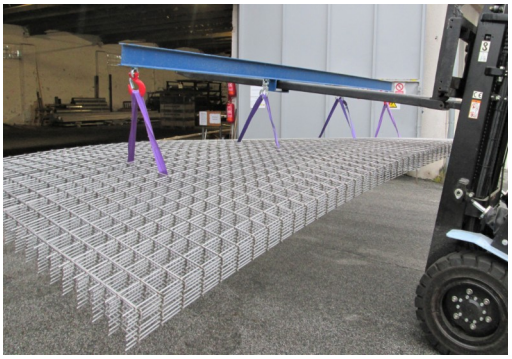
Concrete stainless reinforcement RebarPROFI

Holds - does not rust - saves



Advantages

- minimal future maintenance and thus no repair costs
- frequent traffic restrictions due to repairs are not needed
- stainless steel reinforcement allows to reduce the thickness of the concrete, which significantly reduces the weight of the structure (prefabricated parts significantly reduce transport costs and the amount of concrete used)
- since the mechanical properties of stainless steel are better than carbon steel, smaller reinforcement diameters can be used, which significantly reduces the overall weight of the reinforcement
- the use of smaller diameters and a reduced concrete cover results in a lighter structure, with significant financial savings, e.g. in earthworks (e.g. the diameter of the tunnel tube is reduced and less soil is excavated)
- There are many reasons to behave sensibly. In construction, the main one is the durability of buildings. For concrete buildings, durability is closely linked to the durability of the reinforcement used. The durability of the reinforcement lies primarily in its resistance to corrosion. And this applies not only in exposed conditions.

Examples of applications:

- bridges
- highways
- tunnels
- metro
- waterworks

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- parking lots
- embankment buildings
- thin-walled structures, prefabricated components
- construction resistant to fire, temperature changes, etc.
- buildings where non-magneticity is required (airports, hospitals, banks)

There is a wide range available:

- bars diameter 3 - 50 mm
- coils diameter 3 - 20 mm
- ribed bar mashes diameter 3 – 12 mm
- bent reinforcement according to drawing documentation

Products and grades are standardized according to:

- XP A 35-014 (InE 235 - InE 500 - InE 650 a IN E800)
- BS 6744
- ASTM A 955M

Causes of crack formation:

Crack formation is a fundamental problem encountered in reinforced concrete. In almost all cases, cracks form as a result of accidental corrosion of the metal reinforcement.
The cost of repairs accounts for a large proportion of the total annual expenditure in the construction industry. The use of stainless steel reinforcement significantly increases the life of structures and eliminates repair costs.

Weldability:

All types of welding processes for reinforcements are suitable for RebarPROFI stainless steels (butt welding, friction welding, resistance welding, MIG welding with solid wire, arc welding with plated electrode, etc.)

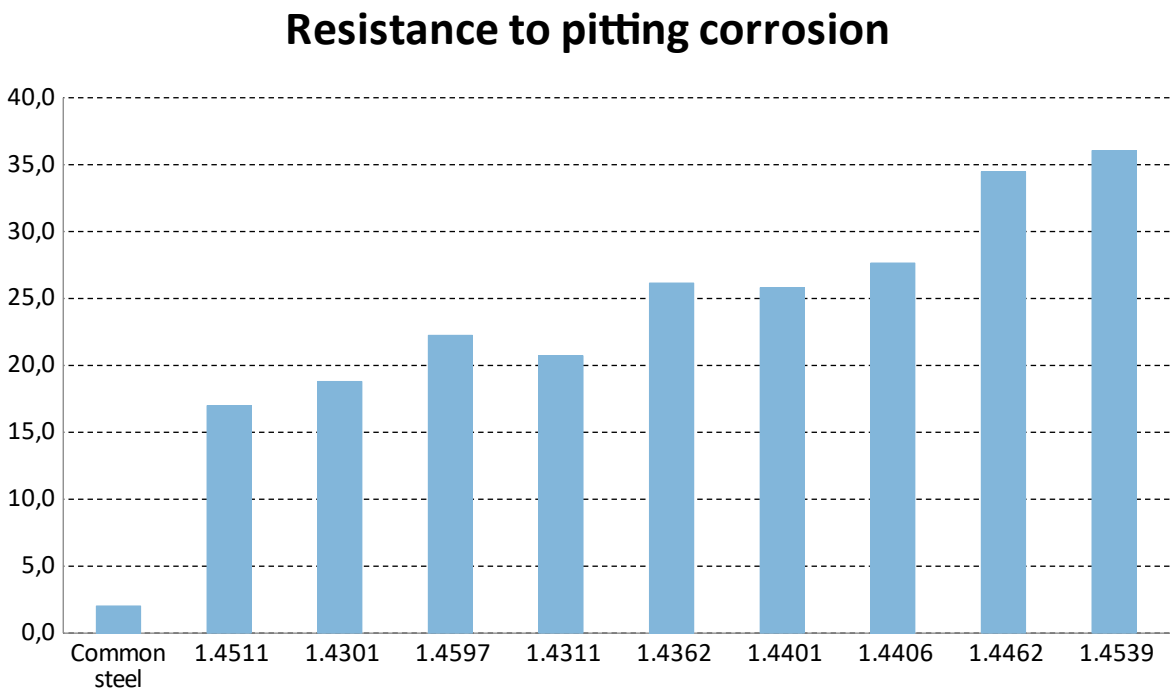
Corrosion resistance:

- corrosion resistance in concrete is 5 to 10 times higher than in ordinary steel
- the limiting chloride content at which corrosion starts in concrete is 0,1 to 0,4 % by weight of concrete for mild steel, for austenitic stainless steel this content may be 1 to 3 %

Comparison of environmental resistance:

It is measured by the so-called pitting index, i.e. the index of resistance to pitting corrosion (according to English practice - PREN - Pitting Resistance Equivalence Number):

PREN = % chromium content + 3.3x molybdenum content + 16x nitrogen content



This, of course, corresponds to the lifetime of the reinforcement in years. It is stated that the service life of carbon steel in normal conditions can be guaranteed in the order of about 20 years depending on the specific conditions, in the case of stainless steel reinforcement it is hundreds of years. These figures are of course matched by the additional costs for inspections, maintenance, repairs, replacements, etc.

The service life is only one of the important parameters of the reinforcement. Another key parameter is the mechanical values. However, stainless steel reinforcement has the edge in this category as well:

- stainless steel reinforcement allows to realise conditions with less concrete thickness while ensuring the same resulting mechanical parameters. Less concrete, less weight, lower transport costs
- stainless steel reinforcement allows the use of a smaller diameter of reinforcement or fewer bars required while maintaining the same parameters - cost savings

These advantages and savings will amply cover the slightly increased cost of constructing structures using stainless steel reinforcement instead of conventional carbon steel reinforcement. It is reported that the increase in total construction

costs when using stainless steel reinforcement is between 1% and 3%. Stainless steel reinforcement is therefore very efficient.

Comparison of mechanical properties:

	Carbon steel	Ferritic	Austenitic-Ferritic	Austenitic	Austenitic with molybdenum
		1.4511	1.4062 1.4362 1.4462	1.4301 1.4311	1.4401 1.4406 1.4436 1.4571 1.4539
Rp0,2 [MPa]	500/650	500	550/600/650 (acc. Ø)	500	500
Linear expansion (20°C-100°C) [10-6K-1]	10	10	13	16	16
Thermal conductivity [Wm-1K-1]	40	25	15	15	15
Electrical resistance [μW.cm]	18-20	60	80	73-75	73-75
Modulus of elasticity (at 20°C) [GPa]	206	220	200	193-196	193-196
Magnetic	yes	yes	yes	no	no

A wide range of applications with many advantages:

- seismic resistance - concrete with stainless steel reinforcement meets the requirements for seismic resistance according to Eurocode 8, class M
- impact resistance - thanks to its mechanical properties, the stainless steel reinforcement gives the concrete excellent impact resistance
- improves fire resistance - stainless steel reinforcement increases fire resistance at higher temperatures due to its mechanical properties
- non-magnetic - some grades of stainless steel reinforcement are non-magnetic and allow use in areas that require this property - hospitals, airports, etc.
- Other advantages - excellent low temperature properties, low thermal conductivity, easy to use (compared to galvanised or coated carbon steel bars)

Stainless steel reinforcement grades and applications:

The use of different grades of stainless steel reinforcement according to the construction classes defined in Eurocode 2 (EN 206-1):

X0	-	no risk of corrosion or distortion
XA	-	chemical infestation
XC	-	corrosion caused by carbonation of concrete
XD	-	corrosion induced by chlorides other than those originating in seawater
XS	-	chloride-induced corrosion originating in seawater
XF	-	corrosion caused by repeated freezing and thawing

Recommended grades:

Type	Grade (EN 10088)	Equivalent (for the USA market)	Recommended construction classes	Density [kg.dm-3]
Basic	1.4062	S32202	XC, XD1, XD2	7,7
(DUPLEX)	1.4362	S32304	XD3, XS1, XF1, XF2, XA1	7,8
	1.4462	S32205/S31804	XS2, XS3, XF3, XF4, XA2, XA3	7,8
Basic (traditional)	1.4301	304	XC2, XC3, XC4	7,9
	1.4311	304LN	XD1, XD2	7,9
	1.4401	316	XD3, XS1, XS2, XF, XA	8,0
	1.4406	316LN	XS3, XF, XA	8,0
Special	1.4511	430LNb	X0, XC1	7,7
	1.4597	204Cu	X0, XC	8,0

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1.4571	316Ti	XD, XS, XF, XA	8,0
1.4539	904L	XS, XA3	8,0
1.4436	316Mo	XS3, XF, XA	8,0

Excellent stock availability of traditional and especially modern duplex grades - cheaper and with better mechanical properties.

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