RGP BALLS®

PRECISION BALLS

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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

STEEL

AISI 1010/1015 LOW CARBON STEEL CEMENTED BALLS

Low cost carbon steel balls, case-hardened only. The thickness of the case hardened layer depends on the diameter of the ball.

Applications

Furniture rails and rollers, drawers and rolling bearings, locks, oilers and greasers, skates, caddies, toys, belt and roller conveyors, tumble finishing.

Chemical composition

Type	%C	%Si	%Mn	%P	%S						
1010	0,08-0,13	0,10-0,35	0,30-0,60	0,040 max	0,050 max	-	-	-	-	-	-
1015	0,12-0,18	0,10-0,35	0,30-0,60	0,040 max	0,050 max	-	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JPN
C10	1010	1.1121	CC10	040A10	10	10	S10C
C15	1015	1.1141	XC12	080M15	15	15	S15C

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,82
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	468
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	57,9
Electric resistivity		*m*10^-9	Electric	-	155
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	55 - 65	-	-
Ultimate tensile strength	Mechanical	MPa	300 - 400	psix10^3	43 - 58
Service temperature	Thermal	ºC	-40 / 500	ºF	-40 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
1,500 - 300,000	mm	1/16 - 12	"	G100-200-300-500-600-700-1000

AISI 1010/1015 LOW SOFT UNHARDENED CARBON STEEL BALLS

Unhardened low carbon steel balls.

Applications

Caddies, wrought iron work, curtain mechanisms, steel shots, munitions, stirrers and mixers in not aggressive environments, welding appliances.

Chemical composition

Type	%C	%SI	%Mn	%P	%S	-	-	-	-	-	-
1010	0,08-0,13	0,10-0,35	0,30-0,60	0,040 max	0,050 max	-	-	-	-	-	-
1015	0,12-0,18	0,10-0,35	0,30-0,60	0,040 max	0,050 max	-	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
C10	1010	1.1121	CC10	040A10	10	10	S10C
C15	1015	1.1141	XC12	080M15	15	15	S15C

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,82
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg·K	Thermal	Room temp.	468
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	57,9
Electric resistivity		*m*10^-9	Electric	-	155
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	60 - 90	-	-
Ultimate tensile strength	Mechanical	MPa	200 - 300	psix10^3	29 - 43
Service temperature	Thermal	ºC	-40 / 500	ºF	-40 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (AFBMA)
1,500 - 300,000	mm	1/16 - 12	"	G1000-2000

AISI 1085 HIGH CARBON STEEL BALLS

High carbon steel balls, are through hardened. They feature by very good hardness and wear resistance.

Applications
Low precision bearings, furniture bearings, bicycle and automotive components, agitators, sliding rails, drawer rails, skates, roller conveyors, castors, locks, bearing units, polishing and milling machines.

Chemical composition

Standard	%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%(Cu+Sn)	%Al	-
1085	0,80-0,93	0,60 max	0,70-1,00	0,040 max	0,050 max	-	-	-	-	-	-
1.0616	0,83-0,88	0,10-0,30	0,50-0,80	0,030 max	0,030 max	0,15 max	0,20 max	0,050 max	0,25 max	0,010 max	-
82B	0,79-0,86	0,15-0,35	0,60-0,90	0,030 max	0,030 max	-	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
C90	1085	1.0616	XC90	C85S	85 (A)	82B	SWRH87B

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,85
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	470
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	33,9
Electric resistivity		*m*10^-9	Electric	-	175
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 200

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	59 - 66	-	-
Ultimate tensile strength	Mechanical	MPa	700 - 800	psix10^3	100 - 115
Service temperature	Thermal	ºC	-40 / 500	ºF	-40 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
1,500 - 300,000	mm	1/16 - 12	"	G28-40-48-50-60-80-100-200-300-500-600-700-1000

AISI 52100 100Cr6 CHROME STEEL BALLS

Low alloy martensitic chrome steel, AISI 52100 thanks to its high hardness, wear resistance, surface finishing and dimensional precision, it is widely used to manufacture mechanical components.

Applications
Precision bearings, automotive components (brakes, steering, line shaft), bicycle, agitators, appliances, sliders, quick couplings, machine tool, lock mechanisms, conveyor belts, skates, pens, pumps, castors, measurement instruments, valves.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	-	-	-
0,93-1,05	0,15-0,35	0,25-0,45	0,025 max	0,025 max	1,40-1,65	0,30 max	0,08 max	0,20 max	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
100Cr6	52100	1.3505	100C6	534A99	9Ch1	GCr15	SUJ2

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,80
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	464
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,3
Thermal conductivity		W/(m·K)	Thermal	Room temp.	42,4
Electric resistivity		*m*10^-9	Electric	-	215
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 300

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	60 - 66	-	-
Ultimate compressive strength	Mechanical	MPa	2500 - 2600	psix10^3	362 - 377
Service temperature	Thermal	ºC	-60 / 150	ºF	-76 / 302

Range

Diameters	U.o.M.	Diameters	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,250 - 300,000	mm	1/64 - 12	"	G10-15-16-20-24-25-28-40-48-50-60-80-100-200-300-500-600-700-1000

LOW NOISE AISI 52100 HIGH PRECISION CHROME STEEL BALLS

High precision AISI 52100 chrome steel balls feature the lowest tolerances and noise levels.

Applications
High precision & aircraft bearings, recirculating ball screws, high precision spindles & gears, bearings for electric motors.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	-	-	-
0,93-1,05	0,15-0,35	0,25-0,45	0,025 max	0,025 max	1,40-1,65	0,30 max	0,08 max	0,20 max	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
100Cr6	52100	1.3505	100C6	534A99	9Ch1	GCr15	SUJ2

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,80
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	464
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,3
Thermal conductivity		W/(m·K)	Thermal	Room temp.	42,4
Electric resistivity		*m*10^-9	Electric	-	215
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 300

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	60 - 66	-	-
Ultimate compressive strength	Mechanical	MPa	2500 - 2600	psix10^3	362 - 377
Service temperature	Thermal	ºC	-60 / 150	ºF	-76 / 302

Range

Diameters	U.o.M.	Diameters	U.o.M.	Precision grades (ISO 3290-1)
1,000 - 16,000	mm	3/64 - 5/8	"	G5

100CrMn6 CHROME STEEL BALLS

100CrMn6 steel allows to get higher core hardness than standard AISI 52100. Generally used for large diameter balls only.

Applications
Windmills and large bearing diameters.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Cu	%Mo	%Al	%O	-	-
0,93-1,05	0,45-0,75	1,00-1,20	0,025 max	0,015 max	1,40-1,65	0,30 max	0,10 max	0,050 max	0,0015 max	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
100CrMnSi6-4	-	1.3520	100CM6	535A99	SHKH15SG	GCr15SiMn	SUJ3

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,85
Young's modulus	E	GPa	Mechanical	-	210
Specific heat	c	J/kg-K	Thermal	Room temp.	475
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	12,6
Thermal conductivity		W/(m·K)	Thermal	Room temp.	35,0
Electric resistivity		*m*10^-9	Electric	-	220
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 300

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	60 - 66	-	-
Ultimate compressive strength	Mechanical	MPa	2500 - 2600	psix10^3	362 - 377
Service temperature	Thermal	ºC	-60 / 150	ºF	-76 / 302

Range

Diameters	U.o.M.	Diameters	U.o.M.	Precision grades
45,000 - 300,000	mm	1-3/4 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

100CrMo7-3 CHROME STEEL BALLS

Bearing steel balls with a small percentage of Mo in the chemical composition, as 100CrMn6 this steel guarantees a high core hardness for balls of large diameters. The structure is bainitic (martensitic for 100CrMn6).

Applications

As for other bearing steels, they are useful when high hardness, wear resistance and fatigue resistance are required.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Cu	%Al	%O	-	-
0,93-1,05	0,15-0,45	0,60-0,80	0,025 max	0,015 max	1,65-1,95	0,20-0,35	0,30 max	0,050 max	0,0015 max	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
100CrMo7-3	K19965	1.3536	100CrMo7-3	100CrMo7-3	-	100CrMo7-3	SUJ5

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,82
Young's modulus	E	GPa	Mechanical	-	205
Specific heat	c	J/kg-K	Thermal	Room temp.	477
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,1
Thermal conductivity		W/(m·K)	Thermal	Room temp.	42,7
Electric resistivity		*m*10^-9	Electric	-	218
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 300

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	57 - 65	-	-
Ultimate compressive strength	Mechanical	MPa	2400 - 2550	psix10^3	348 - 369
Service temperature	Thermal	ºC	-60 / 150	ºF	-76 / 302

Range

Diameters	U.o.M.	Diameters	U.o.M.	Precision grades
45,000 - 300,000	mm	1-3/4 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

100CrMnMo8 CHROME STEEL BALLS

High performance bearing steel balls, they feature highest Chromium and Molibdenum contents between the hardened steels listed by ISO 683-17 standard. Excellent hardenability on pieces of big diameter.

Applications

Antifriction bearings, they are used when the pieces are subjected to strong mechanical stresses and wear.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Cu	%Al	%O	-	-
0,93-1,05	0,40-0,60	0,80-1,10	0,025 max	0,015 max	1,80-2,05	0,50-0,60	0,30 max	0,050 max	0,0015 max	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
100CrMnMoSi8-4-6	-	1.3539	100CrMnMo8	100CrMnMoSi8-4-6	20M-	100CrMnMo8	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,80
Young's modulus	E	GPa	Mechanical	-	210
Specific heat	c	J/kg-K	Thermal	Room temp.	470
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	13,3
Thermal conductivity		W/(m·K)	Thermal	Room temp.	43,4
Electric resistivity		*m*10^-9	Electric	-	212
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 300

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	55 - 63	-	-
Ultimate compressive strength	Mechanical	MPa	2300 - 2450	psix10^3	334 - 355
Service temperature	Thermal	ºC	-60 / 150	ºF	-76 / 302

Range

Diameters	U.o.M.	Diameters	U.o.M.	Precision grades
45,000 - 300,000	mm	1-3/4 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

AISI 420A/420B STAINLESS STEEL BALLS

Martensitic stainless steel hardened balls, they feature good resistance to corrosion and wear. Balls are provided in the passivated condition.

Applications

Similar to that of AISI 420C balls, when required hardness and wear resistance are lower.

Chemical composition

Type	%C	%Si	%Mn	%P	%S	%Cr	-	-	-	-	-
420A	0,16-0,25	1,00 max	1,50 max	0,040 max	0,030 max	12,00-14,00	-	-	-	-	-
420B	0,26-0,35	1,00 max	1,50 max	0,040 max	0,030 max	12,00-14,00	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X20Cr13	420A	1.4021	Z 20 C 13	420 S 37	20 Kh 13	2Cr13	420J1
X30Cr13	420B	1.4028	Z 33 C 13	420 S 45	30 Kh 13	3Cr13	420J2

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,73
Young's modulus	E	GPa	Mechanical	-	195
Specific heat	c	J/kg-K	Thermal	Room temp.	450
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	10,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	27,4
Electric resistivity		*m*10^-9	Electric	-	680
Relative magnetic permeability	μ	-	Magnetic	Not hardened	>600

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	48 - 58	-	-
Ultimate tensile strength	Mechanical	MPa	1700 - 1900	psix10^3	250 - 275
Service temperature	Thermal	ºC	0 / 400	ºF	32 - 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,300 - 300,000	mm	1/64 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

AISI 420A/420B steels offer a corrosion resistance similar to 420C steel. Balls of these materials resist in contact with water, steam, oil and petrol.

AISI 420C STAINLESS STEEL BALLS

Martensitic hardened stainless steel balls, they feature good hardness, wear and abrasion resistance and fair corrosion resistance. Balls are provided in the hardened and passivated condition.

Applications

Special bearings, anti-friction bearings, special pumps, recirculating balls, lighters, ballpoint pens, automotive seatbelts & components.

Chemical composition

%P	%C	%Si	%Mn	%S	%Cr	-	-	-
0,040 max	0,43-0,50	1,00 max	1,00 max	0,030 max	12,50-14,50	-	-	-
0,040 max	0,43-0,50	1,00 max	1,00 max	0,030 max	12,50-14,50	-	-	-
0,040 max	0,43-0,50	1,00 max	1,00 max	0,030 max	12,50-14,50	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X46Cr13	420C	1.4034	Z 34 C 14	-	40 Kh 13	4Cr13	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,75
Young's modulus	E	GPa	Mechanical	-	205
Specific heat	c	J/kg-K	Thermal	Room temp.	450
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	10,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	27,6
Electric resistivity		*m*10^-9	Electric	-	720
Relative magnetic permeability	μ	-	Magnetic	Not hardened	> 600

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	52 - 60	-	-
Ultimate tensile strength	Mechanical	MPa	1700 - 1900	psix10^3	250 - 275
Service temperature	Thermal	ºC	0 / 400	ºF	32 - 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,300 - 300,000	mm	1/64 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

Good corrosion resistance in industrial atmosphere, freshwater, steam, alcool, ammonium, several oilfield products and organic compounds, dairy products, mild acid environments. Fairish in foodstuff and alkaline solutions. Fair in salt atmosphere. It does not resist in contact with sea water and strong acids (even if diluted).

AISI 440C STAINLESS STEEL BALLS

Martensitic hardened stainless steel balls, they feature remarkable hardness, wear resistance, surface finishing, narrow dimensional tolerances. For that reason this type of steel is frequently used in precision devices. Balls are provided in the passivated condition.

Applications

Precision bearings, anti-friction bearings, special valves, conveyor belts and rollers, ballpoint pens.

They are used in foodstuff, medical instruments, quick couplings, recirculating ball bearings, knotting devices, oil refinery devices.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Mo	-	-	-	-	-
0,95-1,20	1,00 max	1,00 max	0,040 max	0,030 max	16,00-18,00	0,75 max	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X 105CrMo17	440C	1.4125	Z100CD17	-	95X18	9Cr18Mo	SUS440C

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,70
Young's modulus	E	GPa	Mechanical	-	210
Specific heat	c	J/kg-K	Thermal	Room temp.	450
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	10,2
Thermal conductivity		W/(m·K)	Thermal	Room temp.	19,6
Electric resistivity		*m*10^-9	Electric	-	680
Relative magnetic permeability	μ	-	Magnetic	Not hardened	> 700

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	57 - 65	-	-
Ultimate tensile strength	Mechanical	MPa	1900 - 2000	psix10^3	275 - 290
Service temperature	Thermal	ºC	0 / 400	ºF	32 - 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,300 - 300,000	mm	1/64 - 12	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

The material resists to corrosion in contact with freshwater, steam, oil, petrol, alcohol.
They are subjected to pitting corrosion in sea water environments.
Poor corrosion resistance in acid environments.

AISI 431 STAINLESS STEEL BALLS

Martensitic stainless steel balls, they show the best corrosion resistance for this steel family and good mechanical properties, hardness and impact resistance.
Balls are provided in the passivated state.

Applications

Special pumps and valves, they are used in the aircraft, foodstuff and naval field.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	-	-	-	-	-
0,200 max	1,00 max	1,00 max	0,040 max	0,030 max	15,00-17,00	1,25-2,50	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X 16 CrNi 1	431	1.4057	Z 15 CN 16 02	431 S 29	20172	1Cr17Ni2	SUS 431

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,75
Young's modulus	E	GPa	Mechanical	-	208
Specific heat	c	J/kg-K	Thermal	Room temp.	460
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	10,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	25,1
Electric resistivity		*m*10^-9	Electric	-	710
Relative magnetic permeability	μ	-	Magnetic	Not hardened	> 700

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	44 - 54	-	-
Ultimate tensile strength	Mechanical	MPa	1550 - 1750	psix10^3	225 - 253
Service temperature	Thermal	ºC	0 / 400	ºF	32 - 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
2,500 - 75,000	mm	3/32 - 3	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

Good corrosion resistance in contact with organic acids, mild acids and basis, alkaline solutions, steam, industrial and sea atmospheres.

AISI 302/304/304L STAINLESS STEEL BALLS

Unhardened austenitc stainless steel balls, they display good mechanical characteristics, toughness and corrosion resistance.
AISI 304L provides lower carbon content, AISI 302 better mechanical characteristics.
Balls are provided in the passivated condition.

Applications

Special bearings and pumps, aerosol pumps, gardening and household sprayers, perfume miniature pumps, seams, medical application valves, agricultural backpack sprayers.

They are used in foodstuff, aerospace and military industry.

Chemical composition

Type	%C	%Si	%Mn	%P	%S	%Cr	%Ni	%N
302	0,150 max	1,00 max	2,00 max	0,045 max	0,030 max	17,00-19,00	8,00-10,00	0,100 max
304	0,080 max	0,75 max	2,00 max	0,045 max	0,030 max	18,00-20,00	8,00-10,50	0,100 max
304L	0,030 max	0,75 max	2,00 max	0,045 max	0,030 max	18,00-20,00	8,00-10,50	0,100 max

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X10CrNi18-8	302	1.4310	Z11CN18-08	301S21	12KH18N9	1Cr18Ni9	SUS301
X5CrNi18-10	304	1.4301	Z7CN18-09	304S15	08KH18N10	0Cr18Ni9	SUS304
X2CrNi18-9	304L	1.4307	Z3CN18-10	304S11	04KH18N10	00Cr19Ni10	SUS304L

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,95
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	17,5
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,8
Electric resistivity		*m*10^-9	Electric	-	710
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,025*

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	20 - 39 (1)*	HV	100 - 250 (2)*
Ultimate tensile strength	Mechanical	MPa	500 - 1300	psix10^3	72 - 188
Service temperature	Thermal	ºC	-196 / 700	ºF	-320,8 / 1697

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)**
0,300 - 300,000	mm	1/64 - 12	"	G100-200-300-500-600-700-1000

Corrosion Resistance
Very good corrosion resistance with respect to organic substances, oxidating solutions, foodstuff, sterilizing solutions.
Good resistance with respect to atmospheric corrosion and dyes.
They are subjected to pitting and crevice corrosion in presence of hot chloride solutions and to stress corrosion when temperature exceeds 60°C.
They do not resist to sulfuric acid solutions.
AISI 302 shows slightly best corrosion resistance with respect to AISI 304/304L stainless steels.

Notes

Property	Description
Hardness*	Balls can be supplied in the (1) COLD WORKED (HRC 20-39, standard product) or (2) ANNEALED (HV 100-250, on demand) conditions.
Magnetism	Eventual magnetism of AISI 316 balls and in general of all austenitc stainless steels strictly depends by the manufacturing process, specific inquiries for not magnetic balls should priorly reported.
Precision Grade**	On specifical request and for big quantities, we can supply G10 and G16 precision grade balls. Diameters from 3,000 mm to 1/2".
Precision Grade**	On specifical request we can supply G20-24-25-28-40-48-50-60-80 precision grade balls.

AISI 316/316L STAINLESS STEEL BALLS

Austenitic stainless steel balls with higher corrosion resistance than AISI 304 balls.
They show good toughness.
AISI 316L has a lower carbon content (maximum 0,030%).
Balls are provided in the passivated condition.

Applications

Special bearings, pumps and valves, aerosol and dispenser sprayers.

Utilised in the foodstuff, paper, chemical, rubber, military, textile industry.

Applications in photographic devices, medical instruments, quick couplings, recirculating balls, ink cartridges, jewels.

Chemical composition

Type	%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	-	-	-
316	0,080 max	1,00 max	2,00 max	0,045 max	0,030 max	16,00-18,00	10,00-14,00	2,00-3,00	-	-	-
316L	0,030 max	1,00 max	2,00 max	0,045 max	0,030 max	16,00-18,00	10,10-14,00	2,00-3,00	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X5CrNiMo1712-2	316	1.4401	Z6CND17.11	316S16	08KH16N11M3	0Cr17Ni12Mo2	SUS316
X2CrNiMo1712-2	316L	1.4404	Z3CND17-11-02	316S11	03KH17N14M2	0Cr19Ni12Mo2	SUS316L

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,95
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	17
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,0
Electric resistivity		*m*10^-9	Electric	-	730
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,020*

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	20 - 39 (1)*	HV	100 - 250 (2)*
Ultimate tensile strength	Mechanical	MPa	550 - 1250	psix10^3	80 - 180
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 3290-1 / DIN 5401 / AFBMA)**
0,300 - 300,000	mm	1/64 - 12	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Very good corrosion resistance with respect to organic substances, good resistance to several strong acids (acetic, phosphoric, sulphuric acid) and on sea water.

They are subjected to pitting and crevice corrosion in presence of hot chloride solutions and to stress corrosion when temperature exceeds 60°C.

They do not resist in contact with hydrochloric and hydrofluoric acids, aqua regia, iron and magnesium chlorides.

Notes

Property	Description
Hardness*	Balls can be supplied in the (1) COLD WORKED (HRC 20-39, standard product) or (2) ANNEALED (HV 100-250, on demand) conditions.
Magnetism	Eventual magnetism of AISI 316 balls and in general of all austenitc stainless steels strictly depends by the manufacturing process, specific inquiries for not magnetic balls should priorly reported.
Precision grade**	On specifical request and for big quantities, we can supply G10 and G16 precision grade balls. Diameters from 3,000 mm to 1/2".
Precision Grade**	On specifical request we can supply G20-24-25-28-40-48-50-60-80 precision grade balls.

AISI 316Ti STAINLESS STEEL BALLS

Not hardenable austenitic stainless steel titanioum stabilized balls, the presence of Ti allows to guarantee a better intercrystalline corrosion resistance with respect to AISI 316/316L grades, mainly at high temperatures. Balls are provided in the passivated condition.

Applications

Ball valves, special pumps and valves, they are used in devices for the foodstuff, chemical, pharmaceutical, naval, medical, textile industry.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%N	%Ti	-	-
0,080 max	0,75 max	2,00 max	0,045 max	0,030 max	16,00-18,00	10,00-14,00	2,00-3,00	0,0100 max	5x%(C+N)-0,70	-	-

International Standard

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X6CrNiMoTi17-12-2	316Ti	1.4571	Z6CNDT17-12	316S51	10Ch17N13M2T	06Cr17Ni12Mo2	SUS 316Ti

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,95
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	15,9
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,6
Electric resistivity		*m*10^-9	Electric	-	740
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,020

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HV	225 - 400	-	-
Ultimate tensile strength	Mechanical	MPa	650 - 1150	psix10^3	95 - 166
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 3290-1 / DIN 5401 / AFBMA)
0,300 - 300,000	mm	1/64 - 12	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Similar to that of AISI 316/316L family, they feature better intergranular, stress corrosion cracking and pitting corrosion resistance.

AISI 430/430F STAINLESS STEEL BALLS

Ferritic unhardened stainless steel balls, they show good mechanical features and corrosion resistance better than martensitic stainless steels. Balls are provided in the passivated conditions.

Applications
Special bearings and valves, cosmetic nail polish, sprayers, heat exchangers, measurement instruments.

Chemical composition

Type	%C	%Si	%Mn	%P	%S	%Cr	-	-	-	-	-
430	0,120 max	1,00 max	1,00 max	0,040 max	0,030 max	16,00-18,00	-	-	-	-	-
430F	0,120 max	1,00 max	1,25 max	0,065 max	0,150 min	16,00-18,00	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X6Cr17	430	1.4016	Z8C17	430S17	12KH17	1Cr17	SUS 430
X14CrMoS17	430F	1.4104	Z10CF17	441S29	-	YCr17	SUS 430 F

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,73
Young's modulus	E	GPa	Mechanical	-	205
Specific heat	c	J/kg-K	Thermal	Room temp.	450
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11
Thermal conductivity		W/(m·K)	Thermal	Room temp.	24,0
Electric resistivity		*m*10^-9	Electric	-	625
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 600

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	75 - 95	-	-
Ultimate tensile strength	Mechanical	MPa	750 - 950	psix10^3	107 - 140
Service temperature	Thermal	ºC	0 / 450	ºF	32 / 842

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,300 - 180,000	mm	1/64 - 7	"	G100-200-300-500-600-700-1000

Corrosion Resistance

430 balls resist in freshwater, steam, air, detergents, soaps, organic and oxidating acids, alkaline solutions. They do not resist to chloride, fluoride, bromide, iodide solutions. The corrosion resistance is lower than AISI 302/304 steels.

AISI 303 STAINLESS STEEL BALLS

Austenitic AISI 303 stainless steel balls, it is characterised by the best workability properties between stainless steels, thanks to the high sulphur content. Balls are provided in the passivated state. They are obtained by a hot forging process.

Applications

Special valves.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	-	-	-	-	-
0,15 max	1,00 max	2,00 max	0,200 max	0,150 min	17,00-19,00	8,00-10,00	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X8CrNiS18-9	303	1.4305	Z 8 CNF 18-09	303S31	12CH18N10E	Y1Cr18Ni9	SUS303

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,97
Young's modulus	E	GPa	Mechanical	-	198
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	16,7
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,2
Electric resistivity		*m*10^-9	Electric	-	715
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,020

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HB	170 - 270	-	-
Ultimate tensile strength	Mechanical	MPa	500 - 1300	psix10^3	72 - 188
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 3290-1 / DIN 5401 / AFBMA)
0,800 - 180,000	mm	1/32 - 7	"	G100-200-300-500-600-700-1000

Corrosion Resistance

The corrosion resistance is lower than AISI 302/304 steels, causing to the high S content that favour pitting corrosion. Steel not recommended for sea water applications.

AISI 204 Cu STAINLESS STEEL BALLS

Cr-Mn-Cu austenitic stainless steel balls, Cu addition improves workability but slightly reduces mechanical properties compared to AISI 201 stainless steel. Balls are supplied in the passivated condition and can be supplied both magnetic or not magnetic .

Applications

Special bearings, interiori automotive components, switches, die casting devices. They are widely used in the electronic industry.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Cu	%N	-	-	-
0,15 max	1,00 max	6,50-9,00	0,100 max	0,030 max	14,00-17,50	1,50-3,50	1,80-4,00	0,050-0,250	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X8CrMnCuNB17-8-3	204 Cu	1.4597	X8CrMnCuNB17-8-3	X8CrMnCuNB17-8-3	-	-	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,81
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	496
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	17,1
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,0
Electric resistivity		*m*10^-9	Electric	-	163
Relative magnetic permeability	μ	-	Magnetic	Param. / Slightly ferrom.	1,03 / max 10

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	25 - 45	-	-
Ultimate tensile strength	Mechanical	MPa	635 - 1195	psix10^3	92 - 173
Service temperature	Thermal	ºC	-196 / 700	ºF	-320,8 / 1697

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
0,800 - 180,000	mm	1/32 - 7	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Similar to the corrosion resistance of AISI 302/304 stainless steel in neutral or basic environments, lower corrosion resistance in acid enviroments (for example in contact with sulphuric acid) or in presence of chlorides. Not recommended for use in marine environments.

AISI 904L STAINLESS STEEL BALLS

Austenitic stainless steel balls, thanks to the higher Cr, Ni, Mo and Cu content they show the best corrosion resistance properties for this steel family. Balls are provided in the passivated condition.

Applications

Special pumps and valves, applications in the chemical industry in aggressive environments, sea-water applications.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%N	%Mo	%Cu	-	-
0,020 max	1,00 max	2,00 max	0,045 max	0,035 max	19,00-23,00	23,00-28,00	0,100 max	4,00-5,00	1,00-2,00	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X1 NiCrMoCu 25-20-5	904L	1.4539	Z 2 NCDU 25-20	904S13	-	-	SUS 890L

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,98
Young's modulus	E	GPa	Mechanical	-	193
Specific heat	c	J/kg-K	Thermal	Room temp.	475
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	15,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	12,3
Electric resistivity		*m*10^-9	Electric	-	925
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,001

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	65 - 95	-	-
Ultimate tensile strength	Mechanical	MPa	520 - 620	psix10^3	76 - 89
Service temperature	Thermal	ºC	-196 / 450	ºF	-320,8 / 842

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
2,500 - 40,000	mm	3/32 - 1.9/16	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Excellent corrosion resistance against acetic, phosphoric and sulphuric acids, chloride solutions, warm sea water. They are attacked in contact with hydrochloric and nitric acids.

CARPENTER 20 CB 3 BALLS

Austenitic stainless steel balls, they provide excellent mechanical features and corrosion resistance.
This alloy is the best choice to be used in sulphuric acid environments. Balls are provided in the passivated condition.

Applications

Special valves, they are used in foodstuff, chemical, petroleum products, plastic, rubber and explosive industry.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	%Nb	%Ta	%(Nb+Ta)	%Fe
0,060 max	1,00 max	2,00 max	0,035 max	0,035 max	19,00-21,00	32,50-35,00	2,00-3,00	3,00-4,00	8x%C-1,00	1,00 max	1,00 max	balance

International standards

20Cb-3 (UNS N08020, DIN 2.4660, alloy 20) is a registered trademark of Carpenter Technology Corporation.

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,08
Young's modulus	E	GPa	Mechanical	-	193
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	14,7
Thermal conductivity		W/(m·K)	Thermal	Room temp.	20,0
Electric resistivity		*m*10^-9	Electric	-	1082
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,002

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRB	90 - 95	-	-
Ultimate tensile strength	Mechanical	MPa	550 - 630	psix10^3	79 - 92
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 3290-1 / DIN 5401 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-300-500-600-700-1000

Corrosion Resistance

20 CB 3 provides excellent corrosion resistance properties in aggressive environments (sulphuric acid, ferric sulfate), good resistance to nitric, phosphoric, acetic acids, organic acids, sodium hydroxide and pitting, stress, crevice and intergranular corrosion.

Moderate resistance in sea water.

The presence of chloride ions reduces the corrosion resistance of the alloy.

NITRONIC 50 ALLOY BALLS

Austenitic stainless steel Nitronic 50 balls, they provide good corrosion resistance & mechanical features both at low and high temperatures. The alloy is not magnetic even after cold working. Balls are provided in the passivated condition.

Applications

Special pumps and valves, rod riggings, tang systems.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%N	%Nb	%V	-
0,060 max	1,00 max	4,00-6,00	0,040 max	0,030 max	20,50-23,50	11,50-13,50	1,50-3,00	0,200-0,400	0,10-0,30	0,10-0,30	-

International standards

Nitronic 50 (UNS S20910, WN 1.3964) is a registered trademark of AK Steel company.

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,88
Young's modulus	E	GPa	Mechanical	-	196
Specific heat	c	J/kg-K	Thermal	Room temp.	500
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	15,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,6
Electric resistivity		*m*10^-9	Electric	-	820
Relative magnetic permeability	μ	-	Magnetic	Paramagnetic	1,003

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	35 - 45	-	-
Ultimate tensile strength	Mechanical	MPa	1050 - 1250	psix10^3	152 - 181
Service temperature	Thermal	ºC	-196 / 630	ºF	-320,8 / 1166

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Better corrosion resistance than AISI 300 stainless steels series, fair resistance in phosphoric, sulphuric, chloridric, sodium hydroxide and sea water.
Good resistance in acetic and nitric acids.
Balls are subjected to stress corrosion cracking in hot chloride environments.

SUPER DUPLEX 2507 STAINLESS STEEL BALLS

Super duplex (biphasic structure austenite-ferrite) stainless steel balls, they feature good mechanical properties and excellent corrosion resistance in particular in aggressive environment in presence of chlorides.

Applications

Special pumps and valves for application in chemical, power, shipbulding, petrolchemical, oil and gas industry in chemically aggressive environments.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%N	%Mo	%Cu	-	-
0,030 max	0,80 max	1,20 max	0,035 max	0,020 max	24,00-26,00	6,00-8,00	0,240-0,320	3,00-5,00	0,50 max	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X2CrNiMoN25-7-4	F53 / S32750	1.4410	Z3 CN 25.06 Az	2507	08226	2507	2507

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,79
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	475
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100°C)	13,0
Thermal conductivity		W/(m·K)	Thermal	Room temp.	15,0
Electric resistivity		*m*10^-9	Electric	-	825
Relative magnetic permeability	μ	-	Magnetic	Slighlty ferrom.	33

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	25 - 40	-	-
Ultimate tensile strength	Mechanical	MPa	750 - 950	psix10^3	109 - 137
Service temperature	Thermal	ºC	-80 / 300	ºF	-112 / 572

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades (ISO 3290-1 / DIN 5401 / AFBMA)
1,000 - 100,000	mm	3/64 - 4	"	G100-200-300-500-600-700-1000

Corrosion Resistance

Good resistance against pitting, crevice, fatigue, erosion and stress corrosion craking in presence of chlorides, even at high temperatures. Good generalized corrosion resistance against diluted hydrochloric and sulphuric acids, acetic, citric, formic and ossalic acids.

AISI D2 TOOL STEEL BALLS

High carbon and high chromium tool steel balls, they feature good dimensional stability, high mechanical properties and abrasion/wear resistance.

Applications

Special bearings for applications where high mechanical properties in medium aggressive environments are required.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Mo	%V	-	-	-
1,40-1,60	0,10-0,60	0,10-0,60	0,030 max	0,030 max	11,00-13,00	0,70-1,20	0,50-1,10	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X155CrVMo121KU	D2 / T30402	1.2379	Z160CDV12	BD2	-	Cr12Mo1V1	SKD 11

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,67
Young's modulus	E	GPa	Mechanical	-	209
Specific heat	c	J/kg-K	Thermal	Room temp.	460
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	20,5
Electric resistivity		*m*10^-9	Electric	-	650
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	55 - 65	-	-
Ultimate tensile strength	Mechanical	MPa	2100 - 2500	psix10^3	304 - 362
Service temperature	Thermal	ºC	0 / 400	ºF	32 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades
1,000 - 150,000	mm	3/64 - 6	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

D2 tool steel balls feature a corrosion resistance slightly better than AISI 420C martensitic stainless steel.

AISI M2 TOOL STEEL BALLS

AISI M2 high speed Mo-V tool steel balls, they provide good toughness and abrasion resistance.

Applications
Special bearings, ball screws.

Chemical composition

Type	%C	%Si	%Mn	%S	%Cr	%Mo	%V	%W	-	-	-
Standard	0,78-0,88	0,20-0,40	0,20-0,40	0,030 max	3,75-4,50	4,50-5,00	1,60-2,20	5,00-6,75	-	-	-
High C	0,95-1,05	0,20-0,40	0,20-0,40	0,030 max	3,75-4,50	4,50-5,00	1,60-2,20	5,00-6,75	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
HS 6-5-2	M2 / T11302	1.3343	Z85WDCV06-05-04-02	BM2	R6AM	W6Mo5Cr4V2	SKH51

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,16
Young's modulus	E	GPa	Mechanical	-	218
Specific heat	c	J/kg-K	Thermal	Room temp.	418
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	10,6
Thermal conductivity		W/(m·K)	Thermal	Room temp.	24,0
Electric resistivity		*m*10^-9	Electric	-	570
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	62 - 66	-	-
Ultimate tensile strength	Mechanical	MPa	2300 - 2500	psix10^3	334 - 362
Service temperature	Thermal	ºC	0 / 400	ºF	32 / 752

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades
1,000 - 150,000	mm	3/64 - 6	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

The corrosion resistance is better than other tool steels, even if there are materials subjected to corrosive attack when they come in contact with aggressive agents.

AISI M50 TOOL STEEL BALLS

AISI M50 high speed tool steel balls, they provide excellent mechanical properties, hardness and wear resistance at elevated temperatures.

Applications

Special bearings for aircraft uses at elevated temperatures.

Chemical composition

%C	%Si	%Mn	%P	%S	%Cr	%Ni	%Mo	%Cu	%Co	%V	%W
0,80-0,85	0,25 max	0,15-0,35	0,015 max	0,008 max	4,00-4,25	0,15 max	4,00-4,50	0,10 max	0,25 max	0,90-1,10	0,25 max

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
X80MoCrV4 4	M50 / T11350	1.3551	Y80DCV42 16	BM50	-	Cr4Mo4V	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,85
Young's modulus	E	GPa	Mechanical	-	210
Specific heat	c	J/kg-K	Thermal	Room temp.	460
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	11,4
Thermal conductivity		W/(m·K)	Thermal	Room temp.	25,0
Electric resistivity		*m*10^-9	Electric	-	600
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	60 - 65	-	-
Ultimate tensile strength	Mechanical	MPa	2500 - 2700	psix10^3	363 - 391
Service temperature	Thermal	ºC	0 / 425	ºF	32 / 797

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades
1,000 - 150,000	mm	3/64 - 6	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

Better corrosion resistance than S2 tool steel thanks to the presence of the Chromium in a little percentage.

S-2 ROCKBIT TOOL STEEL SHOCK RESISTING BALLS

Alloy steel through hardened balls, they are featured by high toughness and wear/collision resistance. They are specifically indicated for drilling applications.

Applications

Oil-well drilling, well applications, offshore drilling devices.

Chemical composition

%C	%Si	%Mn	%P	%S	%Mo	%V	-	-	-	-	-
0,40-0,55	0,90-1,20	0,30-0,50	0,030 max	0,030 max	0,30-0,60	0,50 max	-	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
-	T41902	-	-	-	Si-Mo	55SiMoVA	-

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	7,72
Young's modulus	E	GPa	Mechanical	-	200
Specific heat	c	J/kg-K	Thermal	Room temp.	468
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	10,8
Thermal conductivity		W/(m·K)	Thermal	Room temp.	19,0
Electric resistivity		*m*10^-9	Electric	-	165
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	54 - 63	-	-
Ultimate tensile strength	Mechanical	MPa	2100 - 2200	psix10^3	305 - 320
Service temperature	Thermal	ºC	-40 / 500	ºF	-40 / 932

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades
4,500 - 75,000	mm	3/16 - 3	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

Good corrosion resistance in alkaline solutions, fairish in contact with salts or industrial atmospheres, poor in contact with water and steam, they do not resist in contact with acid substances.

AISI T15 TOOL STEEL BALLS

Super high speed tool steel tungsten steel AISI T15 balls, they are featured by high hardness and excellent wear resistance, even at high temperatures.
They show fair toughness, then they are not suitable to support high shocks stresses.

Applications

Special bearings when excellent wear resistence at high temperature is required.

Chemical composition

%C	%Si	%Mn	%Cr	%Mo	%Co	%V	%W	-	-	-	-
1,50-1,60	0,15-0,40	0,15-0,40	3,75-5,00	1,00 max	4,75-5,25	4,50-5,25	11,75-13,00	-	-	-	-

International standards

ITA	USA	GER	FRA	UK	RUS	CHN	JAP
130505 KU	T15	1.3202	Z160 WKCV	BT 15	-	W12Cr4V5Co5	SKH10

Physical / mechanical / thermal / electric / magnetic properties

Property	Symbol	U.o.M.	Type	Notes	Values
Density		g/cm3	Physical	Room temp.	8,30
Young's modulus	E	GPa	Mechanical	-	218
Specific heat	c	J/kg-K	Thermal	Room temp.	461
Coefficient of linear thermal expansion		10^-6/ºC	Thermal	(T=0-100ºC)	9,5
Thermal conductivity		W/(m·K)	Thermal	Room temp.	20,0
Electric resistivity		*m*10^-9	Electric	-	650
Relative magnetic permeability	μ	-	Magnetic	Ferromagnetic	> 500

Technical data

Property	Type	U.o.M.	Values	U.o.M.	Values
Hardness	Mechanical	HRC	63 - 68	-	-
Ultimate tensile strength	Mechanical	MPa	3000 - 3500	psix10^3	435 - 507
Service temperature	Thermal	ºC	-40 / 540	ºF	-40 / 1004

Range

Diameters (min/max)	U.o.M.	Diameters (min/max)	U.o.M.	Precision grades
1,000 - 150,000	mm	3/64 - 6	"	See section International Standards: ISO 3290-1 / DIN 5401 / AFBMA

Corrosion Resistance

T15 balls show a corrosion resistance slightly better than M50 high speed tool steel.

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