
Indeed, more stock available means less time needed to satisfy any demand.

AN "EVERYTHING, RIGHT NOW" WAREHOUSE.

You also know that in an ever-changing business, speed is competitiveness.
Our warehouse is a valuable resource with more than 5,000 tons of products regularly in stock.
We can guarantee prompt delivery for most of our customers' needs worldwide.

WE HAVE MORE THAN 3,000 CUSTOMERS ALL AROUND THE WORLD, AND WE SPEAK THEIR LANGUAGES.

Our catalogue is international; wherever you are, you can select our products and consult with our experts, without worrying about physical or language barriers.
Our team can speak all major languages: Italian, German, English, French, Spanish, Ukrainian, Russian, Chinese, and Romanian.

A FAMILY BUSINESS.

We are a company that is also a big family. You won't find any board of directors with us, only the passion we put into each and every challenge. Our business is so stable that after 50 years we are still here, with all the professionalism of an international business.

10.000 m² headquarter

80 employees

4.000 tons of products

+3.000 customers

CERTIFICATION:

CERTIFICATION FOR MANAGEMENT SYSTEMS:
ISO 9001:2015 – ISO 14001:2015 – ISO 45001:2018
PRODUCT CERTIFICATION ACCORDING TO TUV-PROFiCERT PROCEDURES

METAL ALLOYS

ALUMINIUM ALLOYS BALLS SERIES 1XXX

Light balls featured by good corrosion and wear resistance, very good surface finishing. 1xxx series alloys are not heat treated. Balls can be provided in the passivated conditions.

Applications

Special bearings and valves, sealing elements (crushed balls), they are used in automotive industry (safety devices), aviation and aerospace industry, electronic industry, welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cr	%Cu	%Ti	%Al	%V	%Mg	%Zn	-
1050	0,25 max	0,40 max	0,05 max	0,05 max	0,05 max	0,05 max	99,50 min	0,05 max	0,05 max	0,07 max	-
1070	0,20 max	0,25 max	0,03 max	-	0,03 max	0,03 max	99,70 min	0,05 max	0,03 max	0,07 max	-
1100	% (Si+Fe) max 0,95	% (Si+Fe) max 0,95	0,05 max	0,10 max	0,05 - 0,20	0,03 max	99,00 min	0,05 max	0,05 max	0,10 max	-

International standards

Series	Description	Available heat treatments
1xxx	Commercially pure Al	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,71
Young's modulus	E	GPa	Mechanical	-	70
Specific heat	c	J/kg-K	Thermal	Room temp.	875
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	23,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	220,0
Electric resistivity		*m*10^-9	Electric	-	28
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV0.5	20-50	-	-
Ultimate tensile strength	Mechanical	MPa	65-165	psix10^3	10 - 23
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 150,000	mm	3/64 - 6	"	G100-200-500-1000

Corrosion Resistance

1xxx series alloys provide better corrosion resistance thanks to their purity. Good resistance on almost all natural waters. All aluminium alloys are subjected to pitting corrosion in presence of chlorides.

ALUMINIUM ALLOYS BALLS SERIES 2XXX

Light balls feaature good corrosion and wear resistance, very good surface finishing. 2xxx series alloys allow to get better mechanical characteristics. Balls can be provided in the passivated condition.

Applications
Special bearings and valves, sealing elements (crushed balls), they are used in automotive industry (safety devices), aviation and aerospace industry, electronic industry, welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cr	%Cu	%Ti	%Al	%Mg	%Zn	-	-
2017	0,20-0,80	0,70 max	0,40-1,00	0,10 max	3,50-4,50	0,15 max	balance	0,40-0,80	0,25 max	-	-
2024	0,50 max	0,50 max	0,30-0,90	0,10 max	3,80-4,90	0,15 max	balance	1,20-1,80	0,25 max	-	-

International standards

Series	Description	Available heat treatments
2xxx	Al-Cu alloy	2017 A - 2017 W - 2017 T4 - 2024 T351 - 2024 T4

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,78
Young's modulus	E	GPa	Mechanical	-	73
Specific heat	c	J/kg-K	Thermal	Room temp.	795
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	22,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	136,0
Electric resistivity		*m*10^-9	Electric	-	43
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	125-185	-	-
Ultimate tensile strength	Mechanical	MPa	400-500	psix10^3	58 - 72
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,800 - 150,000	mm	1/32 - 6	"	G100-200-500-1000

Corrosion Resistance

2xxx series alloys are lower resistant than 1xxx series alloys due to the significant Cu content, that can generate galvanic reactions. They can be affected by corrosion under industrial and sea environments. All aluminium alloys are subjected to pitting corrosion in presence of chlorides.

ALUMINIUM ALLOYS BALLS SERIES 3XXX

Light balls characterized by good corrosion and wear resistance, very good surface finishing.
Series 3xxx alloys are not heat treated and show slightly better mechanical characteristics with respect to 1xxx series.
Balls can be provided in the passivated state.

Applications
Special bearings and valves, they are used in automotive industry (safety devices), electronic industry, welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cu	%Al	%Zn	-	-	-	-	-
3003	0,60 max	0,70 max	1,00-1,50	0,05-0,20	balance	0,10 max	-	-	-	-	-

International standards

Series	Description	Available heat treatments
3xxx	Al-Mn alloy	3003 T0

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,73
Young's modulus	E	GPa	Mechanical	-	69
Specific heat	c	J/kg-K	Thermal	Room temp.	893
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	23,5
Thermal conductivity		W/(m·K)	Thermal	Room temp.	178,0
Electric resistivity		*m*10^-9	Electric	-	37
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	25 - 55	-	-
Ultimate tensile strength	Mechanical	MPa	130 - 170	psix10^3	19 - 24
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 150,000	mm	3/64 - 6	"	G100-200-500-1000

Corrosion Resistance

Series 3xxx aluminium alloys show a corrosion resistance slightly worse to the series 1xxx.

They have a very good resistance to atmosheric corrosion and they are particularly resistant to pitting corrosion (except than in presence of chlorides).

ALUMINIUM ALLOYS BALLS SERIES 5XXX

Light balls featured by good corrosion and wear resistance, very good surface finishing. 5xxx series alloys feature a good workability.

Applications
Special bearings and valves, they are used in automotive industry (safety devices), aviation and aerospace industry, electronic industry, welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cr	%Cu	%Al	%Mg	%Zn	%Other(each)	%Other(total)
5050	0,40 max	0,70 max	0,10 max	0,10 max	0,20 max	balance	1,10-1,80	0,25 max	0,05 max	0,15 max
5056	0,30 max	0,40 max	0,05-0,20	0,05-0,20	0,10 max	balance	4,50-5,60	0,10 max	0,05 max	0,15 max

International standards

Series	Description	Available heat treatments
5xxx	Al-Mg alloy	5050 O - 5056 T2

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,68
Young's modulus	E	GPa	Mechanical	-	72
Specific heat	c	J/kg-K	Thermal	Room temp.	904
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	23,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	153,0
Electric resistivity		*m*10^-9	Electric	-	48
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV0.5	31-41 (Al 5050)	HV0.5	130-150 (Al 5056)
Ultimate tensile strength	Mechanical	MPa	120-160 (Al 5050) / 420-480 (Al 5056)	psix10^3	18-23 (Al 5050) / 61-69 (Al 5056)
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 150,000	mm	3/64 - 6	"	G100-200-500-1000

Corrosion Resistance

Corrosion resistance similar to series 1xxx, better against chlorides and alkaline solutions. Good atmospheric corrosion resistance and against freshwater, seawater, organic acids, aldehydes. All aluminium alloys are subjected to pitting corrosion in presence of chlorides.

ALUMINIUM ALLOYS BALLS SERIES 6XXX

Light balls featured by good corrosion and wear resistance, very good surface finishing. 6xxx series alloys, thanks to Si and Mg addition, are heat treatable. They feature mechanical properties slightly lower than 2xxx and 7xxx series.

Applications

Special bearings and valves, they are used in automotive industry (safety devices), shipbuilding industry, aviation and aerospace industry, electronic industry, welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cr	%Cu	%Al	%Mg	%Zn	%Ti	-	-
6061	0,40-0,80	0,70 max	0,15 max	0,04-0,35	0,15-0,40	balance	0,80-1,20	0,25 max	0,15 max	-	-

International standards

Series	Description	Available heat treatments
6xxx	Al-Si-Mg alloy	6061 T6

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,70
Young's modulus	E	GPa	Mechanical	-	69
Specific heat	c	J/kg-K	Thermal	Room temp.	898
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	23,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	168,0
Electric resistivity		*m*10^-9	Electric	-	40
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV0.5	85 - 105	-	-
Ultimate tensile strength	Mechanical	MPa	280 - 340	psix10^3	41 - 49
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 150,000	mm	3/64 - 6	"	G100-200-500-1000

Corrosion Resistance

Good corrosion resistance in atmosphere and water, even in marine environment. Corrosion resistance of 6xxx series alloy is usually slighlty lower than 1xxx and 5xxx series. Intergranular corrosion in aggressive environments due to the allowed copper content can be reduced by means of suitable heat treatments. They are subjected to pitting corrosion in presence of chlorides.

ALUMINIUM ALLOYS BALLS SERIES 7XXX

Light balls feature good corrosion and wear resistance, very good surface finishing. Series 7xxx alloys are heat treated and show the best mechanical properties between aluminium alloys. Balls can be provided in the passivated state.

Applications
Special bearings and valves, they are used in the aeronautic, aerospace, military fields and in welding processes.

Chemical composition

Type	%Si	%Fe	%Mn	%Cr	%Cu	%Ti	%Al	%Mg	%Zn	%Other(each)	%Other(total)
7A03	0,20 max	0,20 max	0,10 max	0,05 max	1,80-2,40	0,02-0,08	balance	1,20-1,60	6,00-6,70	0,05 max	0,10 max
7A09	0,50 max	0,50 max	0,15 max	0,16-0,30	1,20-2,00	0,10 max	balance	2,00-3,00	5,10-6,10	0,05 max	0,10 max

International standards

Series	Description	Available heat treatments
7xxx	Al-Zn alloy	T6

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	2,81
Young's modulus	E	GPa	Mechanical	-	71
Specific heat	c	J/kg-K	Thermal	Room temp.	888
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	23,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	156,0
Electric resistivity		*m*10^-9	Electric	-	45
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	160-180	-	-
Ultimate tensile strength	Mechanical	MPa	450-550	psix10^3	66 - 79
Service temperature	Thermal	ºC	-196 / 200	ºF	-320,8 / 392

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 150,000	mm	3/64 - 6	"	G100-200-500-1000

Corrosion Resistance

Series 7xxx aluminium alloys show a corrosion resistance slighty better with respect to 2xxx series, but worse with respect to 1xxx and 3xxx series. They can subjected to pitting corrosion and stress corrosion cracking corrosion in aggressive environments.

BRASS BALLS

Brass balls show fairish mechanical performance, good corrosion resitance, excellent electrical properties. They generate low frictions. Balls are provided in the passivated condition.

Applications
Special valves, industrial pumps and valves, electronic devices, safety switches, heating units, appliances, furniture rails.
They are used in the automotive, electronic and petrochemical industry.

Chemical composition

Type	%Cu	%Zn	%Pb	%Fe	-	-	-	-	-	-	-
C26000	68,50-71,50	balance	0,070 max	0,050 max	-	-	-	-	-	-	-
C27000	63,00-68,50	balance	0,090 max	0,070 max	-	-	-	-	-	-	-
C28000	59,00-63,00	balance	0,090 max	0,070 max	-	-	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
P-CuZn30	C26000	2.0265	CuZn30	CZ106	L70	H70	C2600
P-CuZn35	C27000	2.0335	CuZn36	CZ107	L63	H65	C2700
P-CuZn40	C28000	2.0360	CuZn40	CZ109	L60	H62	C2800

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,49
Young's modulus	E	GPa	Mechanical	-	110
Specific heat	c	J/kg-K	Thermal	Room temp.	375
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	20,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	118,0
Electric resistivity		*m*10^-9	Electric	-	63
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,05

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	75 - 95	-	-
Ultimate tensile strength	Mechanical	MPa	500 - 600	psix10^3	72 - 87
Service temperature	Thermal	ºC	-196 / 500	ºF	-320,8 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,400 - 180,000	mm	1/64 - 7	"	G100-200-500-1000-2000

Corrosion Resistance

Good corrosion resistance in drinking-water, brackish water, sea-water (except at high flow rate), salt atmospheres, petroleum products, alcohols.

Fairish resistance with respect to acids and alkali.

It does not resist in contact with hydroxides, cyanides, oxidizing acids.

As a general rule, corrosion resistance decreases as zinc content increases.

BRONZE ALUMINUM ALLOYS

Bronze Al alloys are characterized by good mechanical characteristics and hardness.
Balls are provided in the passivated condition.

Applications

Special pumps and valves, electronic industry, decorative applications.

Chemical composition

%Si	%Ni	%Cu	%Al	%Zn	%Pb	%Fe	-
0,10 max.	0,50 max.	balance	6,00 - 8,50	0,20 max.	0,02 max.	0,50 max.	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
CuAl8	C61000	2.0920	CuAl8	CA102	Br7	QAl7	CuAl8

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,66
Young's modulus	E	GPa	Mechanical	-	119
Specific heat	c	J/kg-K	Thermal	Room temp.	376
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	69,1
Electric resistivity		*m*10^-9	Electric	-	115
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,05

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	27 - 32	-	-
Ultimate tensile strength	Mechanical	MPa	600 - 700	psix10^3	87 - 101
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,500 - 180,000	mm	1/16 - 7	"	G50-100-200-500-1000-2000

Corrosion Resistance

Good corrosion resistance in hot concentrated caustic solutions and salt solutions, excellent in sea water environments.

Balls resist if they are plunged in acetic acid, dry ammonia, sodium carbonate, phosphates, bromide and chloride solutions (dry atmosphere).

BRONZE ALUMINUM NICKEL ALLOYS

Bronze Al Ni alloys, they feature excellent mechanical properties and abrasione and wear resistance. The addition of Ni increases the corrosion resistance without loss of other main properties of the alloy.
Balls are provided in the passivated condition.

Applications

Special pumps and valves for applications in the aerospace, automotive and marine fields.

Chemical composition

%Si	%Mn	%P	%Ni	%Cu	%Al	%Sn	%Zn	%Pb	%Fe
0,10 max.	0,30 max.	0,010 max.	3,50 - 5,50	balance	9,50 - 11,00	0,10 max.	0,50 max.	0,020 max.	3,50 - 5,50

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
P-CuAl10Ni5Fe5	C63000	2.0966	CuAl9Ni5Fe3	CA104	BrAZHN10-4-4	QAL 10-4-4	C6301

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,56
Young's modulus	E	GPa	Mechanical	-	120
Specific heat	c	J/kg-K	Thermal	Room temp.	398
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	16,3
Thermal conductivity		W/(m·K)	Thermal	Room temp.	51,0
Electric resistivity		*m*10^-9	Electric	-	207
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,03

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	29 - 34	-	-
Ultimate tensile strength	Mechanical	MPa	680 - 760	psix10^3	99 - 110
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,500 - 180,000	mm	1/16 - 7	"	G50-100-200-500-1000-2000

Corrosion Resistance

Bronze Al Ni alloys are indicated for seawater applications. They feature good stress corrosion cracking and corrosion fatigue resistance. They are not affected by chloride pitting. They are attacked in enviroments containing hydrogen sulfide.

PHOSPHOR BRONZE ALLOYS

P-Bronze alloys provide good mechanical and electric performances, corrosion and wear resistance. Balls are produced in the passivated condition.

Applications
Special valves and pumps, check valves, special bearings, electric conductors.

Chemical composition

Type	%P	%Cu	%Sn	%Zn	%Pb	%Fe	-	-	-	-	-
CuSn5	0,030-0,350	balance	4,20-5,80	0,30 max	0,050 max	0,10 max	-	-	-	-	-
CuSn6	0,030-0,350	balance	5,00-7,00	0,30 max	0,050 max	0,10 max	-	-	-	-	-
CuSn8	0,030-0,350	balance	7,00-9,00	0,20 max	0,050 max	0,10 max	-	-	-	-	-

International standards

CEN	USA	GER	FRA	UK	RUS	CHN	JAP
CW451K	C51000	-	CuSn5Zn4	PB 102	-	QSn4-0.3	C5102
CW452K	C51900	2.1020	CuSn6p	PB 103	BrOF6,5-0,15	QSn6.5-0.1	C5191
CW453K	C52100	2.1030	CuSn9p	PB 104	-	QSn8-0.3	C5210

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,92
Young's modulus	E	GPa	Mechanical	-	116
Specific heat	c	J/kg-K	Thermal	Room temp.	380
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	18,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	65,8
Electric resistivity		*m*10^-9	Electric	-	115
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,20

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	75 - 105	HV10	135 - 276
Ultimate tensile strength	Mechanical	MPa	600 - 700	psix10^3	87 - 102
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,500 - 180,000	mm	1/16 - 7	"	G100-200-500-1000-2000

Corrosion Resistance

Good in contact with water, steam, mineral oils, petrol. They do not resist against acids and alkalis. They are less corrosion resistant than Bronze Al.

COPPER BALLS

Nearly pure copper balls, they show good mechanical and corrosion resistance properties, excellent thermal and electric conductivity. Small amounts of alloying elements as Cr, Zr, Ag, Cd, Mg, Sn allow to improve the mechanical properties.

Applications

Copper balls are used in galvanic applications and in the field of electronic industry.

Chemical composition

%Cu	%Other	-	-	-	-	-	-	-	-	-	-
99,900 min	0,010 max	-	-	-	-	-	-	-	-	-	-

International standards

EN	USA	GER	FRA	UK	RUS	CHN	JAP
CW004A	C11000	2.0065	Cu-a 1	C101	M0	T2	C 1100

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,91
Young's modulus	E	GPa	Mechanical	-	123
Specific heat	c	J/kg-K	Thermal	Room temp.	385
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	16,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	393,0
Electric resistivity		*m*10^-9	Electric	-	17
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,010

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	40 - 120	-	-
Ultimate tensile strength	Mechanical	MPa	220 - 320	psix10^3	31 - 46
Service temperature	Thermal	ºC	-196 / 260	ºF	-320,8 / 500

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 60,000	mm	3/64 - 2.3/8	"	G100-200-500-1000

Corrosion Resistance

Good corrosion resistance in marine and industrial atmospheres, steam, alkali, neutral saline solutions.

They do not resist in contact with oxidizing acids, halogens, sulphides, ammonia, sea water.

COPPER BERYLLIUM ALLOY BALLS

Cu-Be age hardening alloy balls, they provide high mechanical features, excellent wear-resistance, very good electric conductivity.

Applications

Special bearings, low maintenance bearings, electric connectors, applications in aggressive environments.

Chemical composition

%Si	%Cu	%Al	%Be	%(Co+Ni)	%(Co+Ni+Fe)	-	-	-	-	-	-
0,20 max	balance	0,20 max	1,80-2,00	0,20 min	0,60 max	-	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
CuBe2	C17200	2.1247	CuBe1,9	CB101	BrB2	QBe2	C 1720

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,3
Young's modulus	E	GPa	Mechanical	-	127
Specific heat	c	J/kg-K	Thermal	Room temp.	400
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	13,5
Thermal conductivity		W/(m·K)	Thermal	Room temp.	105,0
Electric resistivity		*m*10^-9	Electric	-	80
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0025

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	40 - 45	HV	390 - 450
Ultimate tensile strength	Mechanical	MPa	1200 - 1600	psix10^3	174 - 232
Service temperature	Thermal	ºC	-196 / 260	ºF	-320,8 / 500

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500-1000

Corrosion Resistance

Cu-Be alloy is resisting to corrosive attacks in sea water, neutral salt solutions, petroleum products.

Fairish resistance to sodium hydroxide solutions, balls do not resist in ferric chloride, sulfides, organic and inorganic strong acids in oxidizing environment, ammonium hydroxide, ammonia steams, molten metals.

Absolutely not to put in contact with acetylene (explosive reaction).

HASTELLOY® C4 ALLOY BALLS

Ni-Cr-Mo alloy with excellent ductility, high temperature resistance, pitting/crevice/stress corrosion cracking resistance.
Balls are provided in the passivated condition.

Applications

Special valves and pumps for the chemical industry.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Co	%Ti	%Fe	-
0,015 max	0,080 max	1,00 max	0,040 max	0,030 max	14,00-18,00	balance	14,00-17,00	2,00 max	0,70 max	3,00 max	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
NiMo16Cr16Ti	N06455	2.4610	NiMo16Cr16Ti	-	-	NS335	NW6455

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,64
Young's modulus	E	GPa	Mechanical	-	212
Specific heat	c	J/kg-K	Thermal	Room temp.	407
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	10,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	10,1
Electric resistivity		*m*10^-9	Electric	-	1245
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0001

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	350 - 480	-	-
Ultimate tensile strength	Mechanical	MPa	1300 - 1500	psix10^3	189 - 217
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Excellent corrosion resistance in contact with mineral acids, solvents, chlorine environments, acetic acid, formic acid, acetic anydride, sea water, oxidinzing atmospheres.

Good corrosion resistance in organic acid and chloride acids.

Fair resistance with respect to C276 alloy in strong reducing environments.

HASTELLOY® C22 ALLOY BALLS

Fully austenitic NiCrMoW alloy with excellent corrosion resistance properties, both uniform and localized, even at higher temperatures, better than C276 and C4 alloys.
Balls are provided in the passivated conditions.

Applications

C22 balls are used in special valves and pumps for the chemical industry, mainly in multi-purposes devices where it is required an excellent corrosion resistance against aggressive and changing environments (both oxidizing and reducing environments).

Typical use in valves in contact with chlorine.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Co	%W	%V	%Fe
0,015 max	0,080 max	0,50 max	0,020 max	0,020 max	20,00-22,50	balance	12,50-14,50	2,50 max	2,50-3,50	0,35 max	2,00-6,00

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
NiCr21Mo14W	N06022	2.4602	NiCr21Mo14W	-	-	NS336	NW6022

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,69
Young's modulus	E	GPa	Mechanical	-	206
Specific heat	c	J/kg-K	Thermal	Room temp.	414
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	12,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	9,8
Electric resistivity		*m*10^-9	Electric	-	1140
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0002

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	250 - 480	-	-
Ultimate tensile strength	Mechanical	MPa	1400 - 1700	psix10^3	203 - 246
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Excellent corrosion resistance both in oxidizing and reducing environments, in contact with ferric and cuprum chlorides, hot contaminated organic and inorganic solutions, acetic, formic and nitric, sulphuric, hydrochloric acids, oxidizing acids, acetic angydride and sea water (both in stagnant and flowing conditions).

HASTELLOY® C276 ALLOY BALLS

Ni based alloy balls, they show very good crevice, pitting and stress corrosion resistance, both on oxidating and reducing environments. Good wear resistance.
Balls are provided in the passivated condition.

Applications

Special pumps and valves, they are applied in the foodstuff, paper, chemical pharmaceutical, naval, petrol, textile industry.

Devices for waste treatment, pollution check, flue gas desulfurization, turbines.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Co	%W	%V	%Fe
0,010 max	0,080 max	1,00 max	0,040 max	0,030 max	14,50-16,50	balance	15,00-17,00	2,50 max	3,00-4,50	0,35 max	4,00-7,00

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
NiMo16Cr15W	N10276	2.4819	NiMo16Cr15W	NC17D	KHN65MV	NS334	NW0276

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,92
Young's modulus	E	GPa	Mechanical	-	195
Specific heat	c	J/kg-K	Thermal	Room temp.	424
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11,1
Thermal conductivity		W/(m·K)	Thermal	Room temp.	11,0
Electric resistivity		*m*10^-9	Electric	-	1275
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0002

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	32 - 48	-	-
Ultimate tensile strength	Mechanical	MPa	1140 - 1240	psix10^3	165 - 180
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Hastelloy® C276 alloy is resisting against strong oxidizing agents like zinc, ammonium, iron and copper chlorides, acetic, formic, phosphoric, nitric, sulphuric, hydrofluoric, acids, hypochlorite, ferric and cupric salt solutions, acetic anhydride, sea water.

INCONEL® 600 ALLOY BALLS

Age hardening Ni based alloy, they provide good mechanical features, corrosion resistance and high temperature oxidation resistance. Balls are provided in the passivated conditions.

Applications
Special pumps and valves, automotive components, heat exchangers, turbines. They are applied in the foodstuff, aerospace, chemical, naval, nuclear, petrol industry.

Chemical composition

%C	%Si	%Mn	%S	%Cr	%Ni	%Cu	%Fe	-	-	-	-
0,15 max	0,50 max	1,00 max	0,015 max	14,00-17,00	72,00 min	0,50 max	6,00-10,00	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N06600	2.4816	NC15FE	NA14	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,44
Young's modulus	E	GPa	Mechanical	-	210
Specific heat	c	J/kg-K	Thermal	Room temp.	437
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	11,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	14,9
Electric resistivity		*m*10^-9	Electric	-	1015
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,010

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	28 - 33	-	-
Ultimate tensile strength	Mechanical	MPa	725-1035	psix10^3	105-150
Service temperature	Thermal	ºC	-196 / 1000	ºF	-320,8 / 1832

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Inconel® 600 balls are used in environments too aggressive for stainless steel. Excellent corrosion resistance with respect to hot sulphuric acids, oxidizing acids and sea water.

Good resistance to chloride gases even at high temperature. They can suffer selective oxidation if they are alternatively subjected to oxiding and reducing conditions.

INCONEL® 625 ALLOY BALLS

Ni based alloy with high corrosion resistance properties, even in very aggressive environments.
Balls are provided in the passivated condition.

Applications

Sea water applications, compressors, heat exchangers, turbines, special pumps and valves.

They are used in aviation, aerospace, chemical, naval, military, nuclear, petrol industry, high temperature applications.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Cu	%Mo	%Nb	%Co	%Al	%Ti	%Fe
0,100 max	0,50 max	0,50 max	0,015 max	0,015 max	20,00-23,00	58,00 min	0,50 max	8,00-10,00	3,15-4,15	1,00 max	0,40 max	0,40 max	5,00 max

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N06625	2.4856	NC 22 D Nb	NA21	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,42
Young's modulus	E	GPa	Mechanical	-	207
Specific heat	c	J/kg-K	Thermal	Room temp.	420
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	13
Thermal conductivity		W/(m·K)	Thermal	Room temp.	9,9
Electric resistivity		*m*10^-9	Electric	-	1275
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,020

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	30 - 48	HV	300 - 480
Ultimate tensile strength	Mechanical	MPa	1000 - 1100	psix10^3	145 - 161
Service temperature	Thermal	ºC	-196 / 1000	ºF	-320,8 / 1832

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Excellent resistance to crevice and pitting corrosion. Inconel® 625 alloy resist in contact with chlorides, alkaline compounds, neutral salts, air.

Good corrosion resistance with respect to nitric, phosphoric, sulphuric, hydrochloric acid and alkali.

INCONEL® 718 BALLS

High strength, corrosion-resistant material. Special nickel-chromium alloy, suitable for extreme applications.
Balls are provided in the passivated condition.

Applications

Gas turbine engines, aerospace and cryogenic applications.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Cu	%Mo	%Ti	%Nb	%Al	%Co	%Fe
0,020-0,080	0,35 max	0,35 max	0,015 max	0,015 max	17,00-21,00 max	50,00-55,00	0,30 max	2,80-3,30	0,60-1,20	4,70-5,50	0,30-0,70	1,00 max	5,00 max

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N07718	2.4668	NC 19 Fe Nb	-	-	GH/4169	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,20
Young's modulus	E	GPa	Mechanical	-	204
Specific heat	c	J/kg-K	Thermal	Room temp.	435
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,0
Thermal conductivity		W/(m·K)	Thermal	Room temp.	11,3
Electric resistivity		*m*10^-9	Electric	-	1250
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,010

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	35 - 48	HV	344 - 485
Ultimate tensile strength	Mechanical	MPa	1100 - 1300	psix10^3	160 - 188
Service temperature	Thermal	ºC	-196 / 700	ºF	-320,8 / 1292

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Similar to other Ni-base alloys, they provide excellent pitting and interstitial corrosion resistance.

INCONEL® X-750 ALLOY BALLS

Ni based alloy with excellent mechanical properties and corrosion resistance. Used both for elevated and low temperatures application. Balls are provided in the passivated condition.

Applications

Turbine gas components that work at high temperature, special pumps and valves, special moulding, check of pollution devices, heat treatments devices, heat exchangers, turbines. They are used in the aerospace, aviation industry, chemical, military and nuclear industry.

Chemical composition

%C	%Si	%Mn	%S	%Cr	%Ni	%Cu	%Ti	%Nb	%Al	%Fe	-
0,080 max	0,50 max	1,00 max	0,015 max	14,00-17,00	70,00 min	0,50 max	2,25-2,75	0,70-1,20	0,40-1,00	5,00-9,00	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N07750	2.4669	NC 15Fe-T	HR 505	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,28
Young's modulus	E	GPa	Mechanical	-	211
Specific heat	c	J/kg-K	Thermal	Room temp.	440
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	12,0
Electric resistivity		*m*10^-9	Electric	-	1230
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,004

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	31 - 36	-	-
Ultimate tensile strength	Mechanical	MPa	1250 - 1350	psix10^3	181 - 196
Service temperature	Thermal	ºC	-196 / 820	ºF	-320,8 / 1508

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Inconel® 750 alloy is resisting against a wide variety of industrial corrosive oxidizing and reducing environments. Excellent resistance with respect to stress corrosion in chlorides environments.

INCOLOY 825 ALLOY BALLS

Austenitic NiCrFe alloy balls, they provide excellent corrosion resistance in aggressive environments, both general and localized.

Applications

Special valves for the chemical industry.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	%Ti	%Al	%Fe
0,050 max	0,50 max	1,00 max	0,020 max	0,030 max	19,50-23,50	38,00-46,00	2,50-3,50	1,50-3,00	0,60-1,20	0,20 max	22,00 min

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N08825	2.4858	NC 21 FeDU	NA 16	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,14
Young's modulus	E	GPa	Mechanical	-	196
Specific heat	c	J/kg-K	Thermal	Room temp.	440
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	14,1
Thermal conductivity		W/(m·K)	Thermal	Room temp.	11,2
Electric resistivity		*m*10^-9	Electric	-	1130
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,005

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	25 - 30	-	-
Ultimate tensile strength	Mechanical	MPa	850 - 950	psix10^3	123 - 138
Service temperature	Thermal	ºC	-196 / 540	ºF	-320,8 / 1004

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Excellent corrosion resistance in contact with oxidizing and reducing compounds, as chlorids, phosphoric, nitric, sulphuric acids, sodium and potassium hydroxide, hydrochloric acid, sea water.

MONEL® 400 ALLOY BALLS

Ni-Cu based alloys with good mechanical characteristics and excellent corrosion resistance. Balls are provided in the passivated condition.

Applications
Special pumps and valves, flue gas desulfurization, heat exchangers.
They are used in the paper, chemical, pharmaceutical, naval, petrol and textile industry.

Chemical composition

%C	%Si	%Mn	%S	%Ni	%Cu	%Co	%Fe	-	-	-	-
0,30 max	0,50 max	2,00 max	0,024 max	63,00-70,00	28,00-34,00	1,00 max	2,50 max	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N04400	2.4360	Nu 30	NA 13	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,82
Young's modulus	E	GPa	Mechanical	-	177
Specific heat	c	J/kg-K	Thermal	Room temp.	436
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,7
Thermal conductivity		W/(m·K)	Thermal	Room temp.	21,9
Electric resistivity		*m*10^-9	Electric	-	529
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,010

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	17 - 22	-	-
Ultimate tensile strength	Mechanical	MPa	670 - 770	psix10^3	97 - 112
Service temperature	Thermal	ºC	-196 / 600	ºF	-320,8 / 1112

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Monel® 400 is resisting in contact with sea water, steam even at high temperature, caustic salts and solutions.

Good corrosion resistance in sulphuric, hydrofluoric and hydrochlorine acids, organic acids, alkaline salts, calcium chloride.

It is not resisting against ferric chloride.

MONEL® K 500 ALLOY BALLS

Ni-Cu precipitation hardening alloy, it presents higher hardness and load resistance with respect to Monel® 400 alloy but same corrosion resistance. Balls are provided in the passivated state.

Applications

Special pumps and valves, they are used in paper, chemical, electronic, pharmaceutical, naval, petrol and textile industry.

Chemical composition

%C	%Si	%Mn	%S	%Ni	%Cu	%Ti	%Al	%Fe	-	-	-
0,25 max	0,50 max	1,50 max	0,010 max	63,00-70,00	27,00-33,00	0,35-0,85	2,30-3,15	2,00 max	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	N05500	2.4375	NU 30 AT	NA 18	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,42
Young's modulus	E	GPa	Mechanical	-	178
Specific heat	c	J/kg-K	Thermal	Room temp.	415
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,6
Thermal conductivity		W/(m·K)	Thermal	Room temp.	17,4
Electric resistivity		*m*10^-9	Electric	-	615
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,005

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	75 - 90 (standard)	HRC	24 - 34 (age hardening)
Ultimate tensile strength	Mechanical	MPa	920 - 1020	psix10^3	133 - 148
Service temperature	Thermal	ºC	-196 / 650	ºF	-320,8 / 1202

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G50-100-200-500

Corrosion Resistance

Good corrosion resistance in sulphuric, hydrofluoric and hydrochloride acid, and alkali solutions.

It resists in contact with neutral, basic and acid salts.

Excellent corrosion resistance in marine environment, even at high flow rate.

Fair resistance in contact with oxidizing salts and ferric chloride, nitric acid.

TITANIUM ALLOYS GRADE 1 - GRADE 2

Titanium balls provide low weight, good mechanical features, thermal properties and corrosion resistance. They are used even in aesthetic applications. Grade 1 and grade 2 belongs to the Commercially Pure Titanium Alloys family.

Applications

Titanium balls are used in aviation, aerospace, military, chemical, petrochemical industry, in the medical field, jewelry, calibration of measurement instruments, piercing purposes.

Chemical composition

Type	%C	%N	%Ti	%Fe	%O	%H	-	-	-
CP-Ti G1	0,080 max	0,030 max	balance	0,20 max	0,18 max	0,015 max	-	-	-
CP-Ti G2	0,080 max	0,030 max	balance	0,30 max	0,25 max	0,015 max	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	R50250	3.7025	T-35	2 TA 1	VT1-00	TA 1	Ti Class 1
-	R50400	3.7035	T-40	TA 2 to 5	VT1-L	TA 2	Ti Class 2

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	4,51
Young's modulus	E	GPa	Mechanical	-	103
Specific heat	c	J/kg-K	Thermal	Room temp.	518
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	8,6
Thermal conductivity		W/(m·K)	Thermal	Room temp.	21,0
Electric resistivity		*m*10^-9	Electric	-	560
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0001

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	28 - 42	HV	285 - 415
Ultimate tensile strength	Mechanical	MPa	330 - 550	psix10^3	48 - 79
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-500-1000

Corrosion Resistance

They resist in contact with salt water and marine atmosphere, oxidizing acids, chlorides (in presence of water). Good corrosion resistance in a wide variety of acids, alkali, and industrial atmospheres. Fairish resistance in sulphuric acid and sodium hydroxide. They do not resist in reducing acids, chlorides gases. CP-Ti 1 grade shows a slightly better corrosion resistance than CP-Ti 2 grade alloy.

TITANIUM ALLOYS GRADE 5 - GRADE 23

Titanium balls provide low weight, good mechanical features, thermal properties and corrosion resistance. They are used even in aesthetic applications. TiAl6V4 is the most common used Ti alloy all over the world. Grade 23 is manufactured with lower impurities content (TiAl6V4 ELI: Extra Low Interstitial). Balls are provided in the passivated condition.

Applications
Aviation, aerospace, military, chemical, petrochemical industry, in the medical field, jewelry, calibration of measurement instruments, piercing purposes.

Chemical composition

Type	%C	%N	%Ti	%Al	%V	%Fe	%O	%H	-	-	-
TiAl6V4	0,080 max	0,050 max	balance	5,50-6,75	3,50-4,50	0,30 max	0,20 max	0,015 max	-	-	-
TiAl6V4 ELI	0,080 max	0,050 max	balance	5,50-6,50	3,50-4,50	0,25 max	0,13 max	0,012 max	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
TiAl6V4	R56400	3.7164	TA6V	TA10-13; TA28	-	TiAl6V4	-
TiAl6V4 ELI	R56401	3.7165	T6V	TA11	-	TiAl6V4 ELI	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	4,45
Young's modulus	E	GPa	Mechanical	-	114
Specific heat	c	J/kg-K	Thermal	Room temp.	523
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	9,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	6,7
Electric resistivity		*m*10^-9	Electric	-	1780
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,0001

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	28 - 42	HV	285 - 415
Ultimate tensile strength	Mechanical	MPa	625 - 830	psix10^3	90 - 120
Service temperature	Thermal	ºC	-196 / 400	ºF	-320,8 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-500-1000

Corrosion Resistance

Balls are resisting in contact with salt water and marine atmosphere, oxidizing acids, chlorides (in presence of water). Good corrosion resistance in a wide variety of acids, alkali, and industrial atmospheres. Fairish resistance in sulphuric acid and sodium hydroxide. Balls are not resisting in reducing acids, chlorides gases. Grade 23 shows a corrosion resistance behaviour in sea water slightly better than grade 5 alloy.

TUNGSTEN CARBIDE (WC) TC K10 Co BINDER ALLOY BALLS

Tungsten carbide balls with small grain size, they provide higher hardness and wear resistance than TC K20 and TC K30 carbides. The impact resistance is much lower. Virgin powders always used.

Applications

Similar to TC K20 and TC K30 carbides, they are used when higher hardness and wear resistance are required.

Chemical composition

Type	%WC	%Co	-	-	-	-	-	-	-	-	-
TC K10	93,00-95,00	5,00-7,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	-	-	-	-
TC K10	K05-K10	C3	YG018	-	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,82
Young's modulus	E	GPa	Mechanical	-	650
Specific heat	c	J/kg-K	Thermal	Room temp.	220
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	5,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	80,0
Electric resistivity		*m*10^-9	Electric	-	200
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 12

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	~ 0,6	-	-
Hardness	Mechanical	HRA	92,5 - 94,0	HV	1945 - 2175
Ultimate compressive strength	Mechanical	MPa	5600 - 6000	psix10^3	813 - 870
Service temperature	Thermal	ºC	-196 / 500	ºF	-320,8 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

Similar to the corrosion resistance of TC K20 and TC K30 tungsten carbides.

TUNGSTEN CARBIDE (WC) K20 Co BINDER (ALLOY) BALLS

K20 WC balls are used in applications where extreme hardness and resistance to wear, abrasion, collision and deformation are required. Virgin powder is strictly used into this production.

Applications

Special and hydraulic precision valves, special bearings, couplers, flow meters, sprayers, recirculating balls, ball splines, tool machines, sliding rails, ballpoint pens, pin and tips for indicators, precision measurement instruments, medical instruments. They are used in naval, mining, petrol and coining industry.

Chemical composition

Type	%WC	%Co	-	-	-	-	-	-	-	-	-
WC20	93,00-95,00	5,00-7,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	-	-	-	-
WC20	K20	C1	YG6	-	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,95
Young's modulus	E	GPa	Mechanical	-	650
Specific heat	c	J/kg-K	Thermal	Room temp.	225
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	5,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	83,0
Electric resistivity		*m*10^-9	Electric	-	180
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 12

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	1,2 - 1,6	-	-
Hardness	Mechanical	HRA	90,0 - 91,5	HV	1550 - 1780
Ultimate compressive strength	Mechanical	MPa	4600 - 5800	psix10^3	797 - 841
Service temperature	Thermal	ºC	-196 / 500	ºF	-320,8 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

As a general rule Tungsten Carbides with Cobalt binder show good corrosion resistance into basic solution while they are not resisting into acid solutions.

TUNGSTEN CARBIDE (WC) K30 Co BINDER ALLOY BALLS

K30 tungsten carbide balls provide a binder percentage slightly higher than the standard balls (7-9%). They are available on demand. The mechanical properties and corrosion resistance are a little lower if compared to standard K20 balls. Virgin powder is strictly used into this kind of production.

Applications

Special and hydraulic precision valves, special bearings, couplers, flow meters, sprayers, recirculating balls, ball spindles, tooling machines, sliding rails, ballpoint pens, pin and tips for indicators, precision measurement instruments, medical instruments. They are used in naval, mining, petrol and coining industry.

Chemical composition

Type	%WC	%Co	-	-	-	-	-	-	-	-	-
WC30	91,00-93,00	7,00-9,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	-	-	-	-
WC30	K30	C2	YG8	-	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,70
Young's modulus	E	GPa	Mechanical	-	630
Specific heat	c	J/kg-K	Thermal	Room temp.	227
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	6,0
Thermal conductivity		W/(m·K)	Thermal	Room temp.	82,0
Electric resistivity		*m*10^-9	Electric	-	175
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 12

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	1,2 - 1,6	-	-
Hardness	Mechanical	HRA	89,5 - 91,0	HV	1480 - 1700
Ultimate compressive strength	Mechanical	MPa	5400 - 5700	psix10^3	784 - 826
Service temperature	Thermal	ºC	-196 / 500	ºF	-320,8 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

As a general rule Tungsten Carbides with Cobalt binder show good corrosion resistance into basic solution while they are not resisting into acid solutions.

TUNGSTEN CARBIDE (WC) YN6 Ni BINDER ALLOY BALLS

Tungsten Carbide with Ni binder (6%) balls, they show slightly worse mechanical characteristics but better corrosion reistance properties with respect to the Cobalt binder tungsten carbides. Virgin powder is always used.

Applications

Special bearings, pumps and valves, dispensers, nozzles/pumps for sprayers, ballpoint pens. They are used in mining and petrol industry.

Chemical composition

Type	%WC	%Ni	-	-	-	-	-	-	-	-	-
YN6	93,00-95,00	5,00-7,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	-	-	-	-
YN6	-	-	YN6	-	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,95
Young's modulus	E	GPa	Mechanical	-	620
Specific heat	c	J/kg-K	Thermal	Room temp.	212
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	5,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	92,0
Electric resistivity		*m*10^-9	Electric	-	185
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 3,00

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	~ 1,4	-	-
Hardness	Mechanical	HRA	89,0 - 91,0	HV	1400 - 1700
Ultimate compressive strength	Mechanical	MPa	4900 - 5200	psix10^3	711 - 754
Service temperature	Thermal	ºC	-196 / 540	ºF	-320,8 / 1004

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

Good corrosion resistance in basic and neutral solutions. For acid solutions they resist up to pH 4.

TUNGSTEN CARBIDE (WC) 9% Ni BINDER ALLOY BALLS

Tungsten Carbide with Ni binder balls (9%), they provide a better corrosion resistance and slightly worse mechanical properties than YN6 type balls. Virgin powders always used.

Applications

Special bearings, pumps and valves, dispensers, nozzles/pumps for sprayers, ballpoint pens. They are used in mining and petrol industry.

Chemical composition

Type	%WC	%Ni	-	-	-	-	-	-	-	-	-
YN9	90,00-92,00	8,00-10,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	-	-	-	-
YN9	-	-	YN9	-	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,7
Young's modulus	E	GPa	Mechanical	-	650
Specific heat	c	J/kg-K	Thermal	Room temp.	215
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	6,1
Thermal conductivity		W/(m·K)	Thermal	Room temp.	84,0
Electric resistivity		*m*10^-9	Electric	-	175
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 3,00

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	~ 1,4	-	-
Hardness	Mechanical	HRA	88,0 - 90,0	HV	1250 - 1550
Ultimate compressive strength	Mechanical	MPa	4700 - 5000	psix10^3	682 - 725
Service temperature	Thermal	ºC	-196 / 540	ºF	-320,8 / 1004

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

Good corrosion resistance in basic and neutral solutions. For acid solutions they resist up to pH 3.

TUNGSTEN CARBIDE (WC) 10% Ni BINDER ALLOY BALLS

Tungsten Carbide with Ni binder balls (10%), they provide a better corrosion resistance and slightly worse mechanical properties than YN9 type balls. Virgin powders always used.

Applications

Special bearings, pumps and valves, dispensers, nozzles/pumps for sprayers, ballpoint pens. They are used in mining and petrol industry.

Chemical composition

Type	%WC	%Ni	-	-	-	-	-	-	-	-	-
NK	89,00-91,00	9,00-11,00	-	-	-	-	-	-	-	-	-

International standards

Type	ISO	USA	CHN	UK	-	-	-
NK	-	-	-	NK	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	14,60
Young's modulus	E	GPa	Mechanical	-	660
Specific heat	c	J/kg-K	Thermal	Room temp.	216
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	6,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	81,0
Electric resistivity		*m*10^-9	Electric	-	170
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 3,00

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Grain size	Physical	μm	~ 1,4	-	-
Hardness	Mechanical	HRA	87,5 - 89,5	HV	1200 - 1450
Ultimate compressive strength	Mechanical	MPa	4600 - 4900	psix10^3	668 - 710
Service temperature	Thermal	ºC	-196 / 540	ºF	-320,8 / 1004

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
0,200 - 127,000	mm	1/64 - 5	"	G5-10-16-20-25-28-40-60-100

Corrosion Resistance

Good corrosion resistance in basic and neutral solutions. For acid solutions they resist up to pH 2-3.

TUNGSTEN HEAVY ALLOYS WNiFe BALLS

High density tungsten alloy balls, they provide good mechanical properties, wear and corrosion resistance and good thermal stability.

Applications

Special bearings, pumps and valves, flowmeters, ball screws, measurement instruments. They are preferred when good hardness and wear resistance properties in not too aggressive environments are demanded.

Chemical composition / Density

Type	%W	%Ni	%Fe	Density g/cm3	Type	%W	%Ni	%Fe	Density g/cm3
85W-10.5Ni-4.5Fe	~ 85	~ 10,5	~ 4,5	~ 15,8 - 16,0	93W-4.9Ni-2.1Fe	~ 93	~ 4,9	~ 2,1	~ 17,5 - 17,6
90W-7Ni-3Fe	~ 90	~ 7	~ 3	~ 16,9 - 17,15	93W-4Ni-3Fe	~ 93	~ 4	~ 3	~ 17,5 - 17,6
90W-6Ni-4Fe	~ 90	~ 6	~ 4	~ 16,8 - 17,0	95W-3.5Ni-1.5Fe	~ 95	~ 3,5	~ 1,5	~ 17,9 - 18,1
91W-6Ni-3Fe	~ 91	~ 6	~ 3	~ 17,1 - 17,3	95W-3Ni-2Fe	~ 95	~ 3	~ 2	~ 17,9 - 18,1
92W-5Ni-3Fe	~ 92	~ 5	~ 3	~ 17,3 - 17,5	96W-3Ni-1Fe	~ 96	~ 3	~ 1	~ 18,2 - 18,3
92.5W-5Ni-2.5Fe	~ 92,5	~ 5	~ 2,5	~ 17,4 - 17,6	97W-2Ni-1Fe	~ 97	~ 2	~ 1	~ 18,4 - 18,6
93W-5Ni-2Fe	~ 93	~ 5	~ 2	~ 17,5 - 17,6	98W-1Ni-1Fe	~ 98	~ 1	~ 1	~ 18,5 - 18,7

Mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Young's modulus	E	GPa	Mechanical	-	328
Elongation at break	A	%	Mechanical	Room temp.	2 - 33 (98W...85W)
Specific heat	c	J/kg-K	Thermal	Room temp.	1500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	5,6
Thermal conductivity		W/(m·K)	Thermal	Room temp.	95,0
Electric resistivity		*m*10^-9	Electric	-	124
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	max 10

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	20 - 36	-	-
Ultimate tensile strength	Mechanical	MPa	550 - 980	psix10^3	80 - 142
Service temperature	Thermal	ºC	-196 / 350	ºF	-320,8 / 662

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-500-1000

Corrosion Resistance

WNiFe alloys provide good corrosion resistance properties, similar to that of series 300 austenitic stainless steels.

STELLITE® 3PM ALLOY BALLS

Co based alloy, usually STELLITE® trade name, that provide excellent wear resistance and high temperature resistance. Its microstructure is formed by a CoCr matrix and dispersed carbides. Balls are provided in the passivated condition. Virgin powders always used.

Applications

Special bearings, pumps and valves, slurry and homogeniser pumps, in all applications where high wear, corrosion and temperature resistance are demanded.

Chemical composition

%C	%Si	%Mn	%Cr	%Ni	%Co	%W	%Fe	-	-	-	-
2,00-2,60	1,00 max	1,00 max	30,00-33,00	3,00 max	42,40-56,00	12,00-14,00	3,00 max	-	-	-	-

International standards

STELLITE® is a trade name, from Deloro Stellite Holdings Corporation, St.Louis, U.S.A. Different alloys are indicated with alphanumeric symbols.

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,65
Young's modulus	E	GPa	Mechanical	-	235
Specific heat	c	J/kg-K	Thermal	Room temp.	460
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	11,0
Thermal conductivity		W/(m·K)	Thermal	Room temp.	14,8
Electric resistivity		*m*10^-9	Electric	-	3850
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	max 1,200

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	50 - 57	-	-
Ultimate tensile strength	Mechanical	MPa	450 - 550	psix10^3	65 - 80
Service temperature	Thermal	ºC	0 - 1000	ºF	32 / 1832

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
9,500 - 75,000	mm	3/8 - 3	"	G25-40-60-100

Corrosion Resistance

Good corrosion resistance in contact with oxidizing agents (except with reducing acids), nitric, phosphoric and formic acid in not extreme concentration and temperature conditions, sulphuric acid at room temperature.

STELLITE® 20 ALLOY BALLS

Co based alloy, usually STELLITE® trade name, that provide excellent wear resistance and high temperature resistance. Its microstructure is formed by a CoCr matrix and dispersed carbides. Balls are provided in the passivated condition. Virgin powders always used.

Applications

Special bearings, pumps and valves, slurry and homogeniser pumps, in all applications where high wear, corrosion and temperature resistance are demanded.

Chemical composition

%C	%Si	%Mn	%Cr	%Ni	%Mo	%Co	%W	%B	%Fe	-	-
1,90-2,95	1,50 max	1,00 max	31,00-35,50	3,00 max	1,00 max	balance	16,50-19,50	0,30 max	3,00 max	-	-

International standards

STELLITE® is a trade name, from Deloro Stellite Holdings Corporation, St.Louis, U.S.A. Different alloys are indicated with alphanumeric symbols.

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,80
Young's modulus	E	GPa	Mechanical	-	230
Specific heat	c	J/kg-K	Thermal	Room temp.	450
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	10,0
Thermal conductivity		W/(m·K)	Thermal	Room temp.	14,5
Electric resistivity		*m*10^-9	Electric	-	3800
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	max 1,200

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	54 - 61	-	-
Ultimate tensile strength	Mechanical	MPa	500 - 600	psix10^3	72 - 87
Service temperature	Thermal	ºC	0 - 1000	ºF	32 / 1832

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
9,500 - 75,000	mm	3/8 - 3	"	G25-50-100

Corrosion Resistance

Good corrosion resistance in contact with oxidizing agents (except with reducing acids), nitric, phosphoric and formic acid in not extreme concentration and temperature conditions, sulphuric acid at room temperature.

STELLITE® 20PMH ALLOY BALLS

Co based alloy, usually STELLITE® trade name, that provide excellent wear resistance and high temperature resistance. Its microstructure is formed by a CoCr matrix and dispersed carbides. Balls are provided in the passivated condition. Virgin powders always used.

Applications

Special bearings, pumps and valves, slurry and homogeniser pumps, in all applications where high wear, corrosion and temperature resistance are demanded.

Chemical composition

%C	%Mn	%Cr	%Ni	%Mo	%Co	%W	%Sn	%Fe	-	-	-
2,80-3,00	0,20-0,40	33,00-36,00	2,50 max	0,50 max	35,10-40,50	17,00-19,00	1,00 max	2,50 max	-	-	-

International standards

STELLITE® is a trade name, from Deloro Stellite Holdings Corporation, St.Louis, U.S.A. Different alloys are indicated with alphanumeric symbols.

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,60
Young's modulus	E	GPa	Mechanical	-	240
Specific heat	c	J/kg-K	Thermal	Room temp.	440
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,7
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,2
Electric resistivity		*m*10^-9	Electric	-	3750
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	max 1,200

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	56 - 63	-	-
Ultimate tensile strength	Mechanical	MPa	550 - 650	psix10^3	80 - 94
Service temperature	Thermal	ºC	0 - 1000	ºF	32 / 1832

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290 / AFBMA)
9,500 - 75,000	mm	3/8 - 3	"	G25-40-60-100

Corrosion Resistance

Good corrosion resistance in contact with oxidizing agents (except with reducing acids), nitric, phosphoric and formic acid in not extreme concentration and temperature conditions, sulphuric acid at room temperature.

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