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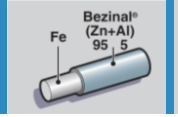
Bezinal®2000 for welded mesh

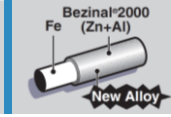
Presentation

Bekaert Singapore
Andrew Marshall

.20./.4./2011

Confidentiality





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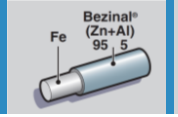
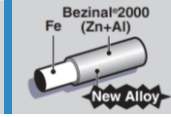
Content





Bezinal® and Bezinal®2000…

- Definition
- Coating properties
- Corrosion properties

... for welded panels

Corrosion of welds

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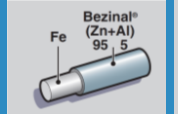
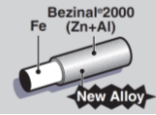
Bezinal® and Bezinal®2000 - Definition





Galfan® – Bezinal® (BEkaert ZINc ALuminium)

Galfan® coated products have established proven advantages over conventional galvanized and other hot-dip metallic coatings during the past 20 years.

Galfan® was developed in 1980 by researchers at Centre de Recherches Métallurgiques, Liège, Belgium, under sponsorship of International Lead Zinc Research Organization Inc.

Galfan® is a Zn95/Al5 coating with an eutectic composition and a melting temperature of 382°C. ILZRO patented the generic Galfan® coating.

NV Bekaert paid licensee to introduce Galfan® in its markets and improved the quality of the coating. Bezinal® was born.

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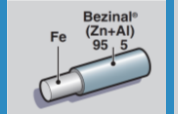
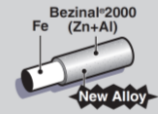
Bezinal® and Bezinal®2000 - Definition





Bezinal®

Bezinal® is an improved version of the Galfan® coating and consequently also is a Zn95/Al5 coating with specific Bekaert knowhow.

Bekaert knowhow concerns processing parameters:

- Wire preparation is a crucial parameter for adhesion of the coating
- Temperature control is critical for the optimal microstructure

Adhesion, microstructure, centricity, alloy layer… these are all parameters with a significant impact on corrosion performance.

Bezinal®2000

Bekaert mission is to be a technological leader in its two core competences: advanced metal transformation and advanced metals and coatings.

Therefore, Bekaert continues to develop new coatings, offering added value to its customers. Bezinal®2000 is a coating performing 2x better compared to Bezinal® in saltspray and kesternich, performing very good in most environments.

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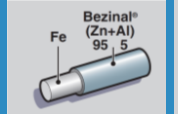
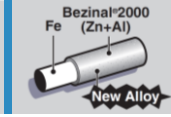
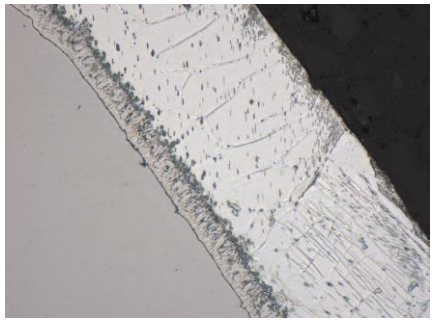
Bezinal® and Bezinal®2000 – Coating properties





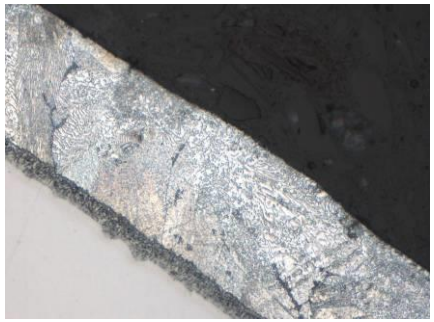
Optical microscopy:

Zinc



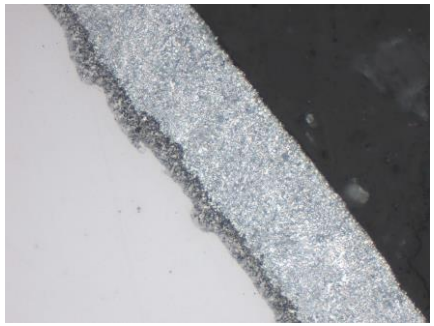
- Nice microstructure
- Alloy layer with nice delta and zeta phase
- Thick eta phase (= pure Zn), heavy galvanized

Bezinal®



- Fine microstructure
- Homogeneous alloy layer

Bezinal®2000



- Fine microstructure
- Homogeneous alloy layer

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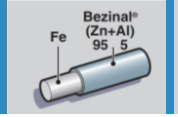
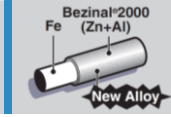
Bezinal® and Bezinal®2000 – Coating properties





Deformability:

Zinc

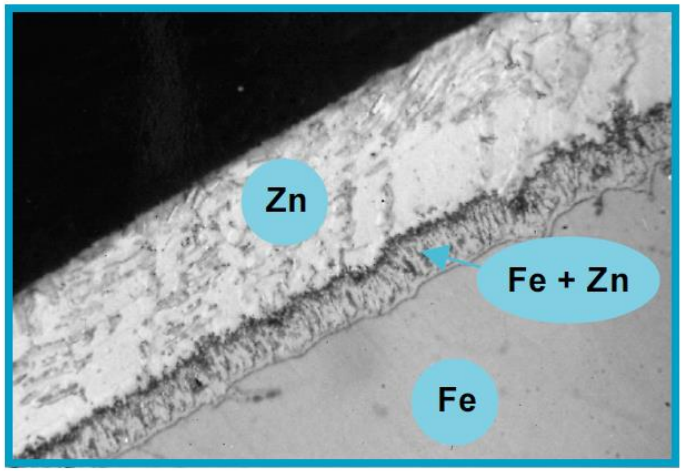


figure 1 : Microstructure of a hot dipped galv. wire

Bezinal®

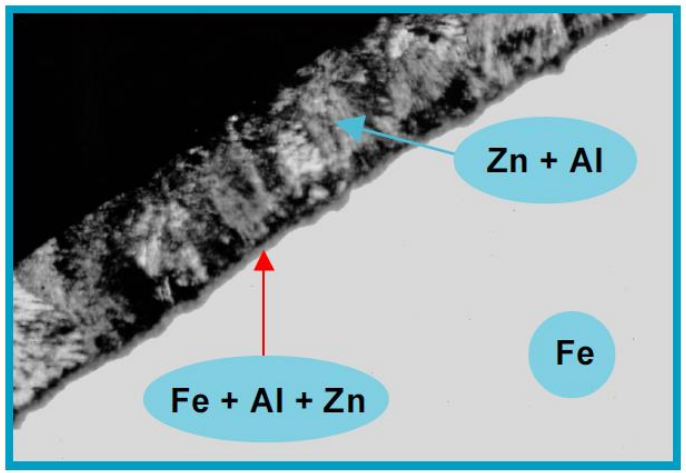


figure 2 : Microstructure of a Bezinal coated wire

A Zinc coating consists of a thick and brittle Fe+Zn layer and an outer layer of pure Zinc

A Bezinal® coating consists of a ductile Fe+Zn+Al layer and an outer Zn+Al lamellar eutectic layer

Bezinal® wire is therefore more deformable than a Zinc coating.

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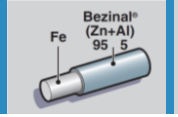
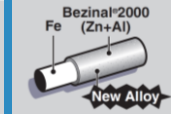
Bezinal® and Bezinal®2000 – Coating properties





Coat weights:

- Amount of coating material per surface area of wire and expressed in g/m²
- Can be roughly translated to coat thickness (µm) by dividing the coat weight to the contour of the wire (πxD).

Minimum coat weights are specified in the standard EN10244-2 (Zinc – Zinc95Al5).

EN 10244-2		g/m²	g/m²
	Class	**A**	**B**
Diameter (mm)	2.5 → 2.8	245	125
	2.8 → 3.2	255	135
	3.2 → 3.8	265	135
	3.8 → 4.4	275	135
	4.4 → 5.2	280	150
	5.2 → 8.2	290	/

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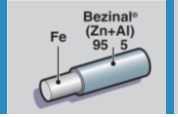
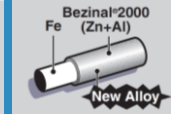
Bezinal® and Bezinal®2000 – Coating properties





Corrosion mechanism of ZnAl coatings

Source: AS4534 (American Standard)

• Studies have indicated that, under external atmospheric exposure, a ZnAl95/5 coating provides up to about three times the corrosion protection afforded by a Zinc coating of the same coating mass.

• Initially depletion of this and other ZnAl coatings of similarly low aluminium content may be rather more than would be experienced with Zinc under the same circumstances

• After a period of time, depending on coating structure and exposure conditions, the corrosion rate becomes much reduced, and significantly less than that for Zinc.

• Explanation: As corrosion proceeds, Zinc is preferentially depleted until the surface layer becomes aluminium rich. The enhanced corrosion resistance of ZnAl coatings is due to this residual, relatively corrosion-resistant layer of aluminium with its inherent oxide film. Depending on circumstances, the onset of red rust may be delayed significantly and beyond the point where a negligible coating remains.

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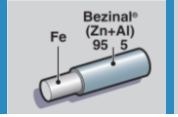
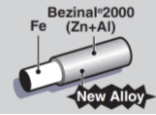
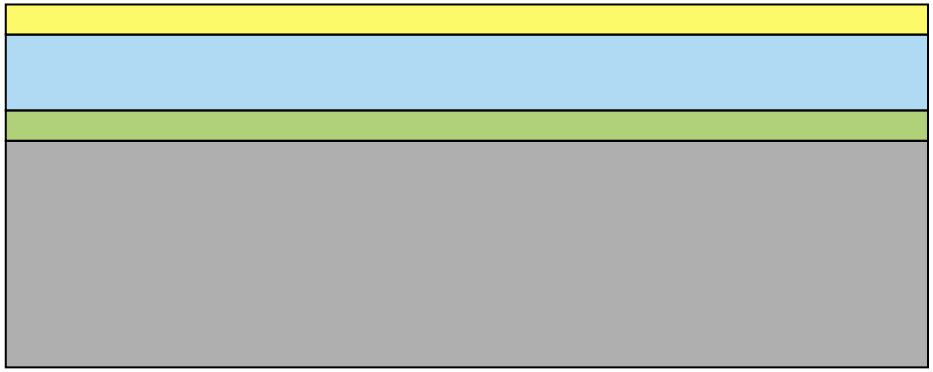
Bezinal® and Bezinal®2000 – Coating properties





Corrosion mechanism of ZnAl coatings

	Zinc	Bezinal®	Bezinal®2000
Density of the passivation layer	Low	High	Very high
Protection by intermetallic layer	Low		Good



Passivation layer

Coating

Intermetallic layer

Steel

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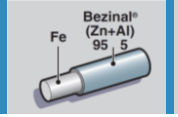
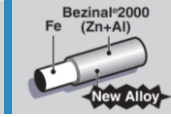
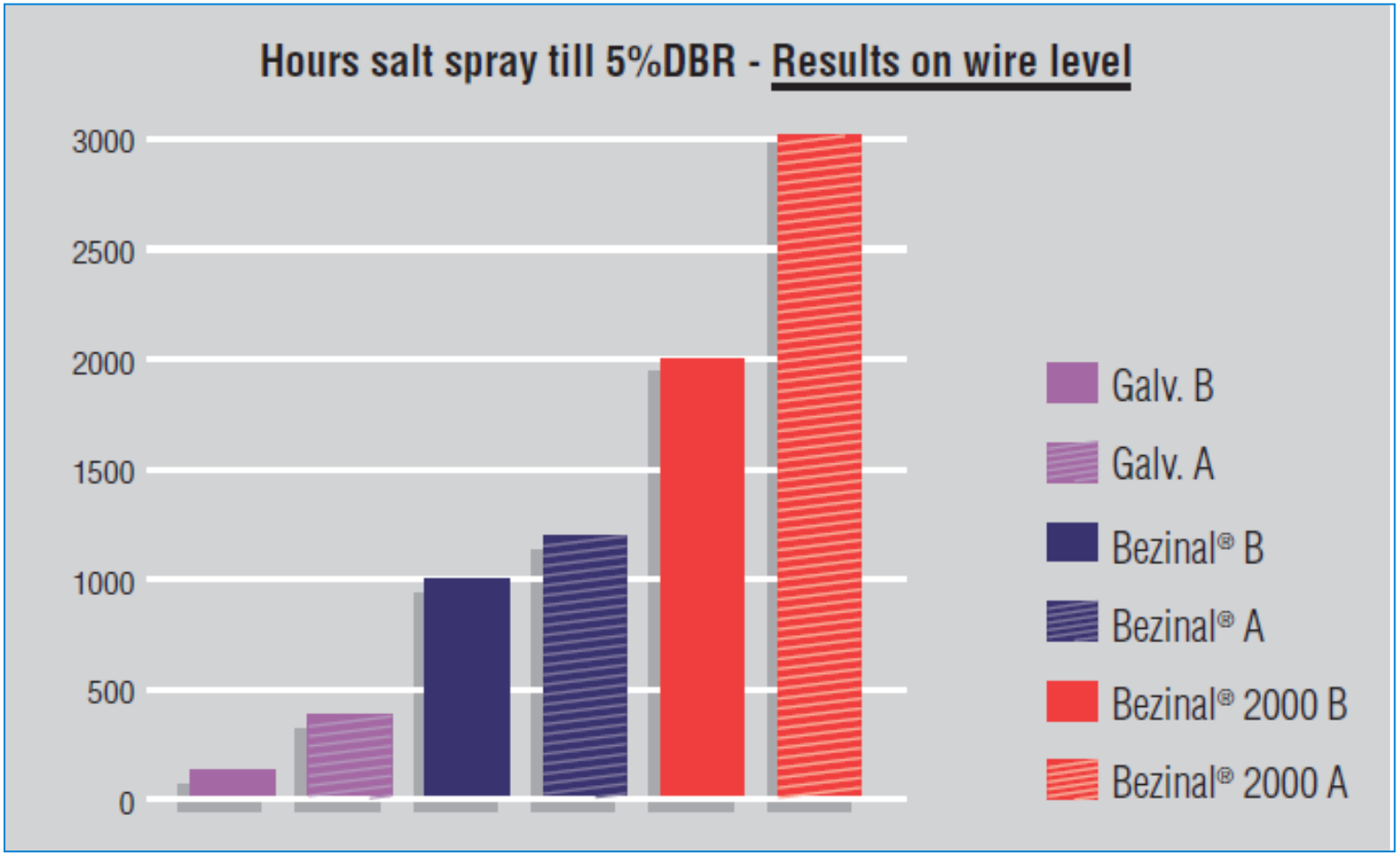
Bezinal® and Bezinal®2000 – Coating properties





Corrosion performance in SS



Bezinal®2000 brochure

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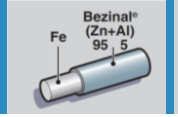
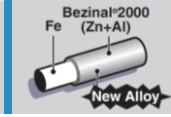
Bezinal® and Bezinal®2000 – Corrosion properties





Expected lifetime – Atmospheric corrosivity categories (EN12944-2)

C1 = Very low aggressive environment
- Does not exist for exterior exposure

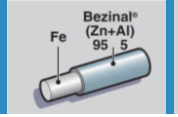
C2 = Low aggressive environment
- Atmosphere with low level of pollution. Mostly rural areas

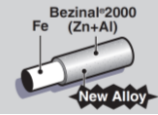
C3 = Medium aggressive environment
- Urban and industrial atmospheres, moderate sulfur dioxide pollution. Coastal areas with low salinity

C4 = High aggressive environment
- Industrial areas and coastal areas with moderate salinity

C5 = Very high aggressive environment
- I – Industrial areas with high humidity and aggressive atmosphere
- M – Coastal and offshore areas with high salinity

Bezinal® and Bezinal®2000 – Corrosion properties





Expected life time – Based on saltspray & kesternich

In general in saltspray test:
- Bezinal® performs average 3x better than Zn
- Bezinal®2000 performs average 6x better than Zn

3.4mm	EN ISO 9224:1992		EN10244-2	Expected lifetime		
	µm/y (Zn)	g/m²/y (Zn)	Class A	Zinc	Bezinal®	Bezinal®2000
C2	0.5	3.6	265	70	>125	>125
C3	2	14.3	265	15	50	110
C4	4	28.5	265	9	25	50
C5	10	71.5	265	3	10	20

3.4mm	EN ISO 9224:1992		EN10244-2	Expected lifetime		
	µm/y (Zn)	g/m²/y (Zn)	Class B	Zinc	Bezinal®	Bezinal®2000
C2	0.5	3.6	135	30	100	>125
C3	2	14.3	135	9	28	55
C4	4	28.5	135	4	14	25
C5	10	71.5	135	1	5	10

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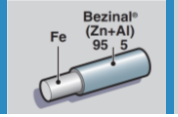

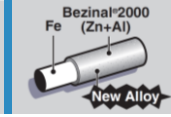

Bezinal® and Bezinal®2000…

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… for welded panels

- Corrosion of welds

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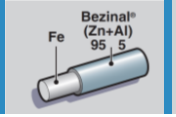
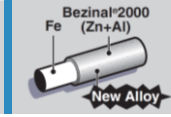
Bezinal® for welded panels – Corrosion of welds





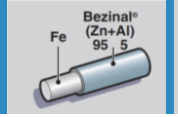
• When welding Zn coated wires, the Fe-Zn intermetallic is completely melted away giving no corrosion protection around the welds.

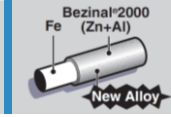
• During the Bezinal® welding process the eutectic Zn-Al layer is removed locally, but the FeAl3 intermetallic layer remains due to its high melting point. This remaining FeAl3 intermetallic layer offers cathodic protection to the areas around the weld.

• Welding generally reduces corrosion resistance of Bezinal® by 15-30% to 5%DBR in Saltspray test compared to unwelded wire.

• If the welding temperature is too high, excess flash is generated and more FeAl3 alloy is melted away. The welding point then becomes more vulnerable to corrosion – see diagram below.

Bezinal® for welded panels – Corrosion of welds





SUPERIOR PROTECTION FOR WELDING POINTS

It has been proved that welded mesh made of galvanised wire has very limited corrosion protection at the welding points. However, welded mesh made of BEZINAL® coated wire guarantees corrosion protection at these vulnerable points. Moreover, the corrosion resistance of this type of mesh is superior – even to welded mesh that is galvanised after welding.

figure 7 : Galvanized mesh at the end of a 5 year test period

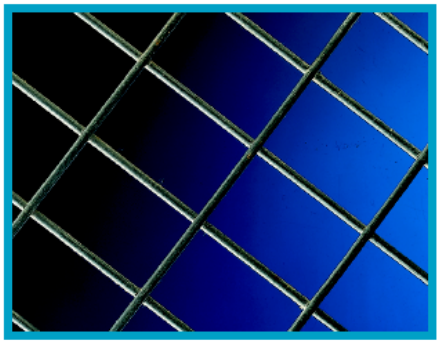


figure 8: BEZINAL® mesh at the end of a 5 year test period

Welded mesh made of BEZINAL® coated wire offers improved protection at welding points.

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