

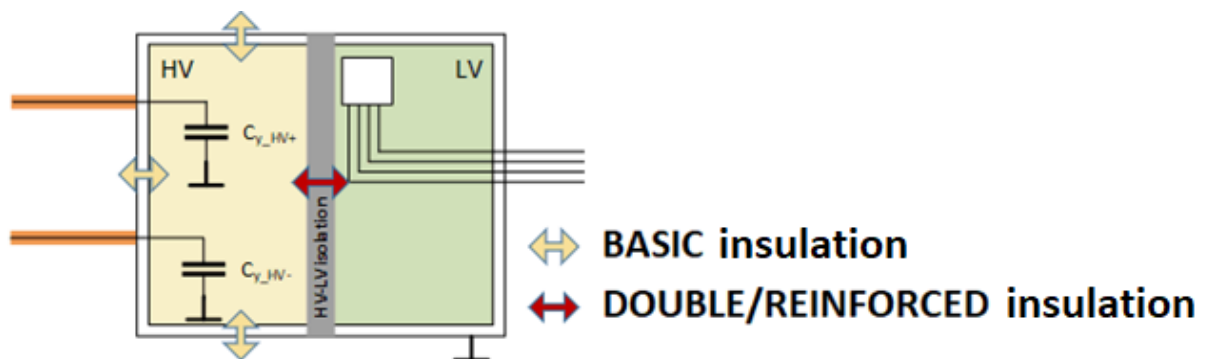
Insulation coordination - HV Inverter

1. Basic data about design

HV side supply voltage max.: **880V_{DC}**

LV side supply voltage: **24V_{DC}**

IP class **IP6K9K**: Pollution degree 2 (according to LV123)



2. Insulation requirements from LV123 and IEC60664-1

2.1 Insulation coordination for DC interconnection circuit (LV123 - MBN 20123:2020-01/7.7.6.3):

Table: Minimum clearances and creepage distances for DC interconnection circuit

Maximum voltage External DC supply ^a	Minimum clearances ^b mm	Minimum creepage distances mm					
		Pollution degree					
		2			3		
V_{dc}		Insulating material group					
		I	II	IIIa	I	II	IIIa
500	2,0	2,5	3,6	5,0	6,3	7,1	8,0
1000	2,0	5,0	7,1	10,0	12,5	14,0	16,0

Note: The specifications for the minimum values of clearances and creepage distances apply to basic insulation.

^a Maximum expected continuous voltage during connection to an external DC supply

^b The specifications apply to an altitude of 4000 m.

Minimum creepage distances for a double or reinforced insulation shall be designed for twice the value of the minimum creepage distances required for the basic insulation.

BASIC insulation (Altitude $\leq 4000\text{m}$, Pollution degree 2; material group I [$600 \leq \text{CTI}$]):

Clearance: 2mm

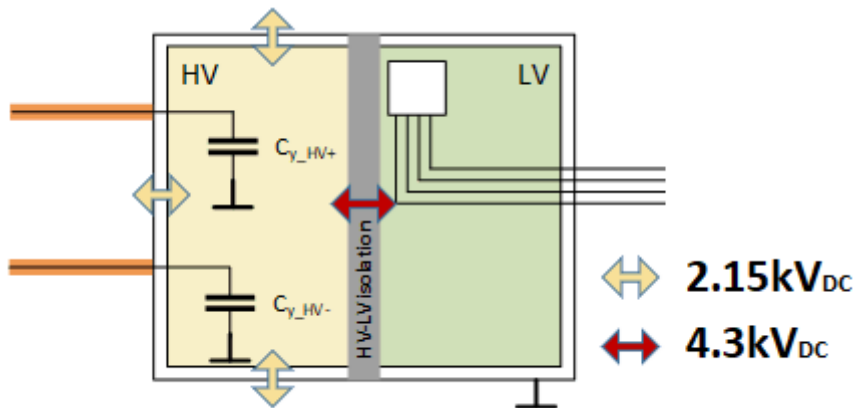
Creepage: 5mm

DOUBLE/REINFORCED insulation (Altitude $\leq 4000\text{m}$, Pollution degree 2; material group I [$600 \leq \text{CTI}$]):

Clearance: 4mm

Creepage: 10mm

Diagram of insulation coordination according to LV123 with marked barriers and their withstanding voltages:



2.1.1 Specifications for devices bridging DOUBLE/REINFORCED insulation barrier LV123:

Clearance distance: 4mm

Creepage distance: 10mm

Withstand insulation voltage: 4.3kV_{DC}

2.2 Exception - device bridging insulation barrier could also conform to IEC 60664-1 with noted explanation and customer agreement:

LV123 note:

If the design of the creepage distances deviates from the specifications in the following sections for specific electronics, e.g. printed circuits, the design shall comply with IEC 60664-1 or applicable parts of IEC 60664. Such a design and the applied standard shall be documented by the supplier and agreed upon with the customer.

IEC 60664-1:

Table 4 – Creepage distances to avoid failure due to tracking

Voltage r.m.s. ¹⁾	Minimum creepage distances								
	Printed wiring material		Pollution degree 1	Pollution degree 2			Pollution degree 3		
	Pollution degree 1	Pollution degree 2		Material group I	Material group II	Material group III	Material group I	Material group II	Material group III ²⁾
	All material groups	All material groups, except IIIb	All material groups						
V	mm	mm	mm	mm	mm	mm	mm	mm	mm
800	2,4	4,0	2,4	4,0	5,6	8	10	11	12,5
1 000	3,2	5,0	3,2	5,0	7,1	10	12,5	14	16

Creepage distances for reinforced insulation shall be twice those determined for basic insulation from table 4.

2.2.1 Specifications for devices bridging DOUBLE/REINFORCED insulation barrier IEC 60664-1:

BASIC insulation (Altitude ≤4000m, **Pollution degree 2**; material group I-IIIa, PCB):

Creepage: 5mm

DOUBLE/REINFORCED insulation (Altitude ≤4000m, **Pollution degree 2**; material group I [600≤CTI]):

Creepage: 10mm

BASIC insulation (Altitude ≤4000m, **Pollution degree 1**; material group I-IIIb, PCB):

Creepage: 3.2mm

DOUBLE/REINFORCED insulation (Altitude ≤4000m, **Pollution degree 1**; material group I-IIIb):

Creepage: 6.4mm