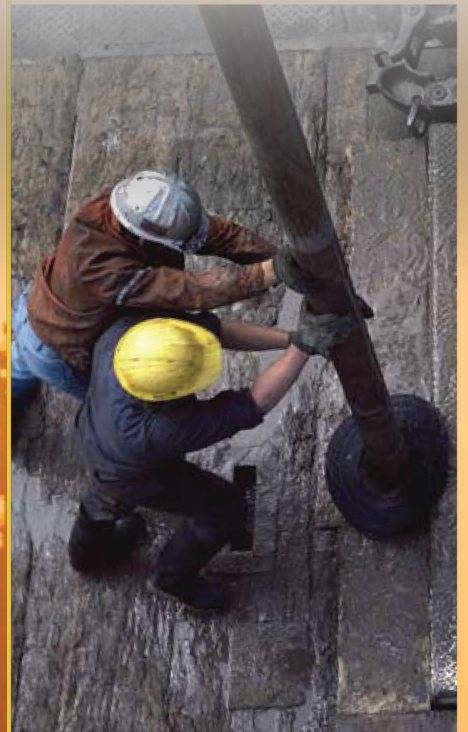




ZAPP



**ENGINEERED
MATERIALS FOR
TOUGH ENVIRONMENTS**

**PROVIDING HIGH - PERFORMANCE MATERIAL
FOR OIL & GAS APPLICATION**

Nicro[®]100

is a new high nitrogen alloyed tool steel which exhibits superior corrosion resistance combined with high toughness even at hardness up to 60 HRC

It is produced combining PESR-Process (Pressurized Electric Slag Remelting) with a smart forging technology.

The combination of these two processes give to the steel an amazing increase in cleanliness and structure, which means a very fine and homogenous microstructure.

Primary advantage are excellent machinability and polishability as well as a high dimensional stability after heat treatment.

The use of nitrogen, in partial replacement of carbon, gives a higher resistance to corrosion and wear compared to other stainless steels for cold work produced with conventional methods.

NICRO 100 is the high end solution for tools facing high static and dynamical load under a high corrosive environment at higher temperatures.

Compared to standard tool steels like: 1.2316, 1.2083, 1.4112, 1.4125, 1.4301, 1.4034, 1.2363 e 1.4528, NICRO 100 exhibits higher corrosion resistance and toughness as well as a higher tempering resistance up to 500 °C still at a hardness of 58-60 HRC

Physical Properties

Modulus of Elasticity	214 GPa
Density	7,72 g/cm ³
Thermal Conductivity	14 W/m ² K

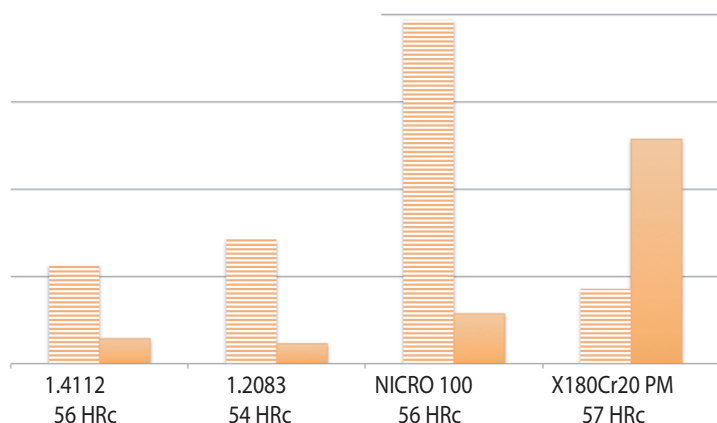
Advantages / Benefits

- _corrosion resistance
- _high toughness
- _excellent machinability
- _dimensional stability after heat treatment
- _excellent polishing
- _resistance to static and dynamic stresses
- _good wear resistance
- _tempering resistance up to 500 ° C

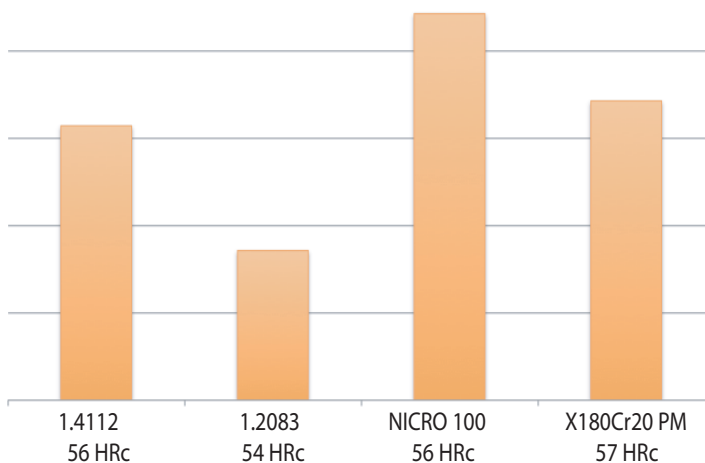
Chemical Composition

Carbon	0,25 - 0,35 %
Silicon	0 - 1,00 %
Manganese	0 - 1,00 %
Chromium	14,0 - 16,0 %
Nitrogen	0,30 - 0,50 %
Nickel	0 - 0,5 %
Molybdenum	0,85 - 1,10 %

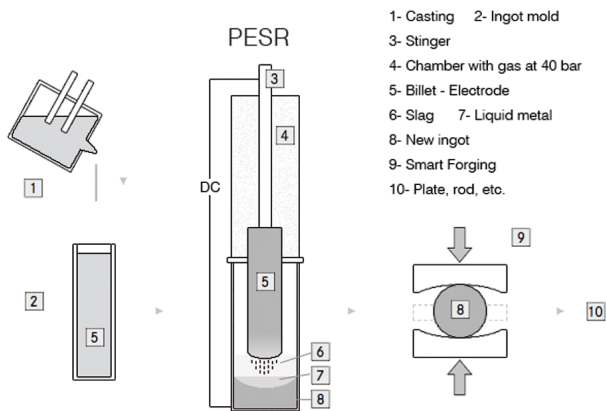
TOUGHNESS WEAR RESISTANCE



CORROSION RESISTANCE



Production Process



High nitrogen alloyed matrix tool steels have high mechanical properties and corrosion resistance.

Special processes are required to obtain these proprieties.

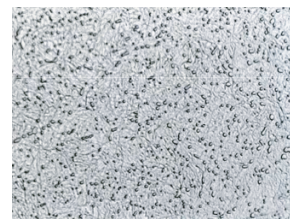
For this reason, for the steel NICRO 100 a particular remelting system called PESR (Pressure Electro Slag remelting) is used to increase the nitrogen content beyond the solubility limits.

The material is then forged by the use of a hammer optimized in shape, that allowing the forging energy to spread efficiently, even in depth.

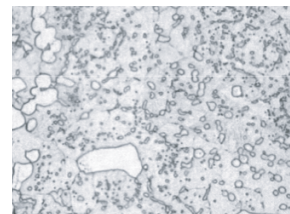
The combination of the two processes create high purity steel with a homogeneous and fine grain microstructure.

PHARMACEUTICAL
PACKAGING
OFF SHORE
MEDICAL
PLASTIC
FOOD

structure (1000x)



NICRO 100



1.4112



The new high quality line (*) of Copper Beryllium born to garant the maximum structural homogeneity and purity in composition.

Formaplast 105 has optimal mechanical characteristics, high thermal conductivity, excellent wear , corrosion and bonding resistance . Furthermore it has excellent polishability, high mechanic fatigue resistance as well as amagnetic properties.

Particular characteristics of this alloy make it very flexible and usefull in many usages and different industrial sectors as: Injection plastic mould, Oil&gas, aeronautic /aerospace, marine, electronic and mechanical.

Chemical Composition

Beryllium	1,6 ÷ 2,0 %
Cobalt + Nichel	min 0,2 %
Cobalt + Nichel + Iron	max 0,6 %
Copper	Balance

Typical Mechanical Properties

	reference values	
Hardness	36÷42	Hrc
Hardness	340÷390	HB
Tensile Strenght	1140÷1380	N/mm ²
Yeld strenght 0,2%	970÷1200	N/mm ²
Elongation A5	3-10	%
Elastic Modulus	131	Gpa

Advantages / Benefits

Due to the unique combination of thermal conductivity and strength available in these copper mold alloys, you gain advantages like:

- Shorter cycle time
- Improved plastic part dimensional control
- Better parting line maintenance
- Excellent corrosion resistance

Physical Properties

	reference values	
Elettric Conductivity	min 25	%IACS
Elettric Conductivity	min 18	m/Ω mm ²
Thermal Conductivity 20 °C	130	W/m °K
Thermal Conductivity 100°C	155	W/m °K
Coeff. Thermal Expansion	17,5	ppm/°C
Specific Heat <small>(Heat Capacity)</small> 100°C	440	J/kg°K
Melting points	870-980	°C
Density	8,36	g/cm ³

The complete line

at 20°C

FormaPlast	105	106	W/m°K
FormaPlast	105 ^{LH}	130	W/m°K
FormaPlast	160	160	W/m°K
FormaPlast	200	217	W/m°K
FormaPlast	240	208	W/m°K
FormaPlast	340	337	W/m°K

Formaplast 160 is an alloy with an excellent combination of thermal conductivity hardness and mechanical resistance. Suitable especially for blow molds, injection and extrusion plastics where is needed an high thermal exchange, mechanical resistance to compression and wear resistance.

Chemical Composition

Nichel	6,5 ÷ 7,5 %
Silicon	1,5 ÷ 2,5 %
Chrome	0,6 ÷ 1,2 %
Copper	Balance

Typical Mechanical Properties

reference values

Hardness	24 ÷ 30	Hrc
Hardness	250 ÷ 290	HB
Tensile Strenght	860	N/mm ²
Yeld strenght 0,2%	725	N/mm ²
Elongation A5	7	%
Elastic Modulus	130	Gpa

Advantages / Benefits

Plastic injection mold inserts
Inserts for blow molds
Plastics processing
Slips
Bearings

Physical Properties

reference values

Elettric Conductivity	min 25	%IACS
Elettric Conductivity	min 18	m/Ω mm ²
Thermal Conductivity 20 °C	130	W/m °K
Thermal Conductivity 100°C	160	W/m °K
Coeff. Thermal Expansion	17,5	ppm/°C
Specific Heat <small>(Heat Capacity)</small> 100°C	410	J/kg°K
Melting points	870-980	°C
Density	8,70	g/cm ³

The complete line

at 20°C

FormaPlast	105	106	W/m°K
FormaPlast	105 ^{LH}	130	W/m°K
FormaPlast	160	130	W/m°K
FormaPlast	200	217	W/m°K
FormaPlast	240	208	W/m°K
FormaPlast	340	337	W/m°K

FormaPlast®

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www.rsalloys.eu
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dalla RS Acciai
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UNIQUE PROPERTY COMBINATIONS MAKE TOUGHMET® 3 AND BRUSH® ALLOY 25 the alloys of choice in the oil and gas industry.

Ideal for instrument housings, bearings, couplings and actuator stems, ToughMet 3 and Brush Alloy 25 extend the reach and accuracy of drilling tools and increase the reliability of well control, completion and production.



TOUGHMET 3

ToughMet 3 copper nickel tin alloy is engineered to provide attributes beyond those typically found in high-strength copper alloys, especially in the high temperature, high pressure regime.

ToughMet 3 material retains its strength at elevated temperatures and resists most sour environments. Some tempers of ToughMet 3 combine high levels of fracture toughness with strength.

Advantages:

- High strength
- Lower friction
- Non-magnetic
- Anti-galling
- Corrosion, erosion and wear resistance
- Excellent machinability

BRUSH ALLOY 25

Brush Alloy 25 is a high-strength copper beryllium alloy that can be age hardened to property combinations tailored for individual application requirements.

Brush Alloy 25 offers high material strength even in large cross sections and the best thermal and electrical conductivity capability available in a high-strength material.

Advantages:

- High fatigue strength
- High strength
- Anti-galling
- Non-magnetic
- Corrosion resistance
- High hardness
- Resiliency
- Thermal and electrical conductivity
- Excellent machinability



PHYSICAL PROPERTIES

	Density lbs/in ³	Elastic Modulus 10 ⁶ psi	Relative Magnetic Permeability	Thermal Conductivity (Room Temp.) BTU/ft hr °F	Poisson's Ratio	Nominal Composition
ToughMet 3	0.325	21	<1.001	22	0.32	Cu – 15 Ni – 8 Sn
Brush Alloy 25	0.302	19	<1.001	60	0.3	Cu – 1.9 Be – 0.2 Co

Properties are specified for the fully heat treated condition

MINIMUM MECHANICAL PROPERTIES*

	Tensile Strength (ksi)	Yield Strength (ksi)	Elongation in 2" (%)	Hardness
ToughMet 3 CX105	99	94.5	4	HRC 27
ToughMet 3 AT110	125	110	6	HRC 30
ToughMet 3 TS150	158	150	5	HRC 36
ToughMet 3 TS160U	160	150	3	HRC 34
Brush Alloy 25 AT	165	130	3	HRC 36
Brush Alloy 25 HT	165	130	2	HRC 36
Brush Alloy 25 AT/HT Oilfield	155	140	6	HRC 36

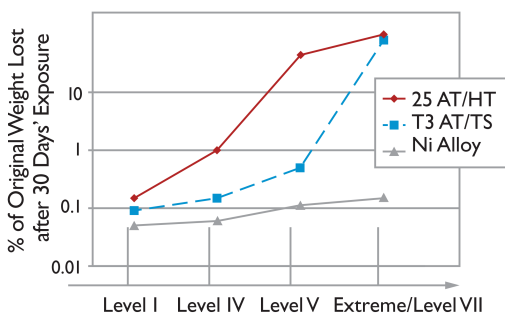
IMPROVED TOUGHNESS TEMPERS*

	Tensile Strength (ksi)	Yield Strength (ksi)	Elongation in 2" (%)	Hardness	CVN ft-lbs
Brush Alloy 25 DSTO-1	140	110	10	HRC 26	11 avg**
Brush Alloy 25 DSTO-2	135	100	12	HRC 26	11 avg**
ToughMet 3 TS120U	120	110	15	HRC 24	12 min
ToughMet 3 TS95	106	95	18	HRB 97	30 avg (24 min)

*Properties combinations cited are minimums. Contact Materion for corresponding dimensional capability.

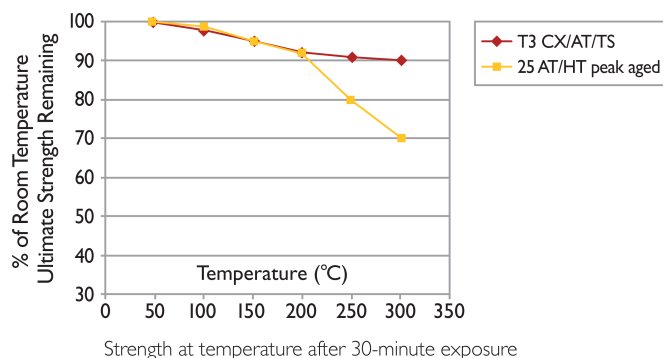
**Reported but not considered a requirement for material acceptance.

CORROSION RESISTANCE

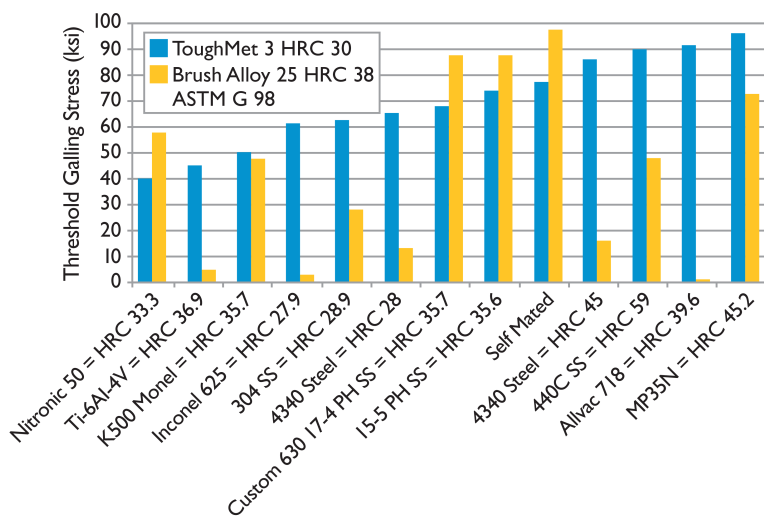


General corrosion rates in NACE standard environments

TEMPERATURE RESISTANCE



GALLING RESISTANCE

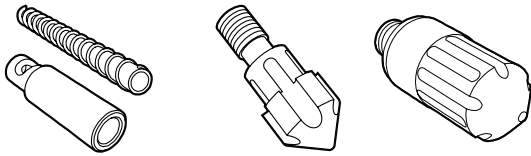


TOOL ALLOYS

DATA SHEET CPM® 420 V

CERTIFIED TO ISO 9001

ZAPP



CHEMICAL COMPOSITION

Carbon	2.30 %
Chromium	14.00 %
Vanadium	9.00 %
Molybdenum	1.30 %
Manganese	0.50 %
Silicon	0.50 %

CPM® 420 V

is a newly developed highly corrosion resistant tool steel produced by the special Crucible Particle Metallurgy Process. CPM® 420 V is a martensitic stainless steel, which contains a large constituent volume of extremely small and finely dispersed particles of highly wear-resistant vanadium carbide. CPM® 420 V combines the effectual properties of stainless steel with the high wear resistance of tool steels. The material is well suited for applications which demand corrosion resistance, whilst also affording a high level of wear resistance.

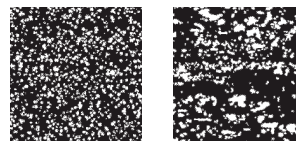
TYPICAL APPLICATIONS

- _ use in the food and plastic industry
- _ chemical processing industry
- _ fields of pumping systems
- _ rubber processing
- _ palletizing tools
- _ bearings, bearing shells
- _ valves, shafts, rollers

PHYSICAL PROPERTIES

Modulus of elasticity E [kN/mm²]	215
Specific weight [kg/dm³]	7.4
Thermal conductivity at 65 °C [W/mk]	17.3
Coefficient of thermal expansion over temperature range of [mm/mm °C]	
20 - 200 °C	11.0×10^{-6}
20 - 315 °C	11.5×10^{-6}

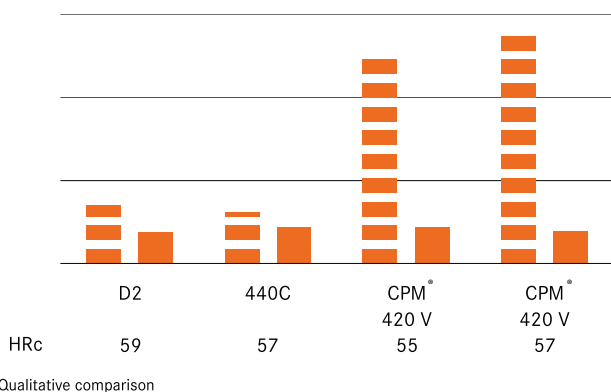
POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE



The uniform distribution of carbides in the powder-metallurgical structure compared to conventional tool steels with big carbides and carbide clusters.

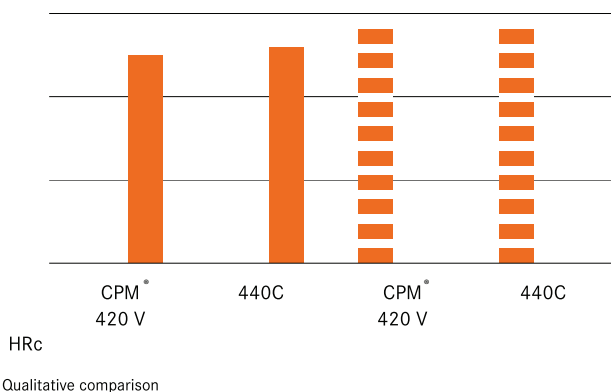
TOUGHNESS / ABRASIVE WEAR RESISTANCE

■ Charpy C-Notch impact test ▨ Abrasive wear resistance



CORROSION RESISTANCE

■ Number of corrosion spots per sq. inch for 5 % NaCl, 5% HNO₃ + 1 % HCl, T = 25 °C
T. = 35 °C ▨ Material loss in mm/month

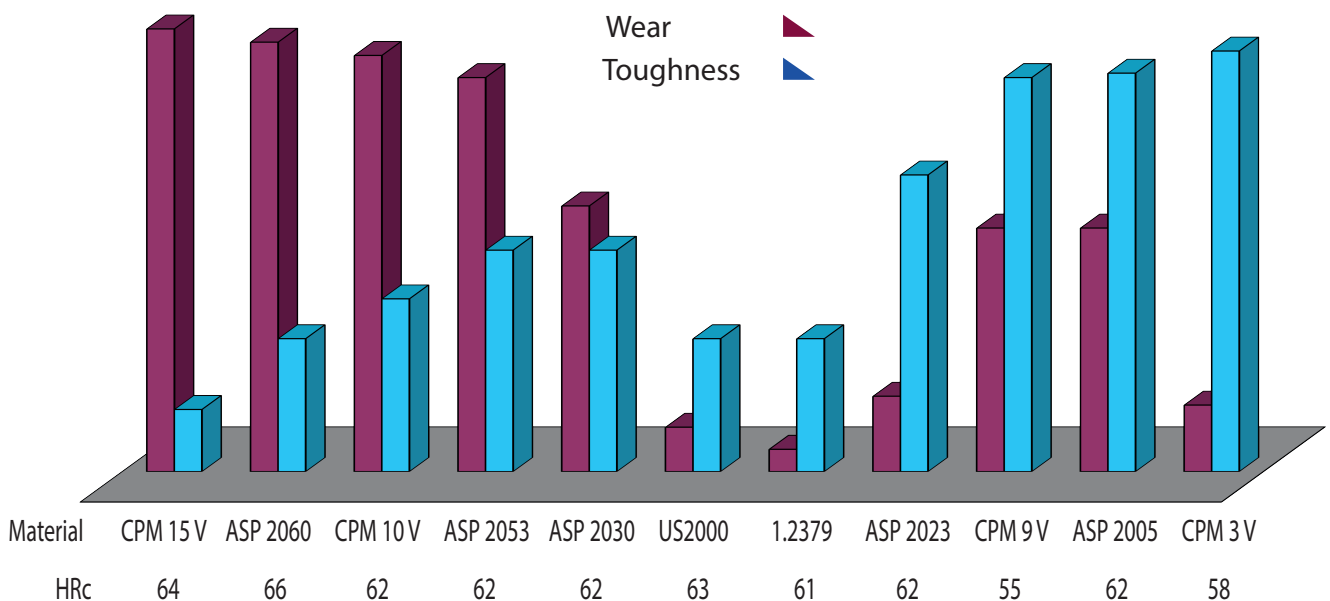


POWDER METALLURGICAL STEELS

<i>Crucible CPM</i>	C	Mn	Cr	Mo	Si	W	Co	V	Total
CPM 1V	0,55		4,50	2,75		2,15		1,00	10,95 %
CPM 3V	0,80		7,50	1,30				2,75	12,35 %
CPM 9V	1,78	0,50	5,25	1,30	0,90			9,00	18,73 %
CPM 10V	2,45	0,50	5,25	1,30	0,90			9,75	20,15 %
CPM 15V	3,40	0,50	5,25	1,30	0,90			14,50	25,85 %
CPM REX M4	1,40	0,30	4,00	5,25	0,55	5,50		4,00	21,00 %
CPM REX T15	1,60	0,30	4,00		0,30	12,00	5,00	4,90	28,10 %
CPM REX 76	1,50		3,75	5,25		10,00	9,00	3,10	32,60 %
CPM REX 121	3,40		4,00	5,00		10,00	9,00	9,50	40,90 %

<i>Crucible CPM</i>	C		Cr	Mo	Nb			V	Total
CPM S 30V	1,45		14,00	2,00				4,00	21,45 %
CPM S 35V	1,40		14,00	2,00	0,50			3,00	20,90 %
CPM 154	1,05		14,00	4,00					19,05 %
CPM 420V / S 90 V	2,30		14,00	1,00				9,00	26,30 %
SUPRACOR	3,75		24,50	3,10				9,00	40,35 %

<i>Erasteel ASP2000</i>	C	Mn	Cr	Mo	Si	W	Co	V	Total
ASP2005	1,50		4,00	2,50		2,50		4,00	14,50 %
ASP2012	0,60	0,3	4,00	2,00	1,0	2,10		1,50	11,50 %
ASP2023	1,28		4,10	5,00		6,40		3,10	19,88 %
ASP2030	1,28		4,10	5,00		6,40	8,50	3,10	19,88 %
ASP2053	2,48		4,20	3,10		4,20		8,00	21,98 %
ASP2060	2,30		4,00	7,00		6,50	10,50	6,50	36,80 %
ASP2080	2,45		4,00	5,00		11,00	16,00	6,30	44,75 %





Kenotherm Srl was founded in 1982 and offers its 35 years of experience, study and research, through customized heat treatment cycles: the attention to the needs of the customer to enhance the materials and technical solutions.

Kenotherm Srl entered the RS Alloys Group in September 2016

Certification and Traceability



The true original imprinting, impossible to fake

Certification is the one and only way to guarantee the real originality of our entire range of products. This document only is a proof of the absolute purchase genuinity.

Unfortunately we often see false certification and several materials using our brand illegally. At this purpose, to avoid this risk, we created the system safety certificate to apply for all our goods , that will allow us to guarantee the absolute confidentiality and protection of certificates.

For this reason, we invite you to check and always require SSC certification, that will be issued along with delivery note, instructions or QR-Code that will address you to your own certificate.

The display of the documentation is available through the QR CODE on our System Safety Certificate on the website www.systemsafetycertificate.eu



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Copper alloys



FORMAPLAST™

High thermal and electric conductivity alloys, with or without beryllium, to optimize productive cycles in plastic moulds, in packaging and in automatic machines.

Aluminum - Bronze



TOUGHMET™

Bronze born to increase the life of mechanical components lowering maintenance costs; excellent mechanical characteristics, low friction coefficient and high resistance to corrosive environments.



FORMAL™

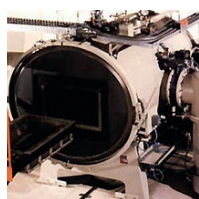
Range of aluminum bronze for cold forming, bearings, rolls, gears and sliding components.

Heat treatments



Since 1982 it is solely dedicated to vacuum heat treatment. Ideal partner to solve problems related to heat treatment. Horizontal vacuum furnaces with gas shut off, pressurizable and able to reach high speeds of cooling.

Automatic and repeatable cycles with extreme precision and reliability.



Hardening on high speed steels
Hardening on self tempering steels
Tempering and annealing
Normalizing and stress relieving
Solubilization and aging
Hardening on martensitic inox steels

Solubilization inox steels
Treatments on super alloys
Copper alloys aging
Magnetic annealing
Cryogenic treatment
Localized tempering

Coatings

Dia-Teck®

Cromo - Teck®

The definitive solution on coating process

Polishing

Our service of mechanical polishing ensures uniformity and flatness, increase the level of rust resistance reducing "pitting" effect. It makes the ideal surface for coatings

Certificates

S.S.C.®

System Safety Certificate

Our unique and patented system of online certification absolute guarantee on the originality of our products