

## APPENDIX 1 : DESIGN VERIFICATION

DESIGN VERIFICATION of IEC 61439-1, Clause 10, Edition 3.0 (2020.05)			Limitation of IEC 61439-1&2 (L) or Declaration of Original Manufacturer (D)	VERIFICATION of PDS SWITCHBOARDS IN 4000A SYSTEM	Tested by
<b>10.2</b>	<b>Strength of materials and parts</b>	<b>Explanations</b>			
10.2.2	Resistance to Corrosion	In all cases, hinges, locks and fastenings shall also be tested unless they have previously been subjected to an equivalent test and their resistance to corrosion has not been compromised by their application.	(L)Limited	Severity Test A : Indoor	DEKRA Sep.2020
10.2.3	Properties of insulating materials	Verification of thermal stability of enclosures / Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects	(L)Limited	Dry Heat Tested according to IEC 60068-2-2 Test Bb Glow Wire Tested according to IEC 60695-2-10/11	DEKRA Sep.2020
10.2.4	Resistance to ultraviolet (UV) radiation	This test applies only to enclosures and external parts of assemblies intended to be installed outdoors and which are constructed of insulating materials or enclosures that are entirely coated by synthetic material.	NONE	Applying at only Insulated material Enclosures	NONE
10.2.5	Lifting	The maximum number of sections allowed by the original manufacturer to be lifted together shall be equipped with components and/or weights to achieve a weight of 1,25 times its maximum shipping weight. With doors closed, it shall be lifted with the specified lifting means and, in the manner, defined by the original manufacturer.	(L)Limited	The Verification of the lifting done in conformity with IEC 61439-2 clause 10.2.5 Assembly weigh was : 3.288kg Tested weigh was : 4.148kg	DEKRA Sep.2020
10.2.6	Verification of protection against mechanical impact (IK code)	Protection levels verified against impacts from outside to the enclosure	(D) Declared	IK 10 is tested and declared by PDS	PDS July 2020
10.2.7	Marking	After the test, the marking shall be legible to normal or corrected vision without additional magnification.	(L)Limited	Markings tested and declared by PDS	PDS July 2020
10.2.8	Mechanical operation	Movable parts like interlocks, locks , doors are tested work 200 times.	(L)Limited	The Verification of the lifting done in conformity with IEC 61439-2 clause 10.2.8 Regular doors , doors with rotary handle and withdrawable units opened-closed in 200 cycles	DEKRA Sep.2020
10.3	Degree of protection of assemblies (IP Code)	Protection against solid and liquid objects of switchboard.See at Appendix 3.	(D) Declared	The Verification done with IEC 60529 conformity of IEC 61439-2 clause 10.3 Declaration of PDS was IP53 FOR PCC modules IP40 for withdrawable modules. The result was: pass.	DEKRA Sep.2020
10.4	Clearances and creepage distances	Protection distances of live conductors to unlive conductors an each other are verified. See at Appendix 4	(L)Limited	The Verification done in conformity with IEC 61439-2 clause 10.4 Main busbars,Distribution busbars, MCCBs, DOL&DSD withdrawable units clerances and creepage distances are measured. The distances are determined conformity with Uimp: up to 12kV and Ui : up to 1000V	DEKRA Sep.2020

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10.5	"Protection against electric shock and integrity of protective circuits"				
10.5.2	Effective earth continuity between the exposed-conductive-parts of the class I assembly and the protective circuit"	It verified that the different exposed-conductive-parts of the assembly are effectively connected to the terminal for the incoming external protective conductor. Verification shall be made using a resistance-measuring instrument that is capable of driving a current of at least 10 A (AC or DC). The current is passed between each exposedconductive part and the terminal for the external protective conductor. The resistance shall not exceed 0,1 Ω.	(L)Limited	The Verification done with conformity of IEC 61439-2 clause 10.5.2 declaration of PDS.	PDS July 2020
10.5.3	Short-circuit withstand strength of the protective circuit	The rated short-circuit withstand strength shall be verified for protection circuits.	(D) Declerated	The Verification done in conformity with IEC 61439-2 clause 10.5.3.5 Main PE Busbar = L3-PE : I <sub>cw</sub> :60kA-1s , 132kA peak Vertical PE Busbar 1 = L3-PE : I <sub>cw</sub> :48kA-1s ,100,8kA peak Vertical PE Busbar 2 = L3-PE : I <sub>cw</sub> :36kA-1s , 75,6kA peak	DEKRA Sep.2020
10.6	Incorporation of switching devices and components	These are rules concerning the installationof devices included in the assembly, whether they are fixed or removable parts and compliance with the customer's wiring requirements. This also includes accessibility to adjustment and reset devices; and all types of indication (LEDs,dials, etc.).	(L)Limited	The Verification done in conformity with IEC 61439-2 clause 10.6	DEKRA Sep.2020
10.7	Internal electrical circuits and connections	This test consists of checking conformity of the power and control circuits with the design requirements. It includes correct sizing of the busbar and cables, earthing the control circuits, etc. It also includes identification of the various circuits using different colours.	(L)Limited	The Verification done in conformity with IEC 61439-2 clause 10.7	DEKRA Sep.2020
10.8	Terminals for external conductors	This rule requires the terminal capacity and whether the terminals are suitable for aluminium or copper conductors to be specified to the end user. It also includes checking all the types of terminal that can be used for the cable entries and outlets (neutral, PEN, symbolic PE, etc.).	(L)Limited	The Verification done in conformity with IEC 61439-2 clause 10.8	DEKRA Sep.2020
10.9	Dielectric properties				
10.9.2	Power-frequency withstand voltage	The rated insulation voltage of a circuit of an assembly is the voltage value to which dielectric test voltages and creepage distances are referred. (Ui) See at Appendix 2	(L)Limited	The assembly was subjected for 60 seconds to a high voltage test no breakdown or flash-over ocured during the tests. Ui:1000V , Uimp : 12kV : - Main and Distribution Busbars, ACB's 2500A-4000A,MCCB's 400A-1600A Ui:800V-690V , Uimp : 8kV-4kV : - Withdrawable Units DSD 30-110kW, DOL 15-15kW, PCC 160A External operating handles of insulating materials tested.	DEKRA Sep.2020
10.9.3	Impulse withstand voltage	The rated impulse voltage of an assembly is the voltage value to which clearance distances and solid insulation withstand to transient overvoltage are referred. (Uimp) See at Appendix 2			
10.9.5	External operating handles of insulating materials tested.	"The rated insulation voltage of a circuit of an assembly is the voltage value to which dielectric test voltages and creepage distances are referred. (Ui)"			

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10.10	Temperature rise limits	<p>Permissible limited temperature rising limits on different parts of an assembly than the tested ambient temperature on maximum Rated Current (In)</p> <p>* Busbars and Conductors : 105K (limited insulated holder capabilities too)</p> <p>* Terminals for external insulated conductors : 70K</p> <p>* Manual operating : of metal : 15K, insulating material : 25K</p> <p>* Accessible external enclosures and covers: metal surfaces : 30K, insulating surfaces : 40K</p> <p>Note 1 : <math>K = \Delta t</math> Measured Temperature °C - Ambient temperature °C</p> <p>Note 2 : Ambient temperature is daily average temp.</p>	(D) Declared	<p>Test was done at IP53 without air forced for PCC modules, IP 40 without air forced for withdrawable modules</p> <p>* ACB 4000A Schneider NW40 H2 at 35°C ambient conditions supply with 2970A limited on only upper fixed terminal of ACB</p> <p>* ACB 4000A Schneider NW40 H2 at 50°C ambient conditions supply with 2500A limited on only upper fixed terminal of ACB</p> <p>* Other measured points were kept below than the rising limits. For all rising results please see at Dekra Test certificate</p> <p>* For choosing the correct system related with temperature rising please see at guide for Users</p>	DEKRA Sep.2020
10.11	Short-circuit withstand strength	<p>Assemblies shall be capable of withstanding the thermal and dynamic stresses resulting from short-circuit currents not exceeding the rated values. Rated short-time withstand current (Icw) together with the associated duration and rated peak withstand current (Ipk)</p>	(D) Declared	<p>Main Busbar : 80/10 x 4 L1,L2,L3 = Icw : 80kA 1s , Ipk : 176kA</p> <p>Main Busbar : 80/10 x 4 L3-N = Icw : 60kA 1s , Ipk : 132kA</p> <p>Distribution Busbar : 80/10 x 4 L1,L2,L3 = Icw : 80kA 1s , Ipk : 176kA</p> <p>Distribution Busbar : 80/10 x 2 L3-N = Icw : 48kA 1s , Ipk : 100,8kA</p> <p>Withdrawable Busbar : 60/10 x 1 L1,L2,L3 = Icw : 60kA 1s , Ipk : 132kA</p> <p>Neutral in Cable Comp. : 30/10 x 2 L3-N = Icw : 36kA 1s , Ipk : 75,6kA</p> <p>* For all busbar results please see at Dekra Test certificate</p>	DEKRA Sep.2020
10.12	Electromagnetic compatibility (EMC)	<p>This test consists of checking the electromagnetic interference caused by the assembly when operating in its environment, the aim being for it to cause no interference.</p>	(L) Limited	<p>The Verification done in conformity with IEC 61439-2 clause 10.12</p>	DEKRA Sep.2020