Insulation coordination & TLI4971 isolation specification for industrial inverter

2021-03
Version 1.1

Isolation definitions

Commonly used isolation parameters

Parameter	description	definition
V_{ISO}	Isolation withstand voltage	Withstand transient unintended over-voltage
V_{ISOM}	Maximum surge isolation voltage (not required for functional isolation)	Withstand high transient voltage impulses of a certain profile
V_{PDtest}	Apparent charge voltage capability	Partial discharge test to detect discharge inside the insulation material to proof insulation integrity
V_{IORM}	Maximum repetitive working voltage	The ability of an isolator to handle high voltage on a continuous, daily basis over its lifetime. Defined as the maximum repetitive **peak** voltage that the isolation can withstand
V_{IOWM}	Maximum working voltage	The ability of an isolator to handle high voltage on a continuous, daily basis over its lifetime. Defined as the maximum RMS voltage or equivalent DC voltage that the isolation can withstand

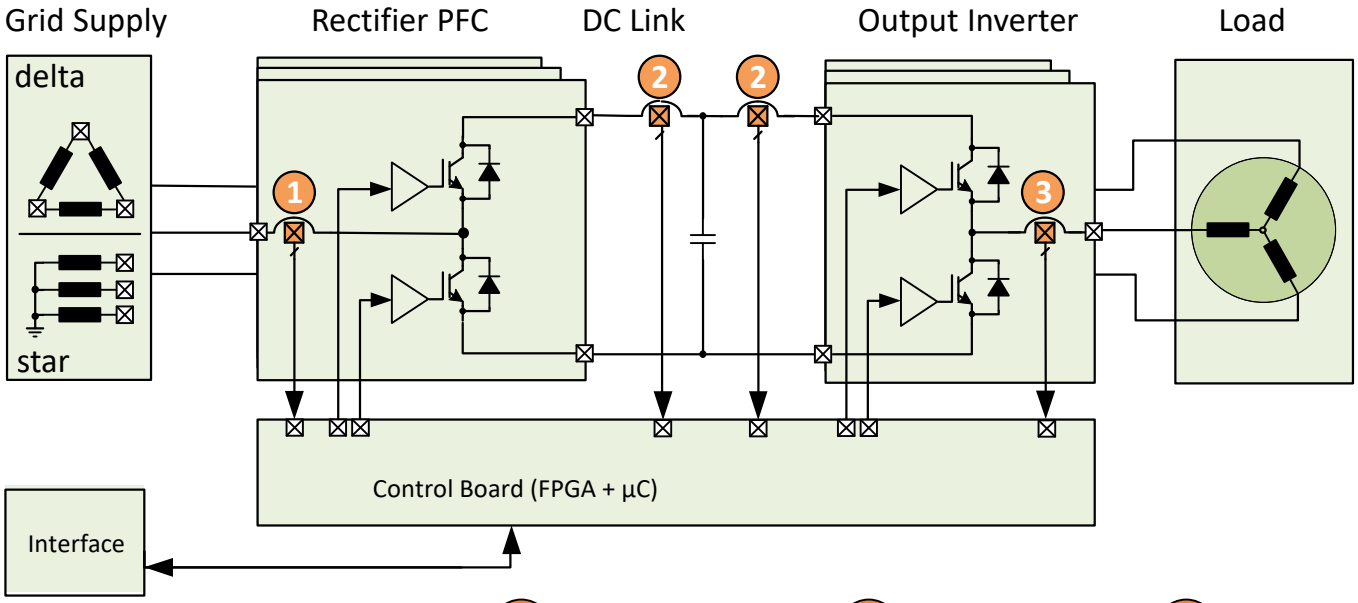
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TLI4971 Isolation Characteristics

HV Isolation Parameter	Parameter	Note	Value
Isolation level	-		functional
Minimum Clearance	Clr	-	4mm
Minimum Creepage	Crp	-	4mm
Isolation test pulse voltage Dielectric surge strength test voltage	V_{PULSE} (V_{IOSM})	Peak, rise time = 1.2µs, fall time = 50µs, type tested, According IEC61800 (extended)	6500V (min)
Production test voltage	V_{ISOP}	RMS, in production, 1.2s, UL1577 certified version	3000V RMS (min)
Dielectric Strength Test Voltage	V_{ISO}	Agency type tested for 60s per UL1577	3500V RMS (min)
Apparent charge voltage capability (method B)	V_{PDtest}	Partial discharge < 5pC peak @ 0m altitude	1500V (min)
Maximum repetitive isolation voltage	V_{IORM}	Max DC voltage, spike, @ 4000m altitude	1150V (max)
Maximum rated Working Voltage (sine wave)	V_{IOWMP}	Peak, @ 4000m altitude	975V peak (max)
Maximum rated Working Voltage (sine wave)	V_{IOWM}	RMS, @ 4000m altitude	690V RMS (max)
Minimum Comparative tracking index	CTI	-	Material group II

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Required Working Voltage

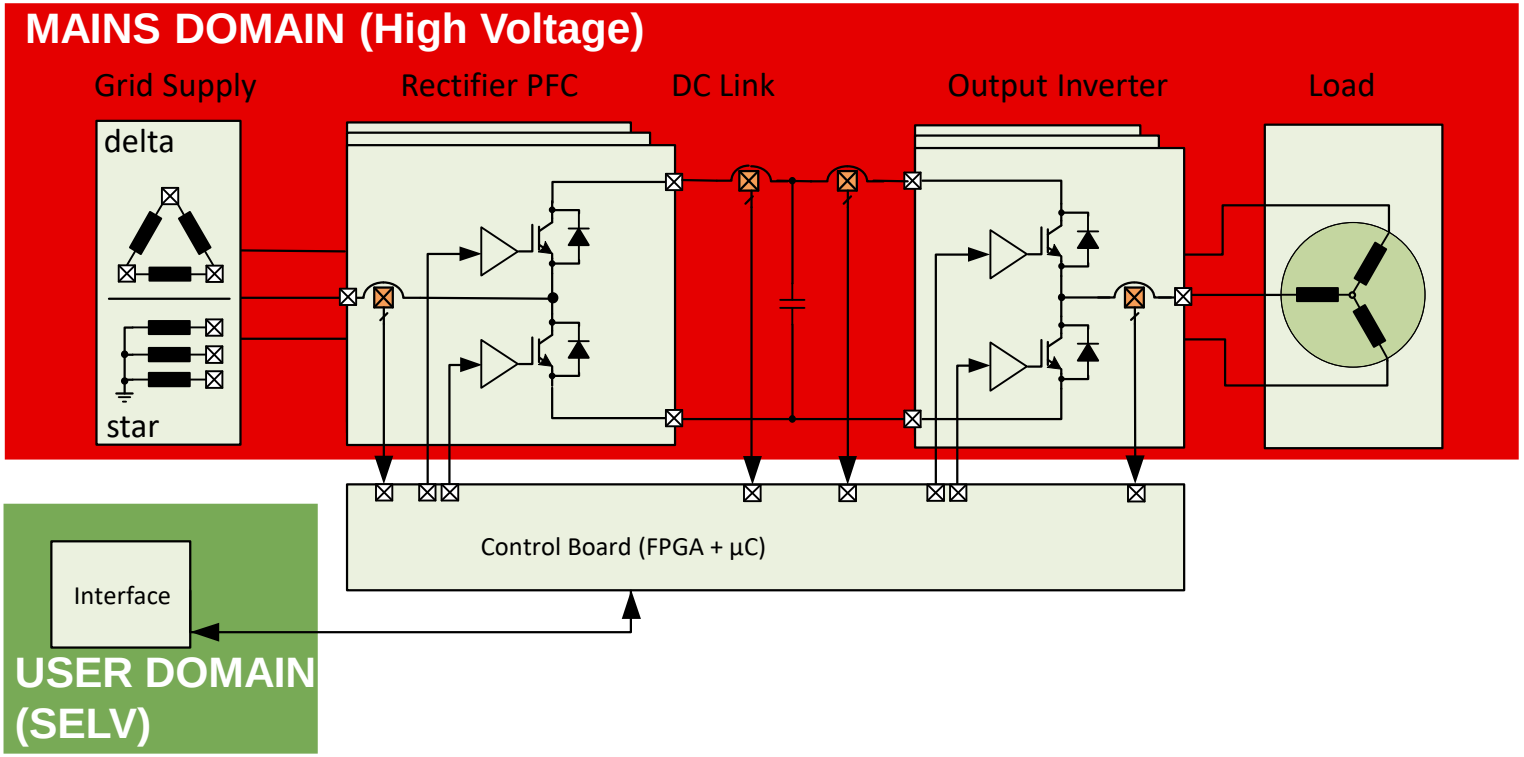


Phase	Line to GND/ neutral Voltage (RMS) (1)	Line to Line Voltage (RMS) (1)	Voltage (peak) (1)	DC Voltage (2) (3)
One phase	230V	-	325V	325V
Three phase	230V	398V	563V	563V
Three phase	398V	690V	975V	975V

TLI4971 is specified to withstand above listed isolation voltage on a daily basis over lifetime

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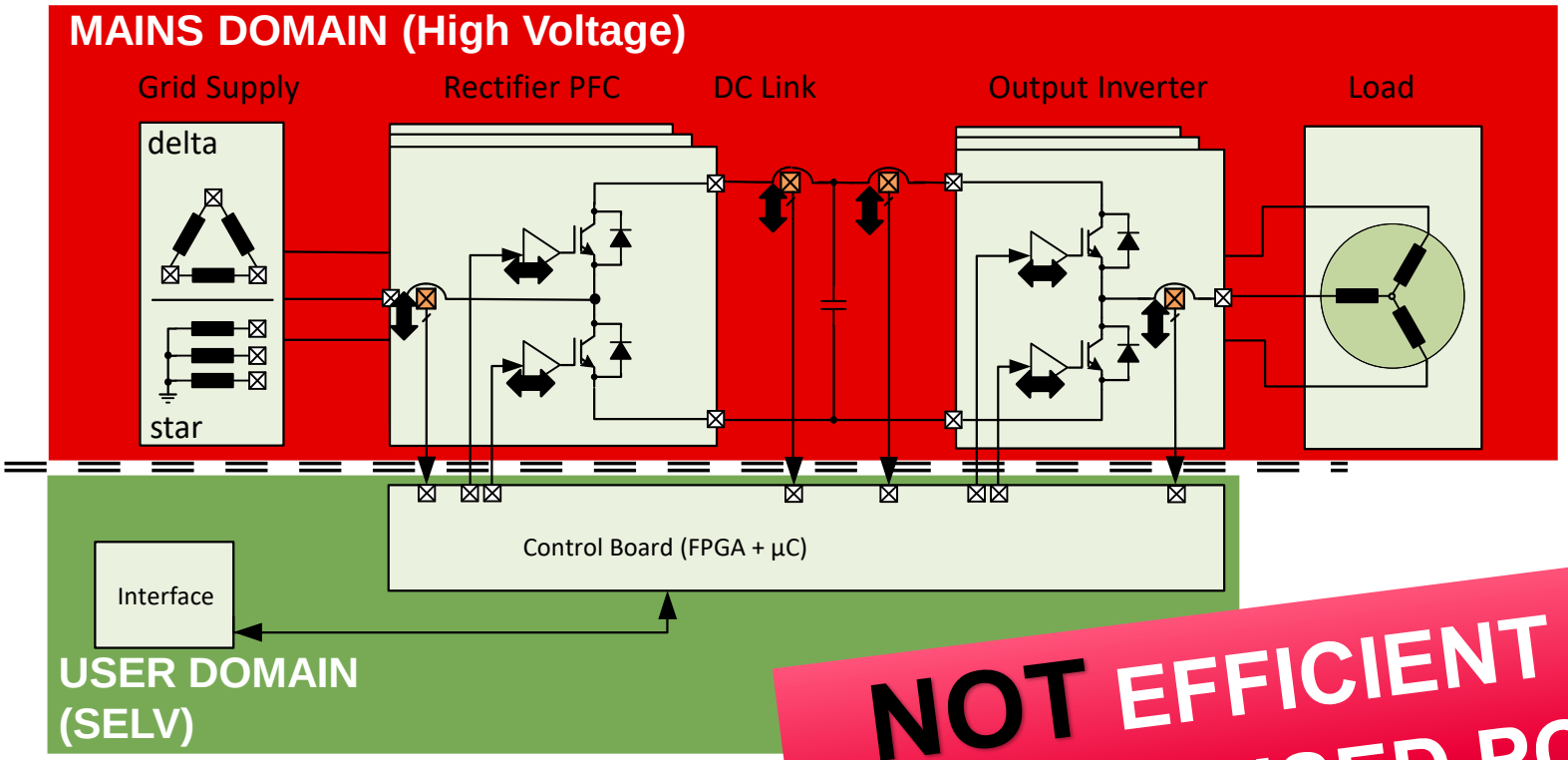
System Insulation Partitioning (Given Environment)



HV	High Voltage
SELV	Safe Extra Low Voltage

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System Insulation Partitioning
Control path and sensing path in SELV domain



NOT EFFICIENT in terms of USED PCB-area and power density

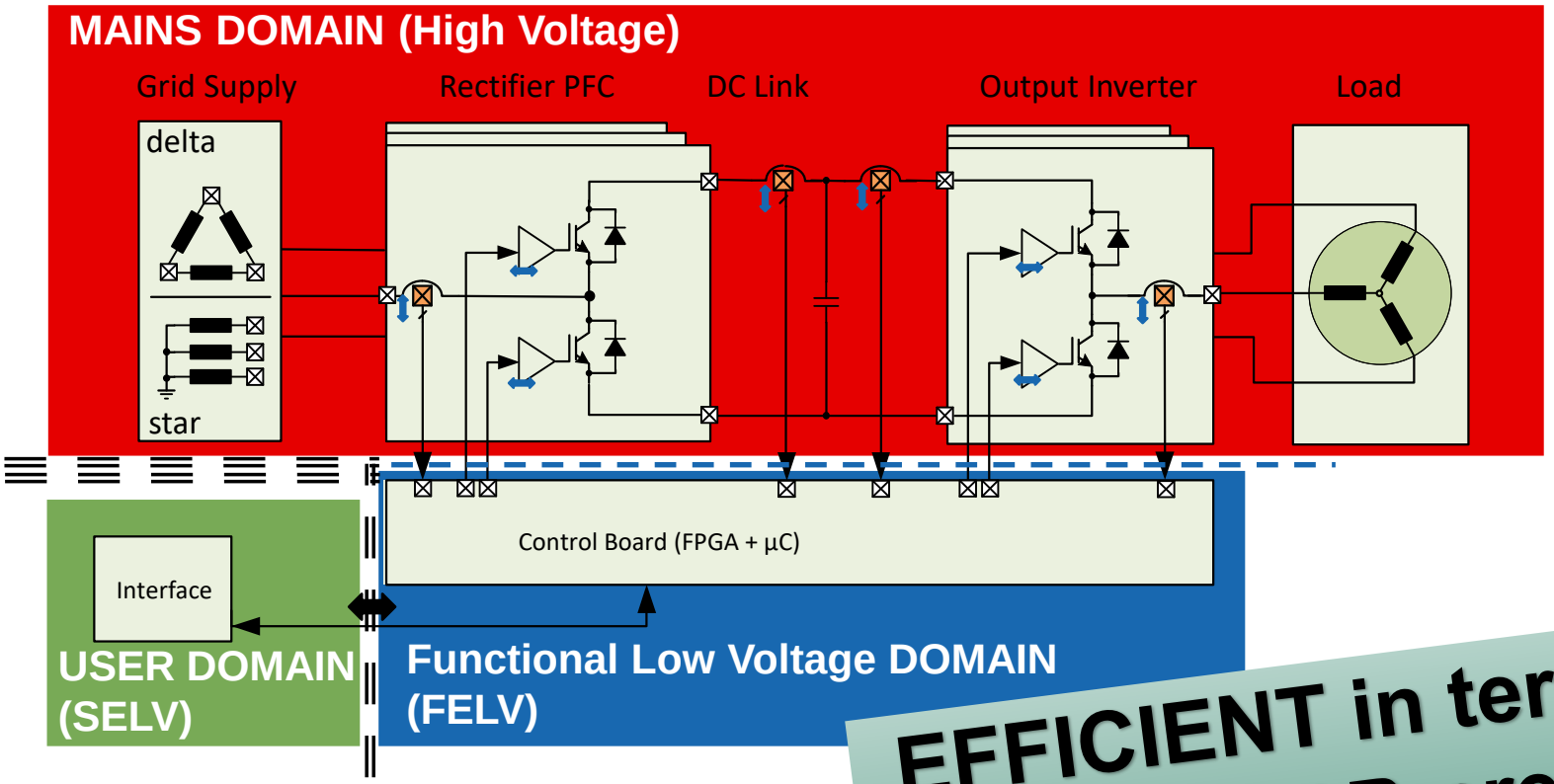
HV High Voltage

SELV Safe Extra Low Voltage

Insulation re-inforced i.e. 8mm

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System Insulation Partitioning
Control path and sensing path in LV domain



EFFICIENT in terms of USED PCB-area as supported by TLI4971

HV	High Voltage
FELV	Functional Extra Low Voltage
SELV	Safe Extra Low Voltage



Insulation re-inforced i.e. 4mm

Insulation functional i.e. 4mm

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