Design of IEC62271 & IEC61439 products: (training)

BARE CONNECTIONS limits of IEC62271-1 changed from 50 to 60K. Could we do the same for silvered connections (75 to 85K) and tinned (65 to 75K).?

https://www.cognitor.com.br/bareconnections.pdf

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Keywords: Substations, Optimization, Switchgear, design, reduction of costs, validation, High Power , Testing, Laboratory, Simulations, Calculations, IEC Standards, Busbar systems, Internal Arcs, Overpressures, Temperature rise, Electrodynamical stresses, short time currents, Magnetic Fields

2007

– 38 –

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4.4.2 Temperature rise

The temperature rise of any part of the switchgear and controlgear at an ambient air temperature not exceeding 40 °C shall not exceed the temperature-rise limits specified in Table 3 under the conditions specified in the test clauses.

Table 3 – Limits of temperature and temperature rise for various parts, materials and dielectrics of high-voltage switchgear and controlgear

Nature of the part, of the material and of the dielectric (Refer to points 1, 2 and 3) (Refer to note)	Maximum value	
	Temperature °C	Temperature rise at ambient air temperature not exceeding 40 °C K
1 Contacts (refer to point 4)		
Bare-copper or bare-copper alloy		
– in air	75	35
– in SF_6 (sulphur hexafluoride) (refer to point 5)	105	65
– in oil	80	40
Silver-coated or nickel-coated (refer to point 6)		
– in air	105	65
– in SF_6 (refer to point 5)	105	65
– in oil	90	50
Tin-coated (refer to point 6)		
– in air	90	50
– in SF_6 (refer to point 5)	90	50
– in oil	90	50
2 Connection, bolted or the equivalent (refer to point 4)		
Bare-copper, bare-copper alloy or bare-aluminium alloy		
– in air	90	50
– in SF_6 (refer to point 5)	115	75
– in oil	100	60
Silver-coated or nickel-coated refer to point 6)		
– in air	115	75
– in SF_6 (refer to point 5)	115	75
– in oil	100	60
Tin-coated		
in air	105	65
– in SF_6 (refer to point 5)	105	65
– in oil	100	60

2017

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– 65 –

Table 14 – Limits of temperature and temperature rise for various parts, materials and dielectrics of high-voltage switchgear and controlgear

Nature of the part, of the material and of the dielectric (Refer to points 1, 2 and 3 in 7.5.6.2) (Refer to NOTE 1)	Maximum value	
	Temperature °C	Temperature rise at ambient air temperature not exceeding 40 °C (NOTE 2) K
1 Contacts (refer to point 4)		
Bare-copper or bare-copper alloy		
– in OG (refer to point 5)	75	35
– in NOG (refer to point 5)	115	75
– in oil	80	40
Silver-coated or nickel-coated (refer to point 6)		
– in OG (refer to point 5)	115	75
– in NOG (refer to point 5)	115	75
– in oil	90	50
Tin-coated (refer to point 6)		
– in OG (refer to point 5)	90	50
– in NOG (refer to point 5)	90	50
– in oil	90	50
2 Connection, bolted or the equivalent (refer to point 4)		
Bare-copper, bare-copper alloy or bare-aluminium alloy		
– in OG (refer to point 5)	100	60
– in NOG (refer to point 5)	115	75
– in oil	100	60
Silver-coated or nickel-coated (refer to point 6)		
– in OG (refer to point 5)	115	75
– in NOG (refer to point 5)	115	75
– in oil	100	60
Tin-coated		
– in OG (refer to point 5)	105	65
– in NOG (refer to point 5)	105	65
– in oil	100	60

1) EXPLAINING THE REASONS,

IEC62271-1 is one of the best prepared IEC documents I know. If I understood correctly, the temperature rises limits of 2007 version raised from 50K to 60K in the 2017 version.

This is good because means (**) reducing something like 8% of busbars weight, to pass the temperature rise test. I am looking for information about the reasoning. Possibly the knowledge on use of materials advanced to enable this.

I suppose that the experience of manufacturers and users is already sufficient to do – at least in AIS and GIS - something like this for silvered and tinned connections. I mean something like raising from 75 to 85K in the silvered connections and , for tinned connections, from 65K to 75 K.

I HAVE TWO QUESTIONS:

a) Is there any study in course to update the silvered and tinned limits ?

b) As the change was possible in HV switchgear could this be done in the temperature rise table of IEC 61439 (*). Materials are the same. Is there any action to define real values in the LV standard , to ending the unnecessary confusion caused to the market, by that table?

References:

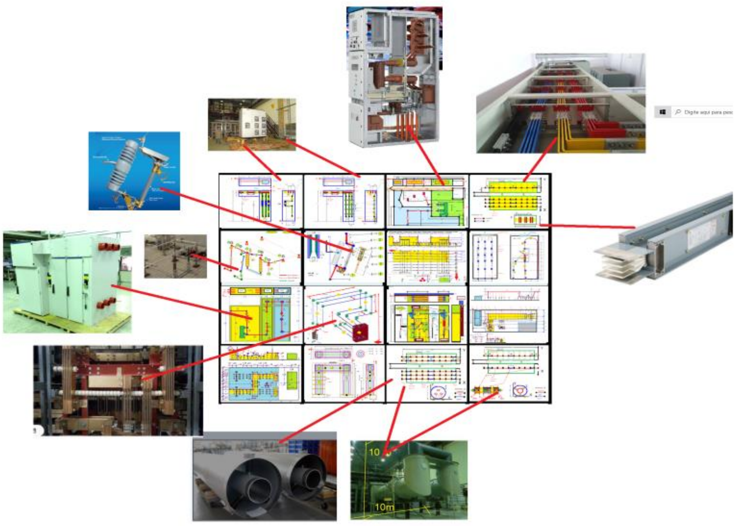
(*) item 3 of the article https://www.cognitor.com.br/improvementsiec.pdf
(**) http://www.cognitor.com.br/silvered.pdf

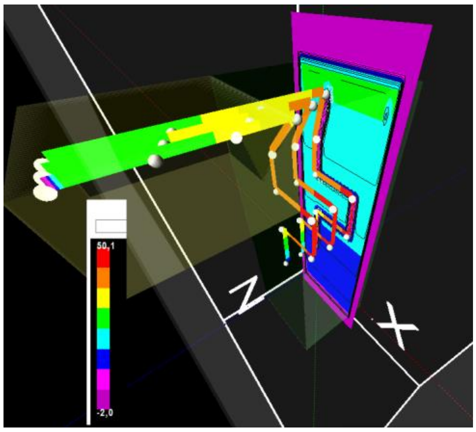
By the way, I am currently doing R&D work to identify the most economical methods to silver or tin plate the ends of copper bars used in IEC 62271 and IEC 61439 panels. If anyone wants to help me , let me know where I can find articles. I imagine that there are already faster methods than electrolytic processes, for small and large thicknesses.   Are there already machines to do this quickly, at least for small thicknesses? Maybe the Chinese developed something in this field.

For doubts write to sergiofeitozacosta@gmail.com or post in the comments area of my Linkedin https://www.linkedin.com/in/sergiofeitozacosta/

Table 1 _ Results for comparisons at 1250 Amperes   (just one panel)

Temperature rise in the connection (K)	Busbar dimensions per phase	Weight of copper (kg) and % of 50Kvalue	Total kg/MVA
50K	100x10 mm	110 (100%)	142
60K	83,5x10 mm	92 (84%)	130
65K	77,5x10 mm	85 (77%)	125
75K	67,8x10 mm	74 (67%)	118





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[2] Book “Switchgear, Busways, Isolators - Substations & Lines” (available also in Spanish and Portuguese) http://www.cognitor.com.br/Book_SE_SW_2013_ENG.pdf

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