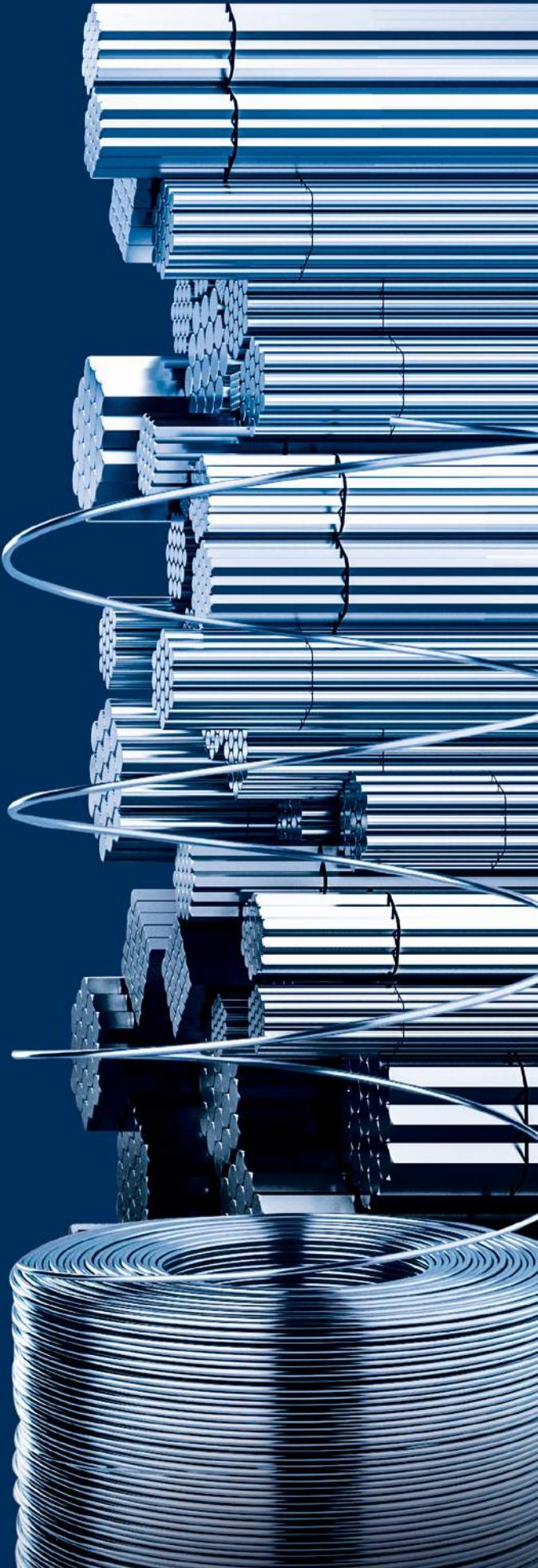


STAINLESS STEEL SOLUTIONS FULL BOOK

Rodacciai®



STAINLESS STEEL SOLUTIONS FULL BOOK

Rodacciai[®]





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COMPANY PROFILE



70 YEARS OF EXPERIENCE IN STEEL BUSINESS

Today the Rodasteel Group is an international leader in the production and processing of steel. Our production and sales locations on three continents (Europe, Asia and America) provide Rodasteel with a widespread sales network to distribute finished products in stainless steels, alloy steels and carbon steels all over the world. The secret of this success is based on an extensive and diversified range of high quality products, on paying attention to the customers, on the ability to innovate continuously and on the experience of Rodasteel people, who know how to identify upcoming market shifts and opportunities.

1956

Foundation of
Trafileria Roda & C.
by Giuseppe Roda

1960

Introduction of lead alloy
steel processing, considered
to be the best in the world

1971

Construction of
the new plant
in Bosisio Parini

1981

Construction of the
Sirone plant, with the
rolling mill

1984

Trafileria Roda & C
becomes
Rodacciai company

Rodacciai was born in Pusiano (Como) in 1956, when Trafileria Roda & C. was founded by the charismatic and innovative entrepreneur Giuseppe Roda. Started as a small local company for steel bar cold drawing, in 1960 Trafileria Roda & C. embarked on a path of production verticalisation along the steel processing chain. Thanks to the installation of a hot-working plant, the company expanded its original offer beyond semi-finished cold pressed products, becoming, during the

years, an international group in the steel processing sector. The group is made by two companies: Rodacciai S.p.A. (Italy) and Aceros Inoxidables Olarra S.A. (Spain). Transparency, integrity and passion are the main values for the entire group, based on them every decision and action are taken. These principles drive all Rodasteel activities and are the basis of the group's Code of Ethics.



1994

Acquisition of the
company Olarra
Aceros Inoxidables

1995-2005

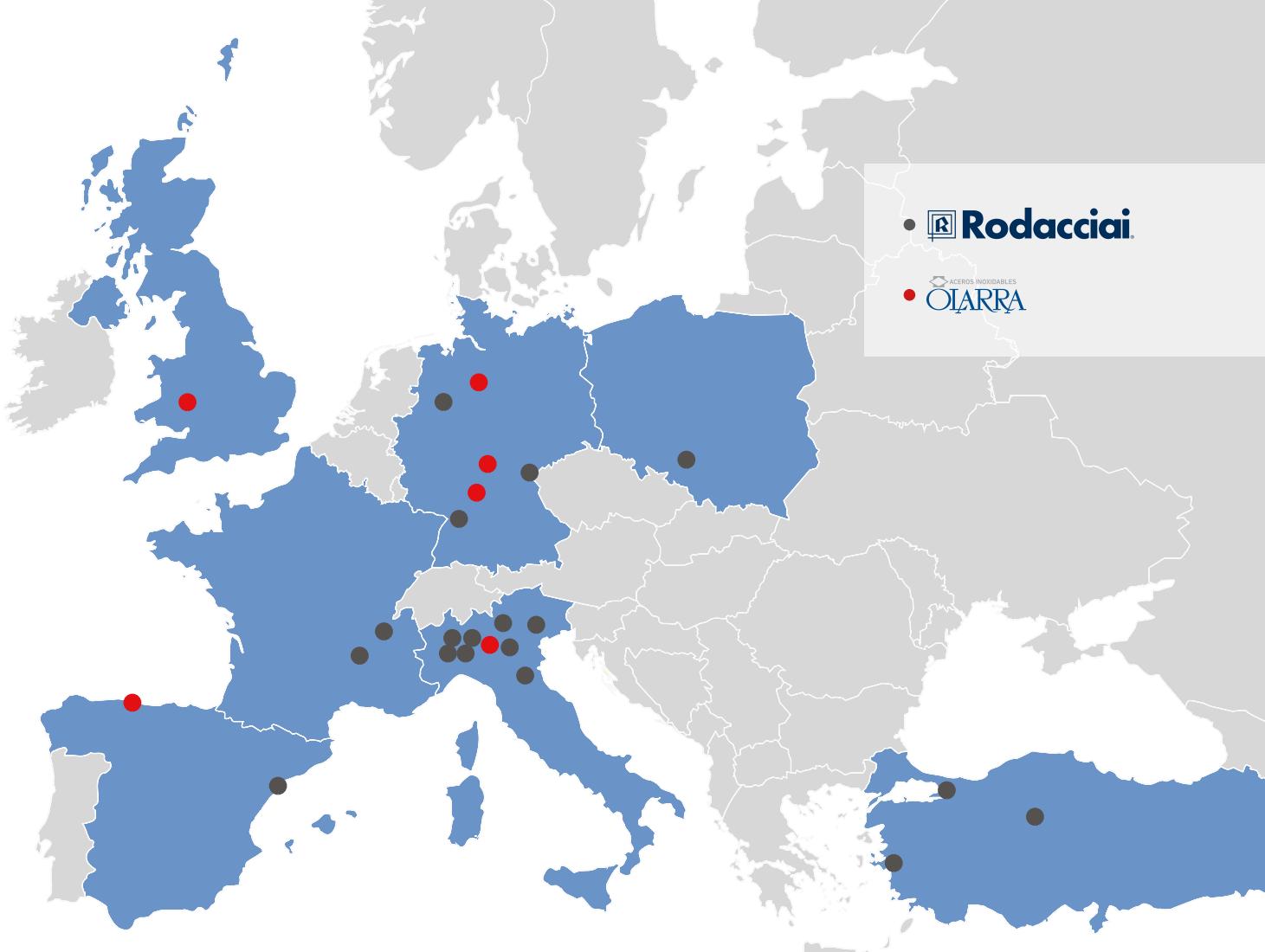
Expansion of the commercial
network in Europe and acquisition
of smaller companies

2007-2016

Investments for
production
expansion

TODAY

Today, Rodasteel Group is a
benchmark in the steel
production and processing sector



8 covered nations



27 distribution centres

EUROPE

Rodacciai

Country: Italy
N° of distribution centres: 6
Cities: Bosisio Parini, Torino, Bergamo, Padova, Bologna

Rodastahl

Country: Germany
N° of distribution centres: 3
Cities: Deisslingen, Hagen, Oelsnitz

Rodastal PL.

Country: Poland
N° of distribution centres: 1
Cities: Gliwice

Rodacciai S.L.

Country: Spain
N° of distribution centres: 1
Cities: Barcelona

BİMEKS ÇELİK

Country: Turkey
N° of distribution centres: 3
Cities: Istanbul, Ankara, Izmir

Euroda Aciers

Country: France
N° of distribution centres: 2
Cities: Cluses, Chasse sur Rhône

SCESI

Country: Italy
N° of distribution centres: 1
Cities: Piacenza

ALUPER

Country: Italy
N° of distribution centres: 1
Cities: San Giuliano Milanese

USA



ÖIARRA - Italia

Country: Italy
N° of distribution centres: 1
Cities: Brescia

ÖIARRA U.K LTD

Country: Great Britain
N° of distribution centres: 1
Cities: Cleobury Mortimer

Roda SpecialtySteel

Country: USA
N° of distribution centres: 3
Cities: Los Angeles, Chicago, New Jersey



DINAMICITY, INNOVATION AND RESILIENCE

The vertical integration achieved over the years by Rodasteel Group, thanks to the acquisition of Olarra and the implementation of the production facilities, offers an important competitive advantage: independency along the entire value chain, which can be translated in our slogan “from the scrap to the finished product”.



Olarra,
Bilbao (steel mill)



Rodacciai,
Bosisio Parini (cold finishing plant)

Rodacciai,
Sirone (rolling mill)



ALL IN HOUSE CONTROL STRATEGY & BUSINESS PROCESS REENGINEERING

The strategic choices, made in the past, have been allowing the Group to differentiate itself over the time.

It is precisely starting from these choices that the company is today a leader in the cold finished steel market.

Our strategy is composed by: **ALL-IN-HOUSE**, to guarantee our customers continuous product and process improvement. Each phase is monitored and tracked.

Business Process Reengineering logic identifies 8 phases, including the redefinition of processes, identification of the levels for change, the development of concrete objectives and actions for continuous improvements.

Rodacciai LAB, an important investment in our laboratory and R&D Dept., creates a high value for both the above explained strategy, helping the company to continuous monitoring the products in each singular step.



Rodacciai





QUALITY CONTROL SYSTEM



Rodacciai works with innovative machinery and optimized production processes to guarantee constant and repeatable high quality products over time. Since 1990 the company has obtained the ISO 9001 system certification, which certifies full compliance with the standards relating to the Quality Management Systems.

In the continuous development of its Quality Policy, Rodacciai, through its production lines, is able to comply with all the necessary certifications for its products.



LABORATORY & CONTROL QUALITY

Rodacciai | LAB

Rodacciai LAB is a recent and big investment, dedicated to the R&D and to the continuous improvement of the products. It is composed by a laboratory fully furnished with all the necessary equipment and testing machines calibrated in accordance with the requirements of ISO 9001 standards. This allows to produce the majority of tests and reports inside the company.



SCRAP YARD



ELECTRIC ARC FURNACE



AOD CONVERTER



HOR. CONTINUOUS CASTING



BARS



HEAT TREATMENT



WIRE ROD



ROLLING MILLS



FURNACE

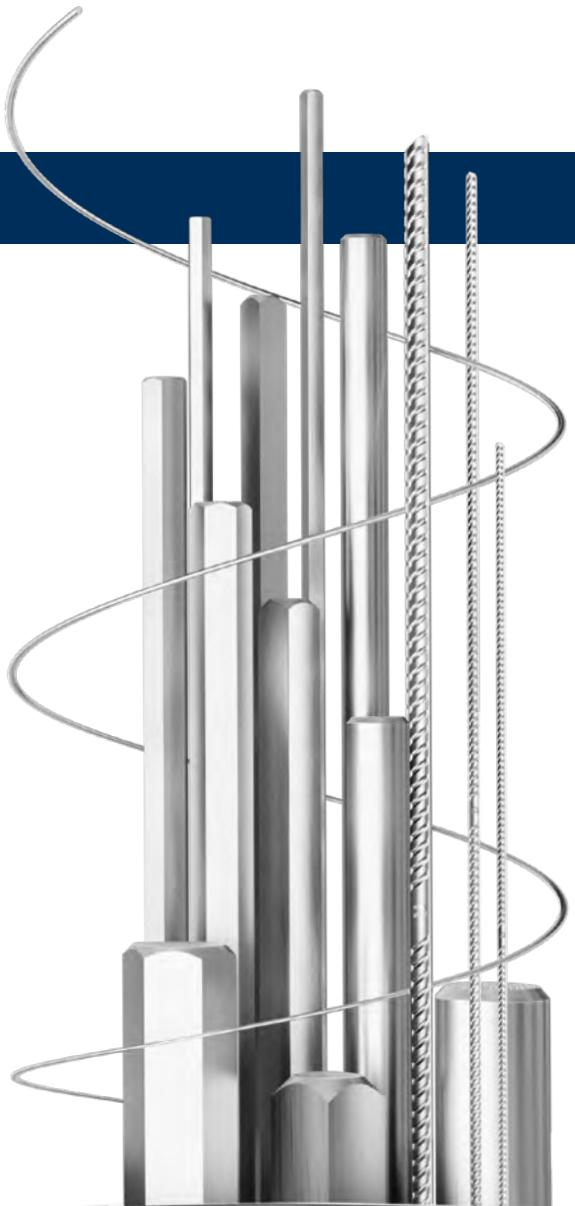


BILLETS





STAINLESS STEEL SOLUTIONS ALL IN HOUSE FROM THE SCRAP TO THE FINISHED PRODUCT



Rodasteel Corporation has always distinguished itself through a unique production philosophy and the choice to have a complete vertical cycle for stainless steel products.

The ALL IN HOUSE strategy, from the scrap to the finished product, can guarantee constant monitoring of each step of the production cycle and provides a unique production flexibility and responsiveness. This aspect is always accompanied by a continuous focus on quality and the certification of products and processes.



Rodacciai, Bosisio Parini (*cold finishing plant*)
Rodacciai, Sirone (*rolling mill*)



Olarra, Bilbao
(*steel mill*)

STEEL MILL

ROLLING MILL

COLD FINISHING

**FURTHER PRODUCTION
PROCESSES (IF NECESSARY)**

COLD DRAWN WIRE



The cold drawn stainless steel wire production is an historical division of Rodasteel group, which has been subsequently extended to reach the current annual production capacity of 75.000 tonnes.

The ALL IN HOUSE strategy allows to control each step of the production cycle guaranteeing a high quality level and studying solutions based on customer's needs. The surface treatments, performed internally, improve the finishing of the

product, making it cleaner and ready for further production steps.

The heat treatments allow to balance the structure of the wire rods and to reduce internal tensions, increasing the deformability of the product. The heat treatments made in house are: quenching and tempering (+QT), soft annealing (+A), solution annealing (+AT). It is possible to customize the surface of the wire. Rodacciai produces and sells cold drawn wire for all the main market applications.

PRODUCTION RANGE AND EXECUTIONS

R	CONDITION	PROFILE	RANGE (mm)	SURFACE FINISHING	TOLERANCE
Coil	Cold-drawn	Round Hexagonal Square Special	1÷22 3÷12 4÷12 Rated on request	Bright Coated	ISA h9-h10-h11 EN 10218-2 T1-T2-T3-T4-T5

Different tolerances can be evaluated.

COLD DRAWN WIRE APPLICATIONS

AUSTENITIC STAINLESS STEEL WIRE

There are several markets for this kind of material - such as automotive, food & beverage, chemical industry and cold forging for screws. Some other materials allow to achieve high mechanical properties and they are suitable for springs and spokes productions.



FERRITIC STAINLESS STEEL WIRE

These qualities are ideal for the production of scourers for cleaning and components for catalytic converters for cars.

MARTENSITIC STAINLESS STEEL WIRE

The series 420, thanks to cold forging process followed by quench and tempering phase, is used in screw production.



STAINLESS STEEL WIRE HEAT-RESISTANT

The most common application is for carpet in the heat treatments furnaces and in the food & beverage machineries.



DUPLEX (AUSTENITIC-FERRITIC) STAINLESS STEEL

Duplex stainless steel wire finds applications in various industries, including oil and gas, chemical processing, desalination plants, pulp and paper and offshore structures.

Typical uses include wire ropes, springs, fasteners, welding consumables and other components that require a combination of strength, corrosion resistance and durability.



PRECIPITATION HARDENING STAINLESS STEELS WIRE

Stainless steel precipitation hardening wire is commonly used in applications that require high strength, corrosion resistance and good mechanical properties.

It finds applications in industries such as aerospace, oil and gas, automotive and medical.

Some common uses of precipitation hardening wire include springs, fasteners, shafts, valves and components for high-stress environments.

AUSTENITIC STAINLESS STEEL WIRE



300 SERIES

Corrosion resistant, non-magnetic steels

Austenitic stainless steel are characterised by high percentage of chromium and nickel that allows a good resistance to the corrosion. This property can be even increased by adding other chemical elements such as molybdenum, titanium and niobium. There is also the possibility to use the Plus series that has a good workability thanks to sulphur.

Some examples are 304 - 1.4301 - 304L - 1.4307 - 316 - 1.4401 - 316L - 1.4404 - 321 - 1.4541 - 316Ti - 1.4571, used in several sectors as fasteners, food & beverage and automotive.

Another material of this steel family is AISI 302, which is characterized by good cold forming properties that allows high mechanical characteristics. For this reason it is perfect for the production of springs and spokes. Austenitic stainless steel wire can be used also for application as fasteners and cold heading wires. Some examples are 304Cu and 316Cu.

MARK RODACCIAI	EUROPEAN OR INTERNATIONAL	PAGE
204CU	X8CrMnCuN17-8-3	18
347H	X6CrNiNb18-10	19
302	X10CrNi18-8	20
303PLUS	X8CrNiS18-9	21
GVR	X6CrNiCuS18-9-2	22
304	X5CrNi18-10	24
304HF	X2CrNi18-9	26
304PLUS	X2CrNi18-9	28
304ST	X2CrNi19-11	30
304CU	X3CrNiCu18-9-4	32
316	X5CrNiMo17-12-2	34
316TI	X6CrNiMoTi17-12-2	36
316L	X6CrNiMoTi17-12-2	38
316CU	X3CrNiCuMo17-11-3-2	40
1.4435	X2CrNiMo18-14-3	41
321	X6CrNiTi18-10	42

STANDARD REFERENCE:

A313 / A313M

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
(ISO 16143-3:2014)		(UNI 6900: 71)	(DIN 1654-5: 89)		(NF A 35-574-90)	(BS 3111 pt.2-79)	AISI
Name	ISO Number	(UNI 6900: 71)	Werkstoff	N°			
X8CrMnCuN17-8-3	4597-204-76-I	-	-	-	-	-	204Cu - S 20430

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	N	Cr	Cu	Mo / max	Ni
0,10	1,00	6,50÷9,00	0,040	0,030	0,10÷0,25	15,50÷17,50	2,00÷3,50	1,00	1,50÷3,00

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	245	270	305	560÷780	40	100	YES	NO

* Only for guidance

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa**WORKING TEMPERATURES RECOMMENDED**

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100

MARK RODACCIAI

204Cu

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440-85)	(NF A 35-574-90)	(BS 970 pt.3-91)	AISI	
X6CrNiNb18-10	550-347-00-I	X 6 CrNiNb 18 11	X6CrNiNb18-10	1.4550	Z6 CNNb 18 - 10	347S31	347H

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Nb	Ni
0,04÷0,08	1,00	2,00	0,045	0,015	17,0÷19,0	10x% C÷1,00	9,0÷12,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	230	205	240	510÷740	40	100	YES	YES

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1150	1020÷1120

STANDARD REFERENCE:

- EN 10088-3: 2014 (Hot-rolled and bright products)
 EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)
 EN ISO 6931-1: 2020 (Stainless steel for springs)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)	(DIN 17224-82)		(NF A 35-574-90)	(BS 970 pt.3-91)	AISI
Name	ISO number		Werkstoff	N°			
X10CrNi18-8	4310-301-00-I	X 2 CrNi 17 07	X 12CrNi 17 7	1.4310	Z11 CN 18 - 08	302S31	302

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	N / max	Cr	Mo / max	Ni
0,05÷0,15	2,00	2,00	0,045	0,015	0,10	16,0÷19,0	0,80	6,0÷9,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
100	230	195	230	500÷750	40	NO	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600	+C 1800
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900	1800÷2100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	720	65	760	60
>5 ≤ 10	660	65	890	-	680	65	730	60
>10 ≤ 25	660	65	850	-	660	65	-	-
>25 ≤ 50	660	65	-	-	-	-	-	-

MECHANICAL PROPERTIES - Wire for springs

Nominal diameter mm	Normal tensile strength (NS)		High tensile strength (HS)	
	MPa min	MPa max	MPa min	MPa max
0,80 < d ≤ 1,00	1900	2190	2050	2360
1,00 < d ≤ 1,25	1850	2130	2000	2300
1,25 < d ≤ 1,50	1800	2070	1950	2250
1,50 < d ≤ 1,75	1750	2020	1900	2190
1,75 < d ≤ 2,00	1700	1960	1850	2130
2,00 < d ≤ 2,50	1650	1900	1750	2020
2,50 < d ≤ 3,00	1600	1840	1700	1960
3,00 < d ≤ 3,50	1550	1790	1650	1900
3,50 < d ≤ 4,25	1500	1730	1600	1840
4,25 < d ≤ 5,00	1450	1670	1550	1790
5,00 < d ≤ 6,00	1400	1610	1500	1730
6,00 < d ≤ 7,00	1350	1560	1450	1670

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
		°C
	900÷1200	1020÷1100

MARK RODACCIAI

302

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK		USA
ISO 16143-3:2014		(UNI 6900: 71)	(DIN 17440-85)		(NF A 35-574-90)	(BS 970 pt.3-91)		AISI
Name	ISO number		Werkstoff	N°				
X8CrNiS18-9	4305-303-00-I	X 10 CrNiS 18 09	X8CrNiS18-09	1.4305	Z8 CNF 18 - 09	303S31		303

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S	N / max	Cr	Cu / max	Ni
0,10	1,00	2,00	0,045	0,15÷0,35	0,10	17,0÷19,0	1,00	8,0÷10,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	230	190	225	500÷750	35	-	NO	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100

MARK RODACCIAI

303PLUS

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number	(UNI 6900: 71)	(DIN 17440 - 85)	N°	(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI
X6CrNiCuS18-9-2	4570-303-31-I	-	-	-	Z8 CNUF 18 - 09	-	-

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S	N / max	Cr	Cu	Mo / max	Ni
0,08	1,00	2,00	0,045	0,15÷0,35	0,10	17,0÷19,0	1,40÷1,80	0,60	8,0÷10,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	$R_{p_0.2}$ (MPa) min	R_p (MPa) min	R_m (MPa)	A_s (%) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
100	215	185	220	500÷710	35	NO	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000
R_m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	$0,10 \leq d \leq 0,20$	$0,20 \leq d \leq 0,50$	$0,50 \leq d \leq 1,00$	$1,00 \leq d \leq 3,00$	$3,00 \leq d \leq 5,00$	$5,00 \leq d \leq 16,00$
R_m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1150	1020÷1100

MARK RODACCIAI

GVR

STANDARD REFERENCE:

- EN 10088-3: 2014 (Hot-rolled and bright products)
 EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)
 EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU
 EN ISO 6931-1: 2020 (Stainless steel for springs)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440-85)	(NF A 35-574-90)	(BS 970 pt.3-91)	AISI	
X5CrNi18-10	4301-304-00-I	X 5 CrNi 18 10	X5CrNi18-10	1.4301	Z7 CN 18 - 09	304S15	304

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni
0,07	1,00	2,00	0,045	0,015	0,10	17,50÷19,50	8,0÷10,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness max* HB	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	190	225	500÷700	45	100	YES	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

MARK RODACCIAI

304

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	700	60	750	60
> 5 ≤ 10	650	65	820	-	650	65	700	60
> 10 ≤ 25	650	65	780	-	650	65	-	-
> 25 ≤ 50	650	65	-	-	-	-	-	-

MECHANICAL PROPERTIES - Wire for springs

Nominal diameter mm	Normal tensile strength (NS)		High tensile strength (HS)	MPa max
	MPa min	MPa min	MPa min	
0,80 < d ≤ 1,00	1775		1850	2050
1,00 < d ≤ 1,25	1725		1750	1990
1,25 < d ≤ 1,50	1675		1750	1930
1,50 < d ≤ 1,75	1625		1650	1870
1,75 < d ≤ 2,00	1575		1650	1820
2,00 < d ≤ 2,50	1525		1550	1760
2,50 < d ≤ 3,00	1475		1550	1700
3,00 < d ≤ 3,50	1425		1450	1640
3,50 < d ≤ 4,25	1400		1450	1610
4,25 < d ≤ 5,00	1350		1350	1560
5,00 < d ≤ 6,00	1300		1350	1500
6,00 < d ≤ 7,00	1250		1300	1440

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation		Solution annealing (water, air)
	°C	900÷1150	1020÷1100

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO	ITALY	GERMANY	FRANCE	UK	USA
ISO 16143-3:2014	(UNI 6900: 71)	(DIN 17440-85)	(NF A 35-574-90)	(BS 970 pt.3-91)	AISI
Name	ISO Number	Werkstoff	N°		
X2CrNi18-9	4307-304-03-I	X 5 CrNi 18 10	X5CrNi18-10	1.4301	Z7 CN 18 - 09
				304S15	304L

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S	N	Cr	Ni
0,03	1,00	2,00	0,045	0,020÷0,030	0,10	17,50÷19,50	9,0÷10,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	175	210	500÷700	45	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	680	68	730	63
>5 ≤ 10	630	68	800	-	630	68	680	63
>10 ≤ 25	630	68	760	-	630	68	-	-
>25 ≤ 50	630	68	740	-	630	68	-	-

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WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100

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304HF

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO	ITALY	GERMANY	FRANCE	UK	USA	
ISO 16143-3:2014 ISO 4954:2021	(UNI 6900: 71)	(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI	
Name	ISO Number	Werkstoff	N°			
X2CrNi18-9	4307-304-03-I	-	-	Z3 CN 19 - 09	304S15	304L

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S	N/ max	Cr	Ni
0,030	1,00	2,00	0,045	0,020÷0,030	0,10	17,50÷19,50	8,0÷10,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max* **	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min*	R _m (MPa)**	A _s (%) min**	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	175	210	500÷700	45	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Classe di resistenza	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

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MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	$0,10 \leq d \leq 0,20$	$0,20 \leq d \leq 0,50$	$0,50 \leq d \leq 1,00$	$1,00 \leq d \leq 3,00$	$3,00 \leq d \leq 5,00$	$5,00 \leq d \leq 16,00$
Rm (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, Rm might be increased by up to 50 MPa

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled(+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
$\geq 2 \leq 5$	-	-	-	-	680	68	730	63
$> 5 \leq 10$	630	68	800	-	630	68	680	63
$> 10 \leq 25$	630	68	760	-	630	68	-	-
$> 25 \leq 50$	630	68	740	-	630	68	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation		Solution annealing (water, air)
	$^{\circ}\text{C}$	900÷1200	1000÷1100

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK		USA
ISO 16143-3:2014 ISO 4954:2021		(UNI 6900: 71)	(DIN 17440 - 85)		(NF A 35-574-90)	(BS 970 pt.3 -91)		AISI
Name	ISO Number		Werkstoff	N°				
X2CrNi19-11	4306-304-03-I	X 2 CrNi 18 11	X2CrNi19-11	1.4306	Z3 CN 19 - 11	304S11		304L

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni
0,030	1,00	2,00	0,045	0,015	0,10	18,0÷20,0	10,0÷12,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	180	215	460÷680	45	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	680	68	730	63
> 5 ≤ 10	630	68	780	-	630	68	680	63
> 10 ≤ 25	630	68	740	-	630	68	-	-
> 25 ≤ 50	630	68	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO	ITALY	GERMANY	FRANCE	UK	USA
ISO 16143-3:2014 ISO 4954:2021	(UNI 6900: 71)	(DIN 1654-5: 89)	(NF A 35-574-90)	(BS 3111 pt.2-79)	AISI
Name	ISO Number	Werkstoff	N°		
X3CrNiCu18-9-4	4567-304-30-I	-	X3CrNiCu18-9	1.4567	Z3 CNU 18 - 10
				394S17	302HQ

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Cu	Ni
0,04	1,00	2,00	0,045	0,015	0,10	17,0÷19,0	3,0÷4,0	8,5÷10,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	175	210	460÷650	45	-	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa**MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)**

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

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MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	600	68	650	63
> 5 ≤ 10	590	68	740	-	590	68	640	63
> 10 ≤ 25	590	68	700	-	590	68	-	-
> 25 ≤ 50	590	68	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

EN ISO 6931-1: 2020 (Stainless steel for springs)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK		USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440 - 85)	N°	(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI	
X2CrNi18-9	4401-316-00-I	X 5 CrNiMo 17 12	X5CrNiMo17-12-2	1.4401	Z7 CND 17 - 11 - 02	316S31	316	

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Mo	Ni
0,07	1,00	2,00	0,045	0,015	0,10	16,5÷18,5	2,00÷2,50	10,0÷13,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	200	235	500÷700	40	100	YES	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

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MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT +C)		Cold Drawn + Solution annealed (+AT +C +AT)		Cold Drawn + Solution annealed + Skin passed (+AT +C +AT +LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	690	65	740	60
> 5 ≤ 10	660	65	830	-	670	65	720	60
> 10 ≤ 25	660	65	790	-	670	65	-	-
> 25 ≤ 50	660	65	-	-	-	-	-	-

MECHANICAL PROPERTIES - Wire for springs

Nominal diameter mm	Normal tensile strength (NS)		High tensile strength (HS)
	MPa min	MPa min	MPa min
0,80 < d ≤ 1,00	1575		1820
1,00 < d ≤ 1,25	1550		1790
1,25 < d ≤ 1,50	1500		1730
1,50 < d ≤ 1,75	1450		1670
1,75 < d ≤ 2,00	1400		1610
2,00 < d ≤ 2,50	1350		1560
2,50 < d ≤ 3,00	1300		1500
3,00 < d ≤ 3,50	1250		1440
3,50 < d ≤ 4,25	1225		1410
4,25 < d ≤ 5,00	1200		1380
5,00 < d ≤ 6,00	1150		1330
6,00 < d ≤ 7,00	1125		1300

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1020÷1120

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK		USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440 - 85)	N°	(NF A 35-574-90)	(BS 970 pt.3-91)	AISI	
X2CrNi18-9	4571-316-35-I	X 6 CrNiMoTi 17 12	X5CrNiMo17-12-2	1.4571	Z6 CNDT 17 - 12	316S31	316Ti	

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Mo	Ni	Ti
0,08	1,00	2,00	0,045	0,015	16,5÷18,5	2,00÷2,50	10,5÷13,5	5x% C÷0,70

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	200	235	500÷700	40	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Spessore	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

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MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	720	65	770	60
> 5 ≤ 10	680	65	850	-	680	65	730	60
> 10 ≤ 25	680	65	810	-	680	65	-	-
> 25 ≤ 50	680	65	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1120

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316TI

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI	
X2CrNiMo17-12-2	4404-316-03-I	X 2 CrNiMo 17 12	X2CrNiMo17-12-2	1.4404	Z3 CND 17 - 11 - 02	(316S11)	316L

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Mo	Ni
0,030	1,00	2,00	0,045	0,015	0,10	16,5÷18,5	2,00÷2,50	10,0÷13,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	200	235	500÷700	40	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

MARK RODACCIAI

316L

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥ 2 ≤ 5	-	-	-	-	670	68	720	63
> 5 ≤ 10	650	68	780	-	650	68	700	63
> 10 ≤ 25	650	68	750	-	650	68	-	-
> 25 ≤ 50	650	68	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)	
		°C	
		900÷1200	1000÷1120

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products) | EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 4954:2021		(UNI 6900: 71)	(DIN 1654-5:89)		(NF A 35-574-90)	(BS 3111-79)	AISI
Name	ISO Number		Werkstoff	N°			
X3CrNiCu-Mo17-11-3-2	4578-316-76-E	-	-	-	-	396S17	(316CU)

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni	Mo	Cu
0,04	1,00	2,00	0,045	0,015	0,10	16,5÷17,5	10,0÷11,0	2,00÷2,50	3,0÷3,5

MECHANICAL PROPERTIES - Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	175	-	450÷650	45	-	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	630	68	680	63
> 5 ≤ 10	610	68	760	-	610	68	660	63
> 10 ≤ 25	610	68	720	-	610	68	-	-
> 25 ≤ 50	610	68	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation		Solution annealing (water, air)
	°C	900÷1150	
			1000÷1100

MARK RODACCIAI

316CU

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products) | EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO Number	(UNI 6900: 71)	(DIN 17440-85)	(NF A 35-574-90)	(BS 970 pt.3-91)	AISI	
X2CrNiMo18-14-3	4435-316-91-I	X 2 CrNiMo 17 13	X2CrNiMo18-14-3	1.4435	Z3 CND 18-14-03	316S13	316L

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Mo	Ni
0,030	1,00	2,00	0,045	0,015	0,10	17,0÷19,0	2,50÷3,00	12,5÷15,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min*	R _m (MPa)	A ₅ (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	200	235	500÷700	40	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa**WORKING TEMPERATURES RECOMMENDED**

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1020÷1120

MARK RODACCIAI

1.4435

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products) | EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

EN 10272: 2016 (Stainless steel bars for pressure purposes) P.E.D. 2014/68/EU

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO	ITALY	GERMANY		FRANCE	UK	USA	
ISO 16143-2:2014 ISO 4954:2021	(UNI 6900: 71)	(DIN 17440 - 85)		(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI	
Name	ISO Number	Werkstoff	N°				
X2CrNi18-9	4541-321-00	X 6 CrNiTi 18 11	X6CrNiTi18-10	1.4541	Z6 CNT 18 - 10	321S31	(321)

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Ni	Ti
0,08	1,00	2,00	0,045	0,015	17,0÷19,0	9,0÷12,0	5x%÷0,70

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness max* HB	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
100	215	190	225	500÷700	40	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 600	+C 700	+C 800	+C 900	+C 1000	+C 1100	+C 1200	+C 1400	+C 1600
R _m (MPa)	600÷800	700÷900	800÷1000	900÷1100	1000÷1250	1100÷1350	1200÷1450	1400÷1700	1600÷1900

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1050	1000	950	900	850	800
A (%) min	20	30	30	30	35	35

Note: If skin passed, R_m might be increased by up to 50 MPa

MECHANICAL PROPERTIES - Bars, wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	720	65	770	60
> 5 ≤ 10	680	65	850	-	680	65	730	60
> 10 ≤ 25	680	65	810	-	680	65	-	-
> 25 ≤ 50	680	65	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1000÷1100



AUSTENITIC HEAT-RESISTING STEELS WIRE

300 SERIES



Steels resistant to corrosion and high temperatures

The specific needs of parts that operate at very high temperatures have led to create stainless steels able to withstand these very particular conditions: this is, for example, the case of steels designed to be used into heat treatment ovens or as resistors of radiating elements.

Thanks to the addition of chromium and nickel in high quantities and to a balanced analysis, the steels in this category are particularly suitable for retaining good mechanical characteristics at high temperature; they can therefore remain in service for a long time in environments at high temperature and with chemical aggressiveness.

MARK RODACIAI	EUROPEAN OR INTERNATIONAL	PAGE
	Steel grade	
310	X8CrNi25-21	46
314	X15CrNiSi25-21	47
1.4828	X15CrNiSi20-12	48

STANDARD REFERENCE:

EN 10095: 1999 (Heat resisting steels and nickel alloys)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number	(UNI 6900: 71)	Werkstoff	N°	(NF A 35-578-91)	(BS 1501 pt. 3-80)	AISI
X8CrNi25-21	4845-310-08-E	X 22 CrNi 25 20	-	-	Z 8 CN 25 - 20	310S16	310 S

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni
0,10	1,50	2,00	0,045	0,015	0,11	24,0÷26,0	19,0÷22,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	R _p _{0,2} (MPa) min	R _p _{1,0} (MPa) min	R _m (MPa)	A _s (%) min
100	192	210	250	500÷700	35

*Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 650)
°C	900÷1100	745÷825	950÷1000	680÷780

STANDARD REFERENCE:

EN 10095: 1999 (Heat resisting steels and nickel alloys)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	Number	(UNI 6900: 71)	Werkstoff	N°	(NF A 35-578-91)	(BS 1501 pt. 3-80)	AISI
-	-	X 16 CrNiSi 25 20	-	-	Z 15 CNS 25 - 20	-	314

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni
0,20	1,50÷2,50	2,00	0,045	0,015	0,11	24,0÷26,0	19,0÷22,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	R _p _{0,2} (MPa) min	R _p _{1,0} (MPa) min	R _m (MPa)	A _s (%) min
100	223	230	270	550÷700	30

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 650)
°C	900÷1100	745÷825	950÷1000	680÷780

STANDARD REFERENCE:

EN 10095: 1999 (Heat resisting steels and nickel alloys)

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 4955:2016		-		-	NF A 35-578	-	AISI
Name	ISO Number		Werkstoff	N°			
X15CrNiSi20-12	4828-305-09-I	-	X 15 CrNiSi 20 12	1.4828	Z17CNS20-12	309S24	309

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	N / max	Cr	Ni
0,20	1,50÷2,50	2,00	0,045	0,015	0,11	19,00÷21,00	11,00÷13,00

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rp ₁ (MPa) min*	R _m (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
							in the delivery condition	in the welded condition
75	223	230	270	550÷750	30	-	-	-

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1050÷1150

MARK RODACCIAI

1.4828





FERRITIC STAINLESS STEELS WIRE

400 SERIES



Corrosion-resistant, non-hardenable steels

AISI 430 – 1.4016 is one of the most common qualities of ferritic stainless steel. It is typically used in production of meshes, in the clean industry and in the automotive sector.

Another application of this steel family is for the production of screws, in this case the recommended quality is AISI 434. For these materials the resistance of the corrosion is lower than austenitic stainless steels.

MARK RODACCIAI	EUROPEAN OR INTERNATIONAL	PAGE
430	X6Cr17	52
430NB	X3CrNb17	54
1.4105	X6CrMoS17	55
434	X6CrMo17-1	56
1.4763	X8Cr24	58

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
(ISO 16143-3:2014)		(UNI 6900: 71)	(DIN 17440 - 86)		(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI
Name	ISO number	(UNI 6900: 71)	Werkstoff	N°			
X6Cr17	4016-430-00-I	X 8 Cr 17	X6Cr17	1.4016	Z 8 C 17	430S17	430

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr
0,08	1,00	1,00	0,040	0,015	16,0÷18,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	Resistance to intergranular corrosion	
					in the delivery condition	in the welded condition
100	200	240	400÷630	20	YES	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	900	850	850	800	750	700
A (%) min	10	15	15	15	15	20

Note: If skin passed, R_m might be increased by up to 50 MPa

MARK RODACCIAI

430

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Soft Annealed + Skin Passed (+A +LC)		Cold Drawn + Solution annealed (+AT +C +AT)		Cold Drawn + Solution annealed + Skin passed (+AT +C +AT +LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	560	63	620	61
> 5 ≤ 10	560	63	660	60	560	63	600	61
> 10 ≤ 25	560	63	640	60	560	63	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)
°C	800÷1100	750÷850

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
(ISO 16143-3:2014)		(UNI 8317: 81)	(DIN 17441 - 86)		(NF A 35-573-90)	(BS 970 pt.3 -91)	AISI
Name	ISO number	(UNI 8317: 81)	Werkstoff	N°	Z 4 CNb 17	-	-
X3CrNb17	511-430-71-I	X 6 CrNb 17	X6CrNb17	1.4511			

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Nb
0,05	1,00	1,00	0,040	0,015	16,0÷18,0	12xC÷1,00

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	$R_p_{0,2}$ (MPa) min	R_m (MPa)	A_s (%) min	Resistance to intergranular corrosion	
					in the delivery condition	in the welded condition
50	200	200	420÷620	20	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R_m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
EN 10088-3: 2005		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt.3 -91)	AISI
Name	Number		Werkstoff	N°			
X6CrMoS17	1.4105	X 10 CrS 17	X6CrMoS17	1.4105	Z 8 CF 17	-	430F

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S	Cr	Mo
0,08	1,50	1,50	0,040	0,15÷0,35	16,0÷18,0	0,20÷0,60

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Durezza HB max*	Rp _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	Resistance to intergranular corrosion	
					in the delivery condition	in the welded condition
100	200	200	430÷630	20	NO	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	900	850	850	800	750	700
A (%) min	10	15	15	15	15	20

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)
°C	800÷1100	750÷850

MARK RODACCIAI

1.4105

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number	(UNI 6900: 71)	(DIN 17440 - 85)	(NF A 35-574-90)	(BS 1554 -90)	AISI	
X6CrMo17-1	4113-434-00-I	X 8 CrMo 17	X6CrMo17-1	1.4113	Z 8 CD 17-01	434S20	434

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Mo
0,08	1,00	1,00	0,040	0,030	16,0÷18,0	0,90÷1,40

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	Resistance to intergranular corrosion	
					in the delivery condition	in the welded condition
100	200	280	440÷660	18	YES	NO

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,10 ≤ d ≤ 0,20	0,20 ≤ d ≤ 0,50	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	900	850	850	800	750	700
A (%) min	10	15	15	15	15	20

Note: If skin passed, R_m might be increased by up to 50 MPa

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	As Treated (+AT) or Peeled (+AT+PE)		Cold Drawn (+AT +C)		Cold Drawn + Solution annealed (+AT +C +AT)		Cold Drawn + Solution annealed + Skin passed (+AT +C +AT +LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	600	60	660	58
>5 ≤ 10	600	60	710	57	600	60	640	58
>10 ≤ 25	600	60	690	57	600	60	-	-

WORKING TEMPERATURES RECOMMENDED

Operation °C	Hot forgings deformation 800÷1100	Annealing (air) 750÷850

STANDARD REFERENCE:

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number	(UNI 6900: 71)	Werkstoff	N°			
-	-	-	X8Cr24	1.4763	-	-	S44600

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N / max	Cr
0,10	1,00	1,00	0,035	0,015	0,10	23,0÷26,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	R _p _{0,1} (MPa) min*	R _p _{0,2} (MPa) min*	R _m (MPa) min*	A _s (%) min*
100	-	280	-	480	20

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 650)
°C	800÷1100	750÷850	950÷1000	680÷780







MARTENSITIC STAINLESS STEELS WIRE

400 SERIES

Steels resistant to corrosion and high temperatures

Stainless steels able to operate at high temperatures, designed to be used into heat treatment ovens or as resistors of radiating element, contain high quantities of chromium and nickel. These steels mantain good mechanical characteristics also at high temperatures and, therefore, are suitable for environments at high temperature and chemical aggressiveness guaranteeing a long duration.

MARK RODACCIAI	EUROPEAN OR INTERNATIONAL	PAGE
	Steel grade	
410	X12Cr13	62
416	X12CrS13	64
420A	X20Cr13	65
420B	X30Cr13	66
420C	X39Cr13	67
420C1	X46Cr13	68
430F	X14CrMoS17	69
1.4122	X39CrMo17-1	70
431	X17CrNi16-2	71
420C F	X46CrS13	72
1.4112	X90CrMoV18	73
1.4418	X4CrNiMo16-5-1	74

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3 -91)	AISI
Name	ISO number		Werkstoff	N°			
X12Cr13	4006-410-00-I	X 12 Cr 13	X12Cr13	1.4006	Z 10 C 13	410S21	410

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Ni / max
0,08÷0,15	1,00	1,50	0,040	0,030	11,5÷13,5	0,75

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	220	-	730 max	-	-
	Quenched + Tempered (+QT 650)	-	450	650÷850	15	25

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa

MARK RODACCIAI

410

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	+A or +A +PE		Cold Drawn (+A +C)		Cold Drawn + Annealed (+A +C+A)		Cold Drawn + Annealed + Skin passed (+A +C+A +LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	-	-	-	-	600	60	660	58
> 5 ≤ 10	600	60	720	57	600	60	640	58
> 10 ≤ 25	600	60	700	57	600	60	-	-
> 25 ≤ 50	590	60	-	-	-	-	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 650)
°C	900÷1100	745÷825	950÷1000	680÷780

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
X12CrS13	4005-416-00-I	X 12 CrS 13	-	-	Z 11 CF 13	416S21	416

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Mo / max
0,06÷0,15	1,00	1,50	0,040	0,15÷0,35	12,0÷14,0	0,60

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p _{0,2} (MPa) min	R _m (MPa)	A ₅ (%) min
100	Ricotto (+A) Quenched + Tempered (+QT 650)	220 -	- 450	730 max 650÷850	- 12

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 650)
°C	900÷1100	745÷825	950÷1000	680÷780

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
X20Cr13	4021-420-00-I	X 20 Cr 13	X20Cr13	1.4021	Z 20 C 13	420S29 - 420S37	420

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr
0,16÷0,25	1,00	1,50	0,040	0,015	12,0÷14,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	230	-	760 max	-	-
	Quenched + Tempered (+QT 700)	-	500	700÷850	13	25
	Quenched + Tempered (+QT 800)	-	600	800÷950	12	20

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C 800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 700)	Tempering (QT 800)
°C	900÷1100	745÷825	950÷1050	600÷750	600÷700

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420A

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-2:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 1554 - 90)	AISI
Name	ISO number		Werkstoff	N°			
X30Cr13	4028-420-00-I	X 30 Cr 13	X30Cr13	1.4028	Z 33 C 13	420S45	420

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr
0,26÷0,35	1,00	1,50	0,040	0,030	12,0÷14,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	245	-	800 max	-	-
	Quenched + Tempered (+QT 850)	-	650	850÷1000	10	12

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa**WORKING TEMPERATURES RECOMMENDED**

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 850)
°C	900÷1100	745÷825	950÷1050	625÷675

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420B

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 1554 - 90)	AISI
Name	ISO number		Werkstoff	N°			
-	-	X 40 Cr 14	X38Cr13	1.4031	(Z 44 C 14)	420S45	420

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr
0,36÷0,42	1,00	1,00	0,040	0,015	12,5÷14,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p _{0,2} (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	245	-	800 max	-	-
	Quenched + Tempered (+QT 800)	-	650	800÷1000	10	12

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 800)
°C	900÷1100	750÷850	950÷1050	650÷700

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
(ISO 16143-3:2014)		(UNI 6900: 71)	(DIN 17440 - 85)		(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
-	-	(X 40 Cr 14)	X46Cr13	1.4034	Z 44 C 14	-	420

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr
0,43÷0,50	1,00	1,00	0,040	0,015	12,5÷14,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	245	-	800 max	-	-
	Quenched + Tempered (+QT 800)	-	650	800÷1000	10	12

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa**WORKING TEMPERATURES RECOMMENDED**

Operation	Hot forgings deformation	Annealing (air)	Quenching in air or oil	Tempering (QT 800)
°C	900÷1100	750÷850	950÷1050	650÷700

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
-	-	X 10 CrS 17	X14CrMoS17	1.4104	Z 13 CF 17	-	430F

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S	Cr	Mo
0,10÷0,17	1,00	1,50	0,040	0,15÷0,35	15,5÷17,5	0,20÷0,60

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p _{0,2} (MPa) min	R _m (MPa)	A _s (%) min
100	Annealed (+A)	220	-	730 max	-
≤ 60	Quenched + Tempered (+QT 650)	-	500	650÷850	12
> 60 ≤ 100	Quenched + Tempered (+QT 650)	-	500	650÷850	10

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)	Quenching in air or oil	Tempering (QT 650)
°C	900÷1100	750÷850	950÷1070	550÷650

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430F

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-2:2014		(UNI 6900: 71)		(SEW 400 : 1973)	(NF A 35-574-90)	(BS 970 pt. 3 -91)	AISI
Name	ISO number		Werkstoff	N°			
X39CrMo17-1	4122-434-09-I	-	X 35 CrMo 17	1.4122	-	-	-

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Mo	Ni / max
0,33÷0,45	1,00	1,50	0,040	0,015	15,5÷17,5	0,80÷1,30	1,00

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A ₅ (%) min	KV (J) min
100	Annealed (+A)	280	-	900 max	-	-
60	Quenched + Tempered (+QT 800)	-	550	750÷950	12	15

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

* For reference only Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)	Quenching in air or oil	Tempering (QT 650)
°C	800÷1100	750÷850	980÷1060	650÷750

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-2:2014		(UNI 6900: 71)		(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
X17CrNi16-2	4057-431-00-X	X 16 CrNi 16	X17CrNi16-2	1.4057	Z 15 CN 16 - 02	431S29	431

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Ni
0,12÷0,22	1,00	1,50	0,040	0,030	15,0÷17,0	1,50÷2,50

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	295	-	950 max	-	-
≤ 60	Quenched + Tempered (+QT 800)	-	600	800÷950	14	25
> 60 ≤ 100	Quenched + Tempered (+QT 800)	-	600	800÷950	12	20
≤ 60	Quenched + Tempered (+QT 900)	-	700	900÷1050	12	16
> 60 ≤ 100	Quenched + Tempered (+QT 900)	-	700	900÷1050	10	15

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)	Quenching in air or oil	Tempering (QT 800)	Tempering (QT 900)
°C	900÷1100	680÷800	950÷1050	750÷800 + 650÷700	600÷650

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STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number	(UNI 6900: 71)	(DIN 17440 - 85)	(NF A 35-574-90)	(BS 970 pt. 3 -91)	AISI	
-	-	-	-	-	-	-	
-	-	-	-	-	-	-	

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S	Cr
0,43÷0,50	1,00	2,0	0,040	0,15÷0,35	12,5÷14,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min
63	Annealed (+A)	245	-	800	-

* Only for guidance ** For rods, only the tensile strength values apply

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (air)
°C	900÷1100	750÷850

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014	-		SEW 400: 1973		NFA 35-574-90	((BS 1501 pt.3 -90))	AISI
Name	ISO number		Werkstoff	N°			
-	-	-	X 90 CrMoV 18	1.4112	-	-	-

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Mo	V
0,85÷0,95	1,00	1,00	0,040	0,015	17,0÷19,0	0,90÷1,30	0,07÷0,12

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	R _p _{0,2} (MPa) min	R _p ₁ (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
63	Annealed (+A)	245	-	800	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)
°C	800÷1100	780÷840

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-2:2014		-	-	-	(NF A 35-574-90)	(BS 1501 pt.3 -90)	AISI
Name	ISO number		Werkstoff	N°			
X4CrNiMo16-5-1	4418-431-77-E	-	X 4 CrNiMo16 5	1.4118	Z6 CND 16-05 -01-	-	-

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Mo	Ni	N / min
0,06	0,70	1,50	0,040	0,015	15,0÷17,0	0,80÷1,50	4,0÷6,0	0,020

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Annealed (+A)	320	-	1100 max	-	-
≤ 100	Quenched + Tempered (+QT 760)	-	550	760÷960	16	90
≤ 100	Quenched + Tempered (+QT 900)	-	700	900÷1100	16	80

* Only for guidance

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)
°C	800÷1100	780÷840





DUPLEX STAINLESS STEELS WIRE

AUSTENITIC-FERRITIC



Duplex (austen-ferritic) stainless steel, suitable for aggressive environments

Duplex stainless steels (austeno-ferritic) have two-phase microstructure containing ferrite and austenite. Despite lower nickel content, they show excellent corrosion resistance and they can achieve high mechanical properties through cold drawing. These steels are suitable for marine and off-shore oil exploration. They are magnetic, can be welded but can not be heat treated and quenched. Duplex steels are still undergoing research and development to fully explore new uses and applications.

MARK RODACCIAI	EUROPEAN OR INTERNATIONAL	PAGE
	Steel grade	
2304	X2CrNiN23-4	78
AISI 329	X3CrNiMoN27-5-2	79
2205	X2CrNiMoN22-5-3	80
2101	X2CrMnNiN21-5-1	82

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	USA	USA
Name	ISO Number	(UNI 6900-71)	(DIN 17440-86)	(NF A 35-574-90)	ASTM A 182	AISI	
X2CrNiN23-4	4362-323-04-I	-	-	-	-	F51 - S31803	2304

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Cr	Cu	Mo	N	Ni
0,03	1,00	2,00	0,035	0,015	22,0÷24,5	0,10÷0,60	0,10÷0,60	0,05÷0,20	3,5÷5,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max	Rp _{0,2} (MPa) min	Rm	A5 (%) max	KV (J) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
160	260	400	600÷830	25	100	YES	YES

MECHANICAL PROPERTIES - Tensile strength of wire 2H condition

Level of resistance	R _m (MPa)
+ C 800	800÷1000
+ C 900	900÷1100
+ C 1000	1000÷1250
+ C 1100	1100÷1350
+ C 1200	1200÷1450
+ C 1400	1400÷1700
+ C 1600	1600÷1900
+ C 1800	1800÷2100

MECHANICAL PROPERTIES - Wire and coils solubilized condition +AT

Size max (mm)	R _m (MPa)	A ₅ (%) min*
> 0,50 ≤ 1,00	1050	20
> 1,00 ≤ 3,00	1000	20
> 3,00 ≤ 5,00	950	25
> 5,00 ≤ 16,00	900	25

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2304

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-2:2014		-	-	-	(NF A 35-574-90)	(BS 1501 pt.3 -90)	AISI
Name	ISO Number		Werkstoff	N°			
X3CrNiMoN27-5-2	4460-312-00-I	-	-	-	Z5 CND 27 - 05 AZ	-	(329)

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N	Cr	Mo	Ni
0,05	1,00	2,00	0,035	0,030	0,05÷0,20	25,0÷28,0	1,30÷2,00	4,5÷6,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max	Rp _{0,2} (MPa) min	Rm (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
100	260	450	620÷880	20	85	YES	YES

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	950÷1200	1020÷1100

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AISI 329 - SS2324 (F52 – S32950)

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

EN 10263-5: 2017 (Wire rods, bars and wire for cold heading products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO	ITALY	GERMANY	FRANCE	UK	USA
ISO 16143-2:2014	-	-	(NF A 35-574-90)	(BS 1501 pt.3 -90)	AISI
Name	ISO Number	Werkstoff	N°		
X2CrNiMoN22-5-3g	4462-318-03-I	-	-	Z3 CND 22 - 05 AZ	318 S 13

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	N	Cr	Mo	Ni
0,030	1,00	2,00	0,035	0,015	0,10÷0,22	21,0÷23,0	2,50÷3,5	4,5÷6,5

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max*	Rp _{0,2} (MPa) min	Rm (MPa)	A5 (%) min	KV (J) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
100	270	450	650÷880	25	100	YES	YES

* Only for guidance

MECHANICAL PROPERTIES - Wire and coils for cold heading

Size mm	as Treated (+AT) o Peeled (+AT+PE)		Cold Drawn (+AT+C)		Cold Drawn + Solution annealed (+AT+C+AT)		Cold Drawn + Solution annealed + Skin passed (+AT+C+AT+LC)	
	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min	R _m (MPa) max	Z (%) min
≥2 ≤ 5	880	55	-	-	950	55	1010	50
> 5 ≤ 10	880	55	1020	-	900	55	970	50
> 10 ≤ 25	880	55	1000	-	880	55	-	-

MECHANICAL PROPERTIES - Wire for springs

Nominal diameter mm	Normal tensile strength (NS)		High tensile strength (HS)	
	MPa min	MPa max	MPa min	MPa max
0,80 < d ≤ 1,00	1800	2070	2140	2470
1,00 < d ≤ 1,25	1800	2070	2090	2410
1,25 < d ≤ 1,50	1700	1960	2090	2410
1,50 < d ≤ 1,75	1700	1960	2000	2300
1,75 < d ≤ 2,00	1700	1960	2000	2300
2,00 < d ≤ 2,50	1550	1790	1900	2190
2,50 < d ≤ 3,00	1550	1790	1860	2140
3,00 < d ≤ 3,50	1550	1790	1850	2050
3,50 < d ≤ 4,25	1450	1670	1750	1950
4,25 < d ≤ 5,00	1450	1670	1700	1900
5,00 < d ≤ 6,00	1350	1560	-	-
6,00 < d ≤ 7,00	1350	1560	-	-

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)
°C	900÷1200	1020÷1100

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
ISO 16143-3:2014		-	-	-	(NF A 35-574-90)	(BS 1501 pt.3 -90)	AISI
Name	ISO Number		Werkstoff	N°			
X2CrMnNiN21-5-1	4162-321-01-E	-	-	-	-	-	UNS 32101

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn	P / max	S / max	N	Cr	Mo	Ni	Cu
0,040	1,00	4,0÷6,0	0,040	0,015	0,20÷0,25	21,0÷22,0	0,10÷0,80	1,35÷1,90	0,10÷0,80

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Hardness HB max	Rp _{0,2} (MPa) min	Rm (MPa)	A _s (%) min	KV (J) min	Resistance to intergranular corrosion	
						in the delivery condition	in the welded condition
100	290	400	650÷900	25	60	YES	YES

MECHANICAL PROPERTIES FOR BRIGHT BARS - Cold drawn or Peeled conditions 2H or 2B or Ground bars 2G

Size max (mm)	Rp _{0,2} (MPa) min	R _m (MPa)	A _s (%) min*	KV (J) min
≤ 10	500	700÷1050	15	-
> 10 ≤ 16	500	700÷1050	20	-
> 16 ≤ 40	500	700÷1050	20	-
> 40 ≤ 100	450	650÷840	30	60

* Values valid only for size ≥ 5 mm

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Solution annealing (water, air)		
		°C	900÷1100	1020÷1080

MARK RODACCIAI

2101





PRECIPITATION HARDENING STAINLESS STEELS WIRE



Stainless steel precipitation hardening, unparalleled strength and durability

Stainless steel precipitation hardening wire, also known as PH stainless steel wire, undergoes a process to achieve improved strength and hardness. The most common steel of this category is the 17-4PH, which contains chromium, nickel, copper and niobium.

Stainless steel precipitation hardening wire is commonly used in applications that require high strength, corrosion resistance and good mechanical properties. It finds applications in industries such as aerospace, oil & gas, automotive and medical. Some common uses are springs, fasteners, shafts, valves and components for high-stress environments.

MARK RODACCIAI	EUROPEAN OR INTERNATIONAL	PAGE
	Steel grade	
631M	X7CrNiAl17-7	86
17-4PH	X5CrNiCuNb16-4	88

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
(ISO 16143-2:2014)		(UNI 6900: 71)	(DIN 17440 - 85)		(NF A 35-574-90)	(BS 970 pt. 3-91)	AISI
Name	ISO number		Werkstoff	N°			
X17CrNi16-2	4568-177-00-I	-	-	-	Z 9 CNA 17-07	-	631

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C	Si / max	Mn / max	P / max	S / max	Cr	Ni
0,12÷0,22	1,00	1,50	0,040	0,015	15,0÷17,0	1,50÷2,50

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Size max (mm)	Heat treatment	Hardness HB max*	R _p 0,2 (MPa) min	R _m (MPa)	A _s (%) min	KV (J) min
100	Solution Annealed (+AT)	255	-	850 max	-	-

* Only for guidance

MECHANICAL PROPERTIES - Cold drawn wire and coils (2H)

Tensile strength levels	+C 500	+C 600	+C 700	+C800	+C900
R _m (MPa)	500÷700	600÷800	700÷900	800÷1100	900÷1100

Note: the desired tensile strength level shall be evaluated depending on diameter required

MECHANICAL PROPERTIES - Cold drawn wire and coils in the solution annealed condition (2D)

Size	0,50 ≤ d ≤ 1,00	1,00 ≤ d ≤ 3,00	3,00 ≤ d ≤ 5,00	5,00 ≤ d ≤ 16,00
R _m (MPa) max	1100	1050	1000	950
A (%) max	10	10	10	15

Note: If skin passed, R_m might be increased by up to 50 MPa

MARK RODACCIAI

631M

MECHANICAL PROPERTIES - Wire for springs

Nominal diameter mm	MPa min	MPa max
0,80 < d ≤ 1,00	1800	2070
1,00 < d ≤ 1,25	1750	2020
1,25 < d ≤ 1,50	1700	1960
1,50 < d ≤ 1,75	1650	1900
1,75 < d ≤ 2,00	1600	1840
2,00 < d ≤ 2,50	1550	1790
2,50 < d ≤ 3,00	1500	1730
3,00 < d ≤ 3,50	1450	1670
3,50 < d ≤ 4,25	1400	1610
4,25 < d ≤ 5,00	1350	1560
5,00 < d ≤ 6,00	1300	1500
6,00 < d ≤ 7,00	1250	1440

WORKING TEMPERATURES RECOMMENDED

Operation	Hot forgings deformation	Annealing (furnace, air)
°C	900÷1150	1060÷1080

STANDARD REFERENCE:

EN 10088-3: 2014 (Hot-rolled and bright products)

ASTM A564/A564M (Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel)

RODACCIAI REFERENCES AND COMPARABLE STANDARDS

ISO		ITALY	GERMANY		FRANCE	UK	USA
Name	ISO number		Werkstoff	N°			
X5CrNiCuNb16-4	4542-174-00-I	-	-	-	Z 9 CNA 17-07	-	630

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

C / max	Si / max	Mn / max	P / max	S / max	Nb	Cr	Mo / max	Ni	Cu
0,07	0,70	1,50	0,040	0,015	5xC÷0,45	15,0÷17,0	0,60	3,0÷5,0	3,0÷5,0

MECHANICAL PROPERTIES – Rods Hot Rolled (1C - 1E)

Steel designation		Thickness T or diameter D mm max	Heat treatment condition	Hardness HBW max	0,2 % proof strength Rp 0,2 (MPa) min	Tensile strength R _m (MPa)	Elongation after fracture A% min (long.)	Impact energy (ISO-V) KV2 J min (long.)
Name	Number							
X5CrNiCuNb16-4	1.4542	100	+AT	360	-	max 1200	-	-
			+P800	-	520	800 to 950	18	75
			+930	-	720	930 to 1100	16	40
			+960	-	790	960 to 1160	12	-
			+1070	-	1000	1070 to 1270	10	-

WORKING TEMPERATURES RECOMMENDED

Steel designation		Hot forming		Heat treatment symbol	Solution annealing		Precipitation hardening
Name	Number	Temperature °C	Type of cooling		Temperature °C	Type of cooling	Temperature °C
X5CrNiCuNb16-4	1.4542	1150 to 900	furnace, air	+AT	1030 to 1050		-
				+P800	1030 to 1050		2 h 760 °C/air + 4 h 620 °C/air
				+P930	1030 to 1050	oil, air	4 h 620 °C/air
				+P960	1030 to 1050		4 h 590 °C/air
				+P1070	1030 to 1050		4 h 550 °C/air

MARK RODACCIAI

17-4PH

STANDARD WIRE PACKAGING

Here below our standard options for wire packaging:



A



B



C



D

There is always the possibility to customise other options according to the requirements of the customer.

DIVISION FOR DIAMETERS:

FROM Ø 1,2 UP TO Ø 9 >> possible solutions

- wooden or metallic spools 250kg - 4,00 mm max
- former 300 - 600 kg max
- drum 180 liters - Ø 1,80 mm max
- drum 280 liters - from 2,00 to 4,00 mm
- coils on wooden pallets 500kg - 1000kg - from 1,20 to 9,00

FROM Ø 9 UP TO Ø 15 >> possible solutions

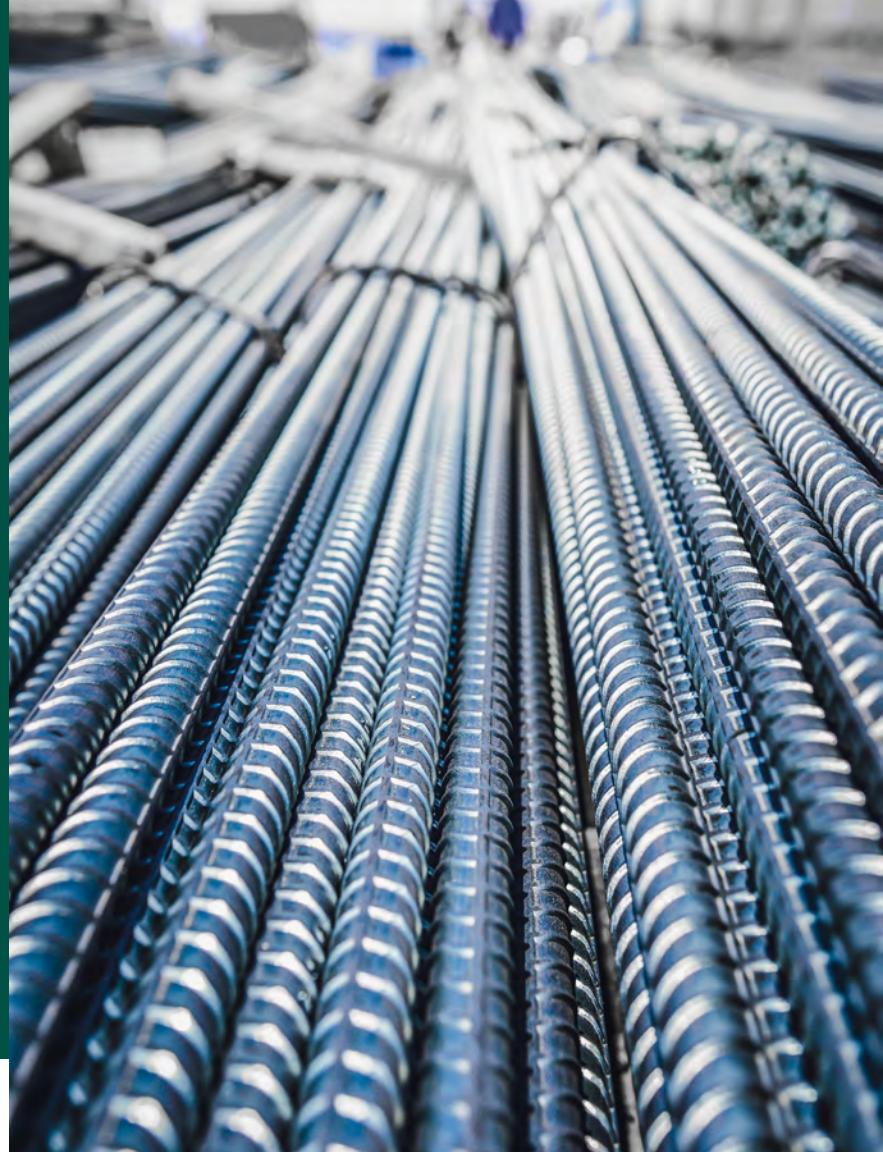
- coils on wooden pallets 500kg -1000kg
- coils 500kg - 1000kg

FROM Ø 15 UP TO Ø 34

coils on wooden pallets 1000kg -2000kg



STAINLESS STEEL REINFORCING BARS FOR CONCRETE



Rodinox® is a complete range of reinforcing products for concrete, in bars and rolls, available in all the most important stainless steel types.

In situations where the environment is aggressive, these bars are the perfect solution to avoid corrosion.

The use of Rodinox® enhances durability on concrete structures compared with usual carbon rebar. Rodinox® can be processed in the same way as carbon steel bars, with the only caution to avoid contamination of stainless surface by using accurately with clean machines.



PRODUCTION RANGE AND EXECUTIONS

RODINOX® is available in rolls in the range from 6 to 16 mm and in bars in the range from 6 to 40 mm.

RODINOX® can be manufactured in the following types:



GRADE	TYPE	REFERENCE STEEL	
RODINOX® R1	austenitic in Cr - Ni	304L / 304LN	1.4307 / 1.4315
RODINOX® R2	austenitic in Cr - Ni - Mo	316L / 316LN	1.4404 / 1.4406
RODINOX® R3	austenitic in Cr - Ni - Mo	316HMo / 316LNMo	1.4436 / 1.4429
RODINOX® R4	duplex	2304	1.4362
RODINOX® R5	duplex	2205	1.4462

APPLICATIONS OF RODINOX BARS



MARINE ENVIRONMENT AND SALT

Structures exposed to marine environment are at risk: above all, the stainless steel reinforcing bars must be used on the parts close to the surface when the structure is alternatively wet and dry.

The concrete cover can be reduced in comparison with the usual cover, necessary when chlorides are present in the environment.



LOW TEMPERATURE HIGH MOUNTAINS AND DE-ICING SALT

Rodinox® bars can be used in high mountains roads and constructions, because low-temperature toughness eliminates the risk of brittle structures even when the climate is rigid. For the same reason, its use is recommended for cryogenic applications.

Rodinox® is resistant to salt, so it can be applied also where de-icing salt must be used.



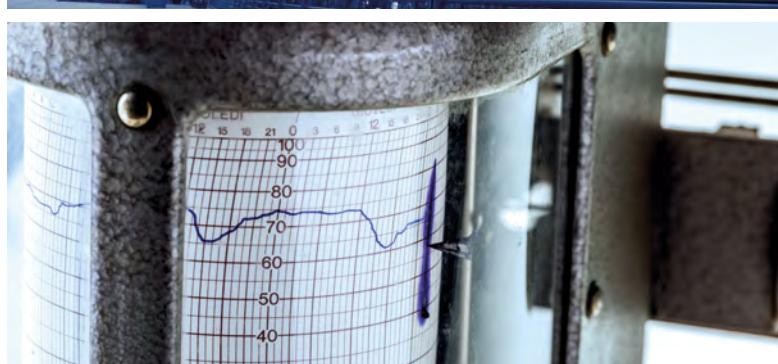
LOW MAGNETIC PERMEABILITY

Rodinox® is suitable for use when very low magnetic permeability is required: for example it can be provided in structures where special electronic equipment are located, but also in other particular situations such as operating rooms of the hospitals, where there are magnetic resonance equipment or the control towers of the airports.



SEISMIC ZONES

Thanks to its high plasticity and fatigue limit, stainless steel Rodinox® bars last longer than the common steel rebar, showing also a lower brittleness: for these reasons its use is recommended in seismic areas, to reduce the risk of collapse of buildings and skyscrapers in case of earthquakes.



HIGH TEMPERATURE RESISTANCE

Rodinox® shows a very good performance also at high and very high temperatures.

Thanks to this feature, it has a long resistance also in case of fire, limiting damages to the buildings and making them safer for people.



APPLICATIONS OF RODINOX BARS



Rodinox® is the solution for reinforcing bars when environmental aggression is a priority and a special durability of the structure is needed.

It can be used in structures coupled with carbon steel rebar without altering its performances: that is why a good design should provide stainless steel reinforcing bars only in appropriate positions.



MARINE ENVIRONMENT AND SALT

Structures exposed to marine environment are at risk: above all, the stainless steel reinforcing bars must be used on the parts close to the surface when the structure is alternatively wet and dry.

The concrete cover can be reduced in comparison with the usual cover, necessary when chlorides are present in the environment.



LOW TEMPERATURE HIGH MOUNTAINS AND DE-ICING SALT

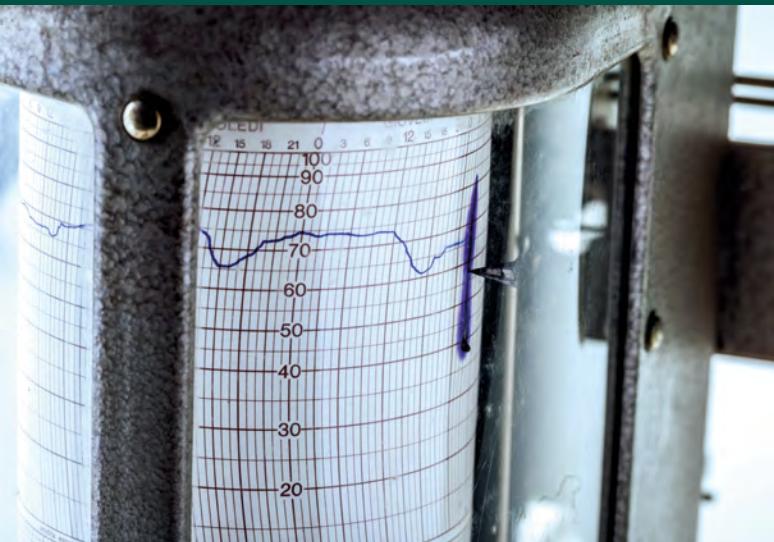
Rodinox® bars can be used in high mountains roads and constructions, because low-temperature toughness eliminates the risk of brittle structures even when the climate is rigid. For the same reason, its use is recommended for cryogenic applications. Rodinox® is resistant to accurately salt, so it can be applied also where de-icing salt must be used.





LOW MAGNETIC PERMEABILITY

Rodinox® is suitable for use when very low magnetic permeability is required: for example it can be provided in structures where special electronic equipment are located, but also in other particular situations such as operating rooms of the hospitals, where there are magnetic resonance equipment or the control towers of the airports.



SEISMIC ZONES

Thanks to its high plasticity and fatigue limit, all Rodinox® stainless steel reinforcing bars last longer than the common steel rebar, showing also a lower brittleness: for these reasons its use is recommended in seismic areas, to reduce the risk of collapse of buildings and skyscrapers in case of earthquakes.



HIGH TEMPERATURE RESISTANCE

Rodinox® is not only resistant to low and very low temperatures: it shows a very good performance also at high and very high temperatures.

A feature that makes it suitable for a long resistance also in case of fire, giving the time for limiting the damage to the buildings and making them safer for people.



LIFE CYCLE COST: DURABILITY THROUGH YEARS



The Life Cycle Cost of structures and buildings can be greatly reduced by using stainless steel reinforcing bars. The best deal is to use Rodinox® bars in contact with water and salt, while leaving the carbon steel rebars for the parts where the risk of chloride contamination tends to zero, such as the inner parts.

Using this mix of materials the initial investment may increase by 3% but the cost of maintenance during the year can be reduced. There is an increasing demand for artifacts that have to last longer, even hundreds of years, requiring a very low maintenance: the only possible approach to these kind of requests is the use of Rodinox®, so that the costs due to the maintenance of reinforcing bars is practically eliminated since the beginning.

A 30 YEARS OLD BRIDGE
MADE WITH ONLY CARBON STEEL

A 60 YEARS OLD BRIDGE
MADE WITH STAINLESS STEEL

PROGRESO BRIDGE - MEXICO

INITIAL COST

20% RODINOX® + 80% CARBON STEEL



100% CARBON STEEL

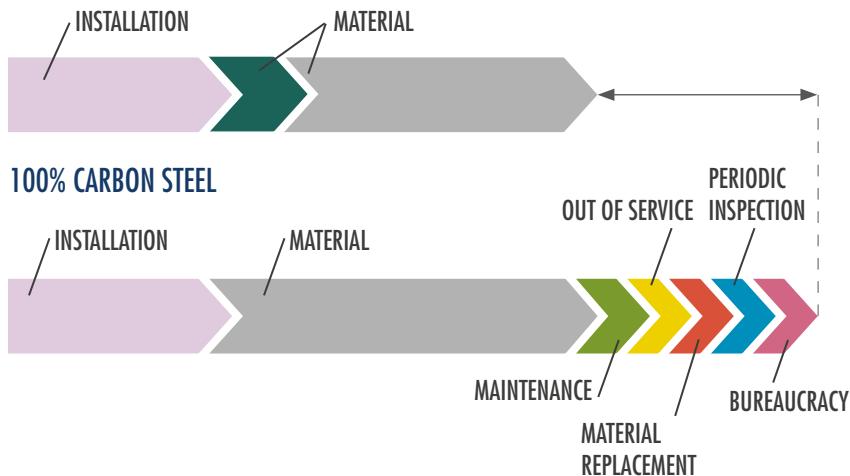


+3%

AVERAGE INCREASE OF THE
CONSTRUCTION'S COST
BY USING RODINOX
INSTEAD OF CARBON STEEL

COST EFFECTIVENESS OF AN ARTIFACT (BRIDGE) IN 90 YEARS

20% RODINOX® + 80% CARBON STEEL



+35%

**COST REDUCTION
OF AN ARTIFACT
IN 90 YEARS
USING RODINOX®**

LIFE OF SERVICE

RODINOX®



CARBON STEEL



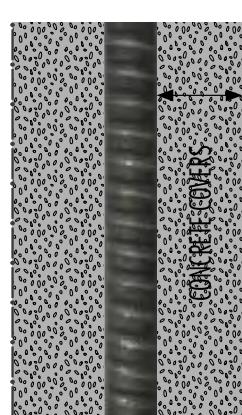
**LIFE OF SERVICE
INCREASED,
I.E. THE YEARS WITHIN
THE EXTRAORDINARY
MAINTENANCE
IS NOT REQUIRED**

CONCRETE REDUCTION THANKS TO RODINOX®

RODINOX®



CARBON STEEL



WITHOUT RODINOX®

IT ALLOWS
A **REDUCTION
OF 50%**
CONCRETE COVERS



STAINLESS STEELS REINFORGING BARS



Rodinox® round with improved adherence for the reinforcement of concrete

Rodinox® is the answer to concrete reinforcement problems when high durability is required under severe climatic and environmental conditions.

In these situations, in fact, concrete reinforcement with carbon steel is not sufficient and it is therefore opportune to use stainless steel, whose characteristics are optimally exploited in the construction field as:

- it is suitable for use in seismic areas thanks to high plasticity, a high fatigue limit and the absence of fragility;
- it resists to low temperatures without brittleness phenomena;
- it resists to high temperatures, including flame and fires;
- it is suitable for use in the hospitals and in the airport control towers thanks to a very low magnetic permeability so that it does not alter the operation of sensitive electronic equipment.

THE SIZE RANGE RODINOX® It is available in rolls in the range from 6 to 16 mm and in bars in the range from 6 to 40 mm.

RODINOX® GRADES In order to meet the various needs, Rodinox® is manufactured in the following types:

GRADE	TYPE	REFERENCE STEEL	
RODINOX® R1	austenitic in Cr - Ni	304L / 304LN	1.4307 / 1.4315
RODINOX® R2	austenitic in Cr - Ni - Mo	316L / 316LN	1.4404 / 1.4406
RODINOX® R3	austenitic in Cr - Ni - Mo	316HMo / 316LNMo	1.4436 / 1.4429
RODINOX® R4	duplex	2304	1.4362
RODINOX® R5	duplex	2205	1.4462

CHEMICAL COMPOSITION

The average chemical composition of Rodinox® is as follows:

GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	N	Cu
RODINOX® R1	0,02	1,6	0,5	<0,010	0,04	18,5	8,1	-	0,20	-
RODINOX® R2	0,02	1,6	0,5	<0,010	0,04	18,0	10,1	2,1	0,20	-
RODINOX® R3	0,02	1,6	0,5	<0,010	0,04	17,1	11,1	2,6	0,20	-
RODINOX® R4	0,02	0,8	0,5	<0,010	0,04	23,2	4,1	0,2	0,10	0,30
RODINOX® R5	0,02	0,8	0,5	<0,010	0,04	22,8	5,2	3,1	0,20	-

* conforms to BS 6744 standard

THE SIZE RANGE RODINOX®

The average chemical composition of Rodinox® is as follows:

GRADE	Ministerial Decree 14.01.2008 Technical Standards for Construction class B450C		BS 6744: 2016	
	Rotoli 6 - 14 mm	Barre 6 - 32 mm	Rotoli 6 - 16 mm	Barre 6 - 32 mm
RODINOX® R1	Rotoli 6 - 14 mm	Barre 6 - 32 mm	Rotoli 6 - 16 mm	Barre 6 - 32 mm
RODINOX® R2	Rotoli 6 - 14 mm	Barre 6 - 32 mm	-	-
RODINOX® R3	Rotoli 6 - 14 mm	Barre 6 - 32 mm	Rotoli 6 - 16 mm	Barre 6 - 32 mm
RODINOX® R4		Barre 6 - 32 mm	Rotoli 6 - 16 mm	Barre 6 - 40 mm
RODINOX® R5	-	-	-	6 - 32 mm

* conforms to BS 6744 standard

RODINOX® REFERENCE STANDARDS

Mass per linear meter as a function of the type of steel (units kg/m)

GRADE	Ø nom. mm	5	6	7	8	10	12	14	16	18	20	22	24	25	26	32	40
	sezione mm ²	19,6	28,3	38,5	50,3	78,5	113,1	153,9	201,1	254,5	314,2	380,2	452,4	490,9	531,0	804,2	1256,6
RODINOX® R1	0,155	0,224	0,304	0,397	0,620	0,893	1,216	1,589	2,011	2,482	3,003	3,574	3,878	4,195	6,353	9,927	
RODINOX® R2	0,157	0,226	0,308	0,402	0,628	0,905	1,231	1,609	2,036	2,514	3,041	3,620	3,927	4,248	6,434	10,053	
RODINOX® R3	0,157	0,226	0,308	0,402	0,628	0,905	1,231	1,609	2,036	2,514	3,041	3,620	3,927	4,248	6,434	10,053	
RODINOX® R4*	0,153	0,221	0,300	0,392	0,612	0,882	1,200	1,569	1,985	2,451	2,965	3,529	3,829	4,142	6,266	9,790	
RODINOX® R5*	0,153	0,221	0,300	0,392	0,612	0,882	1,200	1,569	1,985	2,451	2,965	3,529	3,829	4,142	6,266	9,790	

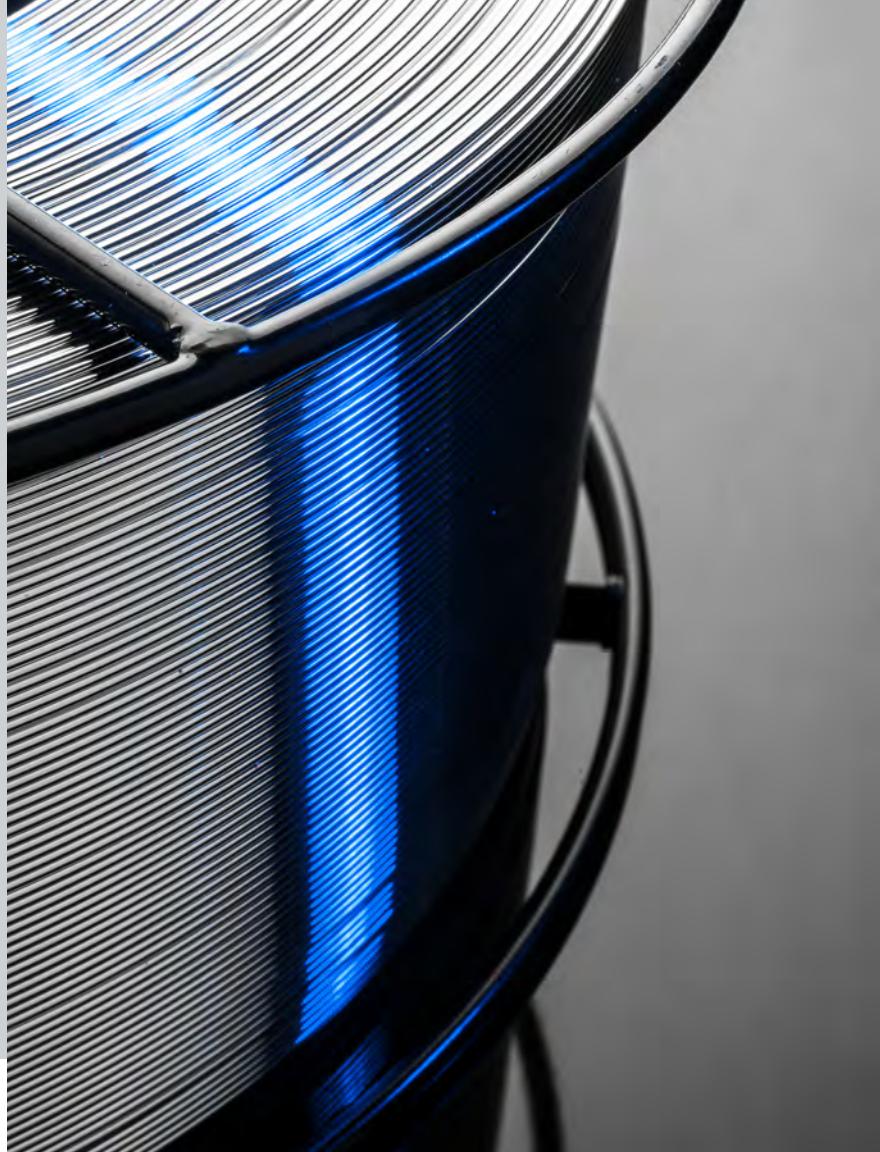
* conforms to BS 6744 standard

MARK RODACCIAI

RODINOX®



STAINLESS STEELS FOR WELDING



Rodacciai
WELDING



Stainless steel wire and rods of various types are used as welding filler materials for the production of electrodes, MIG, TIG and Submerged Arc welding. According to customers' requirements, it is possible to provide austenitic, martensitic, ferritic or austenitic-ferritic (duplex - super duplex) stainless steels.

The use of selected wire rods, with controlled impurity levels, guarantees an optimal weld, both from the point of view of the mechanical strength and in terms of the presence of delta ferrite, i.e. corrosion resistance.

Furthermore, the chemical composition of the materials applies to all principal international standards, including the European standard EN ISO and American standard AWS.

Thanks to the quality of its stainless steel welding wire products, Rodacciai supplies all the major welding houses and electrode manufacturers all over the world. The company offers a variety of different kinds of packaging (spools and drums) and the possibility to customize each of them.

During the years Rodacciai achieved several certifications such as TÜV/CE (Europe), DB (Germany) and CWB (Canada).

Recently the stainless steel welding products have been approved and used by the major car manufacturers worldwide and in the construction of nuclear power plants.



CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	Nb	Ti
RW 307	min	-	5,00	-	-	-	17,0	7,0	-	-	-	-	-
	max	0,08	8,00	0,50	0,030	0,030	20,0	10,0	0,30	0,30	-	-	-
RW 307L	min	-	5,00	0,30	-	-	17,0	7,0	-	-	-	-	-
	max	0,05	8,00	0,70	0,030	0,030	20,0	10,0	0,30	0,30	-	-	-
RW 307SI	min	-	5,00	0,65	-	-	17,0	7,0	-	-	-	-	-
	max	0,10	8,00	1,00	0,030	0,030	20,0	10,0	0,30	0,30	-	-	-
RW 308L	min	-	1,00	-	-	-	19,5	9,0	-	-	-	-	-
	max	0,03	2,50	0,20	0,020	0,030	21,0	11,0	0,30	0,30	-	-	-
RW 308LAWS	min	-	1,00	0,30	-	-	19,5	9,0	-	-	-	-	-
	max	0,03	2,50	0,65	0,020	0,030	21,0	11,0	0,30	0,30	-	-	-
RW 19-9-L	min	-	1,00	0,30	-	-	19,5	9,0	-	-	-	-	-
	max	0,03	2,50	0,65	0,030	0,030	22,0	11,0	0,75	0,75	-	-	-
RW 308LSI	min	-	1,00	0,65	-	-	19,5	9,0	-	-	-	-	-
	max	0,03	2,50	1,00	0,020	0,030	21,0	11,0	0,30	0,30	-	-	-
RW 308H	min	0,04	1,00	0,30	-	-	19,5	9,0	-	-	-	-	-
	max	0,08	2,50	0,65	0,020	0,030	21,0	11,0	0,30	0,30	-	-	-
RW 309L	min	-	1,00	0,30	-	-	23,0	12,0	-	-	-	-	-
	max	0,03	2,50	0,65	0,020	0,030	25,0	14,0	0,30	0,30	-	-	-
RW 309SI	min	-	1,00	0,65	-	-	23,0	12,0	-	-	-	-	-
	max	0,12	2,50	1,00	0,030	0,030	25,0	14,0	0,75	0,75	-	-	-
RW 309LSI	min	-	1,00	0,65	-	-	23,0	12,0	-	-	-	-	-
	max	0,03	2,50	1,00	0,020	0,030	25,0	14,0	0,30	0,30	-	-	-
RW 309LMO	min	-	1,00	0,30	-	-	21,0	11,0	2,00	-	-	-	-
	max	0,03	2,50	0,65	0,020	0,030	25,0	15,5	3,50	0,30	-	-	-
RW 309H	min	0,04	1,00	0,30	-	-	23,0	12,0	-	-	-	-	-
	max	0,15	2,50	0,65	0,030	0,030	24,0	14,0	0,50	0,30	-	-	-
RW 310	min	0,08	1,00	0,30	-	-	25,0	20,0	-	-	-	-	-
	max	0,15	2,50	0,65	0,020	0,030	27,0	22,0	0,30	0,30	-	-	-
RW 312	min	-	1,00	0,30	-	-	28,0	8,0	-	-	-	-	-
	max	0,15	2,50	0,65	0,020	0,030	32,0	10,5	0,30	0,30	-	-	-
RW 316L	min	-	1,00	-	-	-	18,0	11,0	2,50	-	-	-	-
	max	0,03	2,50	0,20	0,020	0,030	20,0	14,0	3,00	0,30	-	-	-
RW 316LAWS	min	-	1,00	0,30	-	-	18,0	11,0	2,50	-	-	-	-
	max	0,03	2,50	0,65	0,020	0,030	20,0	14,0	3,00	0,30	-	-	-
RW 316LSI	min	-	1,00	0,65	-	-	18,0	11,0	2,50	-	-	-	-
	max	0,03	2,50	1,00	0,020	0,030	20,0	14,0	3,00	0,30	-	-	-

WELDING STAINLESS STEEL

CHEMICAL COMPOSITION (CAST ANALYSIS) (%)

		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	Nb	Ti
RW 316H	min	0,04	1,00	0,30	-	-	18,0	11,0	2,00	-	-	-	-
	max	0,08	2,50	0,65	0,020	0,030	20,0	14,0	3,00	0,30	-	-	-
RW 317LAWS	min	-	1,00	0,30	-	-	18,5	13,0	3,00	-	-	-	-
	max	0,03	2,50	0,65	0,020	0,030	20,0	15,0	4,00	0,30	-	-	-
RW 318SI	min	-	1,00	0,65	-	-	18,0	11,0	2,50	-	-	10xC	-
	max	0,08	2,50	1,00	0,020	0,030	20,0	14,0	3,00	0,30	-	1,00	-
RW 347	min	-	1,00	0,30	-	-	19,0	9,0	-	-	-	10xC	-
	max	0,08	2,50	0,65	0,020	0,030	21,0	11,0	0,30	0,30	-	1,00	-
RW 347SI	min	-	1,00	0,65	-	-	19,0	9,0	-	-	-	10xC	-
	max	0,08	2,50	1,00	0,020	0,030	21,0	11,0	0,30	0,30	-	1,00	-
RW 385	min	-	1,00	-	-	-	19,5	24,0	4,20	1,20	-	-	-
	max	0,025	2,50	0,50	0,020	0,020	21,5	26,0	5,20	2,00	-	-	-
RW 2209	min	-	0,50	-	-	-	21,5	7,5	2,50	-	0,10	-	-
	max	0,03	2,00	0,90	0,020	0,030	23,5	9,5	3,50	0,30	0,20	-	-
RW 409CB	min	-	-	-	-	-	10,5	-	-	-	-	10xC	-
	max	0,08	0,80	1,00	0,020	0,030	13,50	0,6	0,50	0,75	-	0,75	-
RW 410	min	-	-	-	-	-	12,0	-	-	-	-	-	-
	max	0,12	0,60	0,50	0,020	0,030	13,5	0,5	0,50	0,40	-	-	-
RW 410NIMO	min	-	-	-	-	-	11,0	4,0	0,40	-	-	-	-
	max	0,05	0,60	0,50	0,020	0,030	12,5	5,0	0,70	0,30	-	-	-
RW 4122	min	0,33	-	-	-	-	15,5	-	0,90	-	-	-	-
	max	0,43	1,00	0,70	0,020	0,030	17,5	1,0	1,20	-	-	-	-
RW 420	min	0,30	-	-	-	-	12,0	-	-	-	-	-	-
	max	0,40	0,60	0,50	0,030	0,030	14,0	0,6	0,75	0,75	-	-	-
RW 420C	min	0,38	0,30	-	-	-	12,0	-	-	-	-	-	-
	max	0,43	0,60	0,50	0,030	0,030	14,0	0,6	0,75	0,75	-	-	-
RW 430	min	-	-	-	-	-	16,0	-	-	-	-	-	-
	max	0,10	0,60	0,50	0,030	0,030	17,0	0,6	0,75	0,75	-	-	-
RW 430LNB	min	-	-	-	-	-	17,8	-	-	-	-	0,05+	
	max	0,02	0,80	0,50	0,020	0,030	18,8	0,5	0,30	0,30	0,02	0,5	
RW 430LNBTI	min	-	-	-	-	-	17,5	-	-	-	-	8xC	10xC
	max	0,03	1,50	1,00	0,030	0,030	19,5	0,5	0,50	0,50	0,02	0,80	0,50
RW 2594	min	-	-	-	-	-	24,0	8,0	2,50	-	0,2	-	-
	max	0,03	2,50	1,00	0,020	0,030	27,0	10,5	4,50	1,5	0,3	-	-

RODACCIAI'S DENOMINATIONS EQUIVALENT

█	EN ISO 14343-A: 2017 Nominal Composition	EN ISO 14343-B: 2017 Alloy Type	AWS A5.9-2017 Alloy Designation	AWS A5.9-2017 Nominal Composition Designation	DIN Werkstoff Nr.
RW 307	18 8 Mn	-	-	18 8 Mn	1.4370
RW 307L	18 8 Mn	-	-	18 8 Mn	1.4370
RW 307SI	18 8 Mn	-	-	18 8 Mn	1.4370
RW 308L	19 9 L	-	-	19 9 L	-
RW 308LAWS	19 9 L	SS308L	ER308L	19 9 L	1.4316
RW 19-9-L	19 9 L	SS308L	ER308L	19 9 L	1.4316
RW 308LSI	19 9 L Si	SS308LSi	ER308LSi	19 9 L Si	1.4316
RW 308H	19 9 H	SS308H	ER308H	19 9 H	-
RW 309L	23 12 L	SS309L	ER309L	23 12 L	1.4332
RW 309SI	-	SS309Si	ER309Si	-	(1.4829)
RW 309LSI	23 12 L Si	SS309LSi	ER309LSi	23 12 L Si	1.4332
RW 309LMO	23 12 2 L	-	-	23 12 2 L	(1.4459)
RW309H	22 12 H	SS309	ER309	22 12 H	-
RW 310	25 20	SS310	ER310	25 20	(1.4842)
RW 312	29 9	SS312	ER312	29 9	1.4337
RW 316L	19 12 3 L	-	-	19 12 3 L	1.4430
RW 316LAWS	19 12 3 L	SS316L	ER316L	19 12 3 L	1.4430
RW 316LSI	19 12 3 L Si	SS316LSi	ER316LSi	19 12 3 L Si	1.4430
RW 316H	19 12 3 H	SS316H	ER316H	19 12 3 H	-
RW 317LAWS	18 15 3 L	SS317L	ER317L	18 15 3 L	-
RW 318SI	19 12 3 Nb Si	-	(ER318)	19 12 3 Nb Si	1.4576
RW 347	19 9 Nb	SS347	ER347	19 9 Nb	1.4551
RW 347SI	19 9 Nb Si	SS347Si	ER347Si	19 9 Nb Si	1.4551
RW 385	20 25 5 Cu L	SS385	ER385	20 25 5 Cu L	-
RW 2209	22 9 3 N L	SS2209	ER2209	22 9 3 N L	(1.4462)
RW 409CB	-	SS409Nb	ER409Nb	-	-
RW 410	13	SS410	ER410	13	-
RW 410NiMo	13 4	SS410NiMo	ER410NiMo	13 4	-
RW 4122	-	-	-	-	1.4122
RW 420	-	SS420	ER420	-	-
RW 420C	-	(SS420)	(ER420)	-	1.4031
RW 430	(17)	SS430	ER430	(17)	1.4016
RW 430LNB	18 LNb	(SS430LnB)	(ER430LnB)	18 L Nb	1.4511
RW 430LNBTI	18 L Nb Ti	-	-	-	-
RW 2594	25 9 4 N L	SS2594	ER2594	25 9 4 N L	-

WELDING STAINLESS STEEL

PRODUCTION RANGE AND FINISHING

WELDING PROCESSES		SIZE	PACKAGING																								
MIG		mm 0,80 - 0,90 - 1,00 - 1,14 - 1,20 - 1,60 inches 0,030 - 0,035 - 0,045 - 1/16	Plastic spool D200 - size: width 55 mm - outside diameter: 200 mm - spindle hole diameter: 51,5 mm w- weight: 5 kg Plastic spool D300 - size: width 100 mm - outside diameter: 300 mm - spindle hole diameter: 51,5 mm - weight: 12,5 kg (for diameter ≤0,8 mm) 15 kg (for diameters >0,8 mm) Blue metallic wire basket BS300 - size: width 100 mm - outside diameter: 300 mm - inside diameter: 51,5 mm - weight: 15 kg Bulk spool / wooden / metallic - size: width 285 mm - outside diameter: 750 mm - spindle hole diameter: 41 mm - weight: 250 kg Drum for robotic welding <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>- wire diameter (mm):</td> <td>0,8</td> <td>0,9</td> <td>1,0</td> <td>1,2</td> <td>1,6</td> </tr> <tr> <td>- height of drum (mm):</td> <td>670</td> <td></td> <td>790</td> <td></td> <td>790</td> </tr> <tr> <td>- outside diameter (mm):</td> <td>510</td> <td></td> <td>520</td> <td></td> <td>580</td> </tr> <tr> <td>- weight (kg):</td> <td>150</td> <td></td> <td>250-400</td> <td></td> <td>250-400</td> </tr> </table>	- wire diameter (mm):	0,8	0,9	1,0	1,2	1,6	- height of drum (mm):	670		790		790	- outside diameter (mm):	510		520		580	- weight (kg):	150		250-400		250-400
- wire diameter (mm):	0,8	0,9	1,0	1,2	1,6																						
- height of drum (mm):	670		790		790																						
- outside diameter (mm):	510		520		580																						
- weight (kg):	150		250-400		250-400																						
TIG		mm 0,80 - 0,90 - 1,00 - 1,14 - 1,20 - 1,60 2,00 - 2,40 - 3,20 - 4,00 inches 0,030 - 0,035 - 0,045 - 1/16 3/32 - 1/8 - 5/32	Rods - length 1000 mm (Ø in mm)/36 inches (Ø in inches) - stamped with AWS and W.Nr. ref. - packed boxes or cardboard tubes - weight: 5 kg																								
SUBMERGED ARC		mm 1,60 - 2,00 - 2,40 - 3,20 - 4,00 inches 1/16 - 5/64 - 3/32 - 1/8 - 5/32	Metallic wire basket K415 - size: width 100 mm - outside diameter: 415 mm - inside diameter: 300 mm - weight: 25 kg Drum - wire diameter: 2,0 - 4,0 mm - height of drum: 850 mm - outside diameter: 660 mm - weight: 300 kg																								
CORE WIRE IN CUT LENGTHS OR IN COILS		mm 1,60 - 2,00 - 2,50 - 3,25 - 4,00 - 5,00 inches 1/16 - 5/64 - 3/32 - 1/8 5/32 - 3/16	Core wires in cut lengths - length 250 - 450 mm (9 - 18 inches) - packed in wooden crates sizes: - 800 - 1.000 kg, base 750x800 mm - height 500 mm - 500 - 650 kg, base 820x570 mm - height 580 mm Core wires in coils - size: internal diameter: 380 mm - weight: 500/800 kg																								

SUSTAINABILITY

BUILDING A LONG-LASTING FUTURE



"SUSTAINABILITY, A STRATEGIC ELEMENT OF RODACCIAI

Rodacciai has proudly established its three fundamental pillars, drawing inspiration also from the United Nations' 2030 Sustainable Development Goals (SDGs): people, planet, and performance. These cornerstones reflect the company's steadfast commitment to sustainability, social responsibility, and excellence.



PEOPLE



PLANET



PERFORMANCE

2030

At Rodacciai, creating a dynamic and empowering work environment full of talented individuals is our priority. Our mission is to inspire and engage professionals, fostering a culture where people are not only enticed to join us but also feel deeply motivated to stay and grow with the company for years to come.

Rodacciai considers environmental preservation to be a pillar of its production activities and an integral component of its ambitious growth objectives. Rodacciai also places strong emphasis on energy efficiency, viewing these efforts as pivotal to its decarbonization goals. This unwavering commitment reflects the company's determination to align its progress with sustainability at every level.

Rodacciai focuses on optimizing production processes and improving product quality to ensure sustainable progress and superior results. By integrating market signals, stakeholder feedback, and international development policies, the company strengthens its stability and business continuity while upholding responsible governance and ESG principles for ethical and sustainable growth.







PEOPLE

Rodacciai stands out as a virtuous example of social commitment and sustainability through a series of initiatives aimed at promoting the culture of merit, professional development, solidarity, and inclusion.

The company operates with a long-term vision, striving to create a positive impact for local communities, institutions, schools, and the most vulnerable sectors of society, using education, training, and cultural support as key tools for transformation.

One of the pillars of its commitment is the promotion of the culture of merit through the "Giuseppe Roda" Scholarships, rewarding the most deserving students from local schools and universities, with the aim of encouraging excellence in studies and fostering social empowerment. The scholarships are awarded at local institutions and non-profit organizations, strengthening the bond between the company and the territory.

The Rodacciai Academy and related initiatives, such as Academy Road PM in

collaboration with RoadJob, represent an important step forward in the professional (re)integration of unemployed and precarious youth. Thanks to qualifying training courses, qualification and requalification activities, and partnerships with local companies, schools, and universities, these projects support the future employment prospects of younger generations.

Rodacciai is also committed to promoting STEM disciplines and technical excellence. Through the HR Excellence project, internship activities, contests, and company visits are offered to students to bring them closer to technical professions and to encourage a corporate culture of excellence.

A notable initiative is the participation in the SlfaSTEM roundtable, aimed at overcoming gender prejudices in scientific and technological subjects and promoting leadership roles in STEM disciplines among female students.



In line with its commitment to innovation and sustainability, the company collaborated on projects such as the Innovation Day to stimulate a critical mindset in young people regarding the use of digital technologies.

Additionally, it supported the first Higher Technical Education and Training (IFTS) course in Italy focused on steel processing, facilitating the employment of trainees through apprenticeships.

The tangible economic support to communities during emergencies caused by natural disasters or similar situations also reflects Rodacciai's commitment to human values. This approach underlines that the company does not limit its efforts to its local context but extends its solidarity to broader realities, responding effectively and promptly to emerging needs.

At the same time, attention to employee well-being is a cornerstone of the company's philosophy.

The HEART and HEALTH initiative represents a concrete commitment to improving the quality of life of its personnel, offering cardiovascular health monitoring to employees over 45.

This is complemented by innovative policies, such as additions to the National Collective Labour Agreement (CCNL), ensuring the opportunity to take paid leaves for personal or family health reasons, proving genuine care for individual and family well-being.

In summary, Rodacciai's commitment to social sustainability is evident in its continuous investment in education, training, and inclusion, but, above all, in its consistent focus on people: fostering the growth and well-being of communities, as well as its own employees.

These initiatives not only reflect the company's values but represent also a model for a fairer, more innovative, and more supportive future.



PLANET

Rodacciai considers environmental conservation a fundamental pillar of its production activities and growth objectives.

The company is fully committed to continuously monitoring and evaluating its environmental impacts to devise innovative strategies that mitigate and reduce adverse effects. A key element of this approach is the responsible management of raw materials: by predominantly using steels sourced from scrap metal within its supply chain—scrap that can be re-melted without any loss of properties—Rodacciai is steadily reducing its reliance on virgin raw materials, whose extraction is highly impactful. **Waste management** is an integral part of the group's sustainability philosophy. In line with circular economy principles, Rodacciai has implemented projects aimed at the valorization, where permissible, of industrial by-products, thereby reducing the volume of waste destined for disposal.

These efforts reflect the company's ongoing commitment to improving and optimizing resources.

Water resource management plays a crucial role in Rodacciai's environmental strategy. The company diligently monitors water consumption and has equipped its facilities with closed-loop systems that incorporate purification and water recovery processes. Within regulatory and technological limits, it also preserves water consumption from the aqueduct, allocating groundwater for production purposes. Equally important is the attention given to controlling pollutant emissions. Through monitoring plans and the adoption of appropriate technological solutions, Rodacciai ensures that atmospheric emissions remain under control, guaranteeing that its operations comply with environmental standards and contribute to a healthier ecosystem.



Energy consumption is addressed with the same level of commitment.

The company focuses on both the nature and quantity of energy used, enhancing the efficiency of production processes and evaluating sourcing from renewable energy sources.

This commitment materializes through the technological modernization of facilities, the limitation of energy waste, and the optimization of operational processes, whose results are documented via an automated performance monitoring system. These measures culminate in the decarbonization plan with targets for 2030, guiding the company towards a reduced environmental impact linked to its production processes.

These integrated initiatives in the management of raw materials, water, waste, emissions, and energy not only improve operational resilience but also underscore Rodacciai's commitment to environmental stewardship and sustainable growth.





PERFORMANCES

Rodacciai is deeply committed to the optimization of production processes and the enhancement of product quality, ensuring sustainable progress and superior results across all operations.

These principles, coupled with the incorporation of market signals, stakeholder feedback, and adherence to international development policies, are essential to ensuring business continuity and strengthening the company's stability.

This comprehensive approach reflects Rodacciai's dedication to responsible governance and alignment with Environmental, Social, and Governance (ESG) standards, reinforcing its commitment to sustainable growth and ethical business

practices. To support these goals, the company places a strong emphasis on strategic business planning, including the development of comprehensive multi-year growth plans. These plans serve as a roadmap for achieving long-term objectives while adapting to evolving market conditions and global trends.

Rodacciai also prioritizes the measurement and monitoring of its performance through the implementation of Key Performance Indicators (KPIs).

This system enables the company to track progress, ensure transparency, and drive continuous improvement across all areas of its operations, further reinforcing its role as a leader in sustainable and resilient business practices.



The information contained in this brochure is indicative and not binding, Rodacciai reserves the right to change the specifications of the products described at any time. Rodacciai is not responsible for the data in this brochure.

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