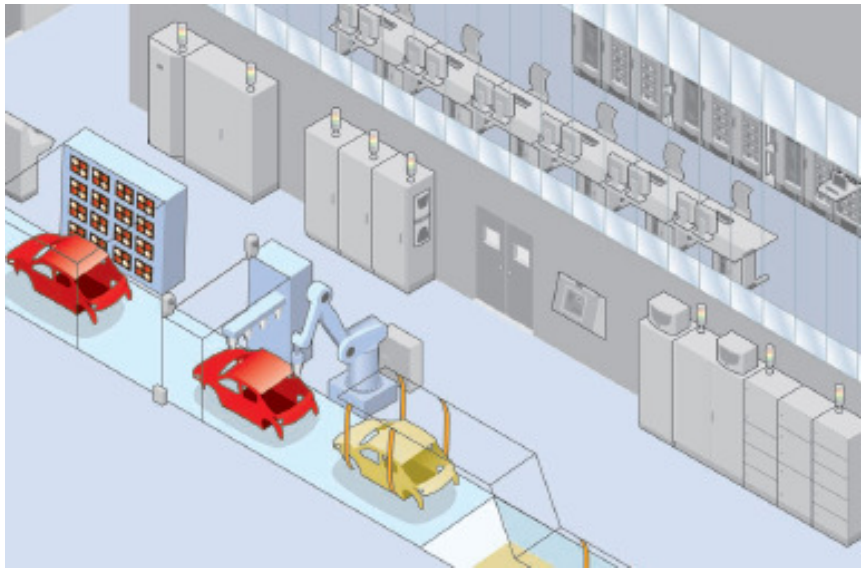
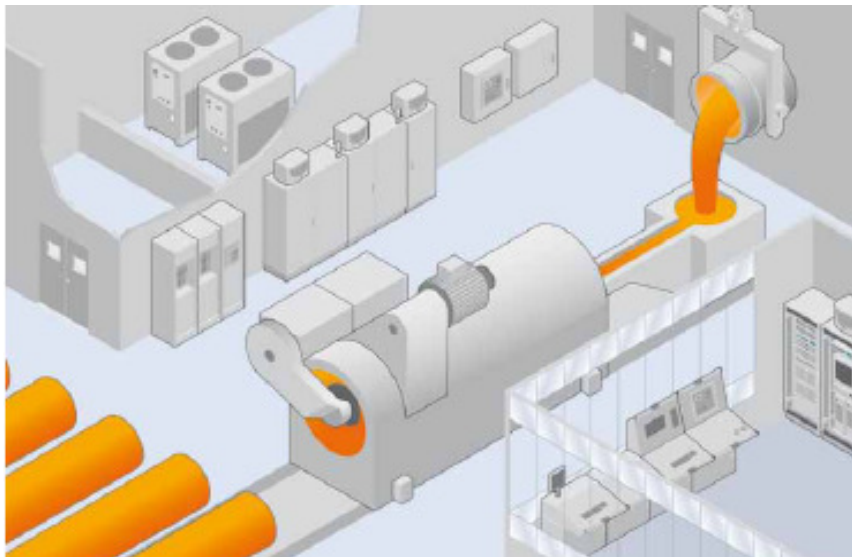
innovative
enclosure solutions
for industrial & electronic
applications

General details and comparison of steels

General details

Enclosures for Automation and LV Energy distribution have to work in a specific environment and to comply with the conditions listed into **EN 61439-1** and **EN 60204-1** specifications (in terms of temperatures, humidity, UV rays, atmospheric agents, corrosive elements, electromagnetic sources, vibrations, further mechanical stresses, etc…)





Iron-based alloys

Basic metal = main element (Fe)

Secondary elements = they contribute to determine the different features of the alloys (C or Ni..)

Steel = specific name provided to the alloy consisting of iron and carbon (this latest one is present in a percentage not higher than 2,11%)

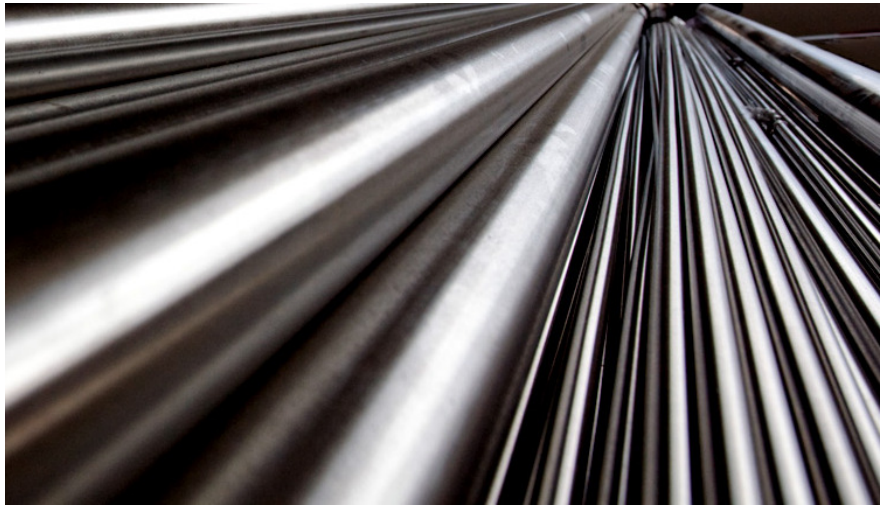
Different types of steel

Steel materials are divided into 3 families:

Carbon steel (ordinary steel – iron alloy steel)
When none of the elements present in the composition is higher than the percentages specified in table 1 of UNI EN 10020.

Stainless steel
When chromium percentage is at least 10,5% and carbon percentage is 1,2% as maximum.

Further alloyed steel or micro-alloyed steel
When at least one chemical element of the composition is higher than or equal to the quantities indicated in table 1 of UNI EN 10020 and they do not correspond to stainless steel.



Extra mild: 0,05% < C < 0,15%
Semi-mild: 0,15% < C < 0,25%
Mild: 0,25% < C < 0,40%
Semi-hard: 0,40% < C < 0,46%
Hard: 0,60% < C < 0,70%
Very hard: 0,70% < C < 0,80%
Extra hard: 0,80% < C < 0,85%

C= carbon

UNI EN 10020 – Table 1

Carbon steel vs. alloyed steel_Ladle Analysis

Element		Limit percentage of mass
Al	Aluminium	0,30
B	Boron	0,0008
Bi	Bismuth	0,10
Co	Cobalt	0,30
Cr	Chromium	0,30
Cu	Copper	0,40
La	Lanthanide *	0,10
Mn	Manganese *	1,65
Mo	Molybdenum *	0,08
Nb	Niobium *	0,06
Ni	Nickel *	0,30
Pb	Lead *	0,40
Se	Selenium *	0,10
Si	Silicium *	0,60
Te	Tellurium *	0,10
Ti	Titanium *	0,05
V	Vanadium *	0,10
W	Tungsten *	0,30
Zr	Zirconium *	0,05
Further elements	Except for: carbon, phosphorus, sulphur, nitrogen *	0,10
* Considered as single ones		

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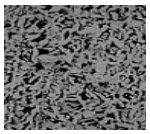
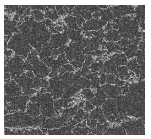
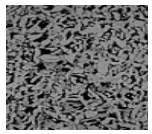
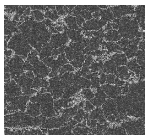
Ordinary vs. Micro alloyed steel

Quantitative Features

	Ordinary steel with low percentage of carbon for cold-working  Areta structure – 15/10 thickness	High yield strength micro alloyed structural steel (HSLA - High Strength Low Alloy) for cold-working  E NUX structure – 12/10 thickness
Denomination	DC01	HC260LA
Standard	EN 10130	EN 10268
Chemical composition		
Mn % max	0,60	0,60
P % max	0,045	0,025
Si % max	0,00	0,50
S % max	0,045	0,025
*** Ti % max	0,00	0,15
Yield max	R_e N/mm² 280	$R_{p0,2}$ N/mm² 330
Breaking point min - max	R_m N/mm² 270 – 410	R_m N/mm² 350 - 430
*** Element which is determining a higher breaking point (and, as a consequence, the resistance of the material)		

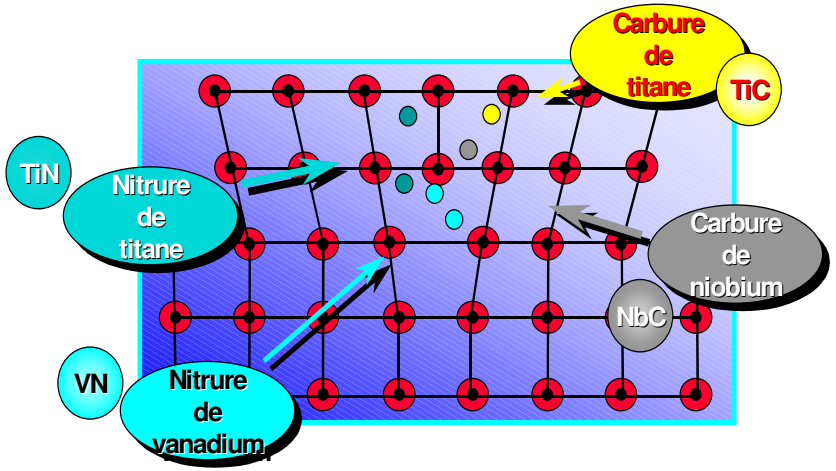
Ordinary vs. Micro alloyed steel

Qualitative Features

	Ordinary steel with low percentage of carbon for cold-working Areta structure 	High yield strength micro alloyed structural steel (HSLA - High Strength Low Alloy) for cold-working E NUX structure 
Features	The mild steel with low percentage of carbon C is suitable for all the types of cold-working (punching, folding) and thermal-mechanical treatments (moulding, welding, pickling). Its hardness is due to an higher content of carbon. Further properties such as toughness, wear resistance, indeformability to thermal treatment, hardening penetration, cutting capability, etc. are provided by further elements added in solution.	This steel is featured by optimal mechanical properties such as resistance to tensile stress and to fatigue stress; if offers good weldability and possibility to galvanizing. Its specific features allow for a reduction of thickness and weight in uses. It is featured by a minimum value of yield, so higher yield point and higher tensile strength than ordinary steel. Due to its properties, it's especially suitable for structures subject to fatigue and - being featured by a high yield point as raw material already - for bended/profiled items.

Micro alloyed steel

Hardening of high yield strength micro-alloyed structural steels (HSLA = High Strength Low Alloy) is achieved by grain refining and the formation of a high number of fine precipitates, which allows very high yield strength to be obtained while maintaining good weldability and a low ductile-brittle transition temperature. Moreover, these steels are characterized by a high R_e/R_m ratio, good formability, high ductile fracture energy and are suitable for structures subject to shock, efforts or stress.



Micro alloyed steel & automotive

HC260LA steel used for E NUX structure →

As a matter of fact, HC260LA sheet steel (EN10268) is included in the specifications of many car producers:

- it has optimal mechanical features
- it allows for the reduction of the thickness without modifying the mechanical features
- it ensures a minimum yield point (as raw material already)
- it is suitable for stuctures stressed by shock or efforts

HLSA - Quality standards linked to the specifications of automotive brands used to identify the same steel HC260LA (used by E.T.A. for E NUX structure)					
EN 10268	FIAT 52811	PSA B53 3312	RENAULT 11-04-002	SEW 093	BMW GS 93005-9
HC260LA	FE E 270 F	E275D	XE 280 D	ZStE 260	HC260LA

Thanks for your attention

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