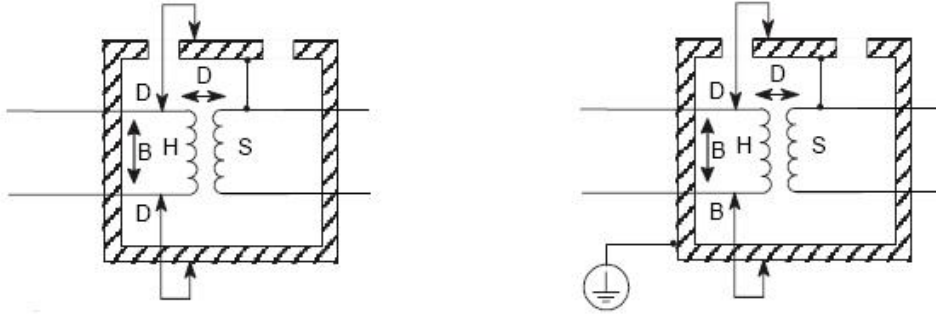


## IEC/EN 60065, 60950-1 최소 절연거리

(공간거리는 연면거리보다 작으므로, 연면거리 요구치로 작성하였으며,  
하기 자료는 100-240 V 정격전압을 기준으로 작성 하였습니다.)



\* H: Hazardous parts (Primary)

\* S: SELV parts (Secondary)

\* D: Double or Reinforce insulation (이중 또는 강화 절연)

\* B: Basic insulation (기본 절연)

- 좌측 그림(접지 되지 않은 경우),

B: 최소 2.5 mm (3.0 mm 권장)

D: 최소 5.0 mm (6.0 mm 권장)

- 우측 그림(접지 된 경우),

B: 최소 2.5 mm (3.0 mm 권장)

D: 최소 5.0 mm (3.0 mm 권장)

- Hazardous parts (Primary)의 B는 fuse 용량이 6 A 미만일때는 fuse 전단까지, 6 A 이상일때는 bridge diode 전단까지 basic insulation이 요구됨.

→ 상기 절연거리는 동작전압에 따라 달라집니다.

(ex IEC/EN 60065 Clause. 13 Clearance distance / Creepage distance)

- **1. Clearance distance**(동작전압 측정시 Vpeak 값으로 결정)

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**Table 8 – Minimum CLEARANCES for insulation in circuits CONDUCTIVELY CONNECTED TO THE MAINS and between such circuits and circuits not CONDUCTIVELY CONNECTED TO THE MAINS**

*CLEARANCES in millimetres*

OPERATING VOLTAGE up to and including		Nominal a.c. MAINS voltage ≤150 V (MAINS transient voltage 1 500 V)				Nominal a.c. MAINS voltage >150 V ≤300 V (MAINS transient voltage 2 500 V)				Nominal a.c. MAINS voltage >300 V ≤600 V (MAINS transient voltage 4 000 V)	
Voltage peak or d.c. V	Voltage r.m.s. (sinu- soidal) V	Pollution degrees 1 and 2		Pollution degree 3		Pollution degrees 1, 2 and 3					
		B/S	R	B/S	R	B/S		R			
210	150	1,0 (0,5)	2,0 (1,0)	1,3 (0,8)	2,6 (1,6)	2,0 (1,5)		4,0 (3,0)		3,2 (3,0)	6,4 (6,0)
420	300	B/S 2,0 (1,5) R 4,0 (3,0)								3,2 (3,0)	6,4 (6,0)
840	600					B/S 3,2 (3,0) R 6,4 (6,0)					
1 400	1 000					B/S 4,2 R 6,4					
2 800	2 000					B/S/R 8,4					
7 000	5 000					B/S/R 17,5					
9 800	7 000					B/S/R 25					
14 000	10 000					B/S/R 37					
28 000	20 000					B/S/R 80					
42 000	30 000					B/S/R 130					

NOTE 1 The values in the table are applicable to basic (B), supplementary (S) and reinforced (R) insulation.

NOTE 2 The values in parentheses are applicable to basic, supplementary or reinforced insulation only if manufacturing is subjected to a quality control programme (an example for such a programme is given in annex M). In particular, double and reinforced insulation shall be subjected to routine tests for dielectric strength.

NOTE 3 For operating voltages between 420 V (peak) or d.c. and 42 000 V (peak) or d.c., linear interpolation between the nearest two points and for values exceeding 42 000 (peak) or d.c. extrapolation is permitted, the calculated spacing being rounded up to the next higher 0.1 mm increment.

NOTE 4 For explanation of the pollution degrees, see 13.1.

→ 상기 table 상의 붉은박스는 Vpeak 로 420 V를 초과하지 않을때  
Basic: 2.0 mm , Reinforce: 4.0 mm 이상 요구된다는 의미 입니다.

-1.1 **Additional Clearance** (추가 공간거리)

**Table 9 – Additional CLEARANCES for insulation in circuits CONDUCTIVELY CONNECTED TO THE MAINS with peak OPERATING VOLTAGES exceeding the peak value of the nominal a.c. MAINS voltage and between such circuits and circuits not CONDUCTIVELY CONNECTED TO THE MAINS**

Nominal a.c. MAINS voltage ≤150 V		Nominal a.c. MAINS voltage > 150 V ≤ 300 V	Additional CLEARANCE mm	
Pollution degrees 1 and 2	Pollution degree 3	Pollution degrees 1, 2 and 3	BASIC OF SUPPLEMENTARY INSULATION	REINFORCED INSULATION
Maximum OPERATING VOLTAGE V (peak)	Maximum OPERATING VOLTAGE V (peak)	Maximum OPERATING VOLTAGE V (peak)		
210 (210)	210 (210)	420 (420)	0	0
298 (288)	294 (293)	493 (497)	0,1	0,2
386 (366)	379 (376)	567 (575)	0,2	0,4
474 (444)	463 (459)	640 (652)	0,3	0,6
562 (522)	547 (541)	713 (729)	0,4	0,8
650 (600)	632 (624)	787 (807)	0,5	1,0
738 (678)	715 (707)	860 (884)	0,6	1,2
826 (756)	800 (790)	933 (961)	0,7	1,4
914 (839)		1 006 (1 039)	0,8	1,6
1 002 (912)		1 080 (1 116)	0,9	1,8
1 090 (990)		1 153 (1 193)	1,0	2,0
		1 226 (1 271)	1,1	2,2
		1 300 (1 348)	1,2	2,4
		– (1 425)	1,3	2,6

NOTE 1 The values in parentheses shall be used when the values in parentheses in Table 8 are used in accordance with note 2 of Table 8.

NOTE 2 For OPERATING VOLTAGES above those shown in the table, linear extrapolation is allowed up to and including 2 000 V. For higher voltages reference should be made to IEC 60664-1.

NOTE 3 Linear interpolation between the nearest two points is permitted, the calculated spacing being rounded up to the next higher 0,1 mm increment.

NOTE 4 For explanation of the pollution degrees, see 13.1.

→ 동작전압에서 420 Vpeak 를 초과할 때 추가되는 거리 입니다.

(만약 동작전압이 450 Vpeak 라면, 기본절연일때 0.1mm 추가, 강화절연일때 0.2 mm 추가 됩니다.)

- 2. Creepage distance (동작전압 측정시 Vrms 값으로 결정)

Table 11 – Minimum CREEPAGE DISTANCES

CREEPAGE DISTANCES in millimetres							
OPERATING VOLTAGE up to and including  V r.m.s. or d.c.	BASIC and SUPPLEMENTARY INSULATION						
	Pollution degree 1	Pollution degree 2			Pollution degree 3		
	Material group	Material group			Material group		
	I, II, IIIa or IIIb	I	II	IIIa or IIIb	I	II	IIIa or IIIb
≤ 50	a	0,6	0,9	1,2	1,5	1,7	1,9
100		0,7	1,0	1,4	1,8	2,0	2,2
125		0,8	1,1	1,5	1,9	2,1	2,4
150		0,8	1,1	1,6	2,0	2,2	2,5
200		1,0	1,4	2,0	2,5	2,8	3,2
250		1,3	1,8	2,5	3,2	3,6	4,0
300		1,6	2,2	3,2	4,0	4,5	5,0
400		2,0	2,8	4,0	5,0	5,6	6,3
600		3,2	4,5	6,3	8,0	9,6	10,0
800		4,0	5,6	8,0	10,0	11,0	12,5
1 000	5,0	7,1	10,0	12,5	14,0	16,0	

NOTE 1 Linear interpolation is permitted between the nearest two points, the calculated spacing being rounded to the next higher 0,1 mm increment.

NOTE 2 For higher voltages Table 4 of IEC 60664-1 may be used.

NOTE 3 For REINFORCED INSULATION, the values for CREEPAGE DISTANCE are twice the values for BASIC INSULATION in this table.

NOTE 4 For explanation of the pollution degrees, see 13.1.

<sup>a</sup> No minimum CREEPAGE DISTANCES are specified for insulation in pollution degree 1. The minimum CLEARANCES apply, as determined in 13.3 or annex J.

→ 상기 table 은 기본절연만을 나타냅니다. 이중절연(또는 강화절연) 의 연면거리는 , 상기 표에서 구해지는 값의 x2 하시면 됩니다.

추가 연면거리는 상기 표의 보간법으로 계산하여 추가 하면 되고, 0.1mm 단위로 절상하라고 되어 있습니다. (상기 table 의 Note 1 참조.)

상기 표에서 동작전압이 100-240 V~ 이므로, 최소 절연거리(기본절연) 2.5mm 결정됩니다.

만약, transformer 의 양단간 동작전압이 273 Vrms 라면, 250 V 와 300 V 에서 보간법으로 계산하면 됩니다. 계산방법은, (3.2 - 2.5)거리 차이 / (300-250) 전압차 로 계산 됩니다.

계산결과 1 V 당 0.014 mm 가 추가 됩니다.

즉, 상기 table 은 250 V 기준이므로, 273-250 = 23 V 가 됩니다.

여기에 1 V당 0.014 mm 가 추가되므로, 23 x 0.014 = 0.322 가 추가됩니다.

계산결과: 250 V 일때 2.5 mm 였으므로, 2.5 mm + 0.322 mm = 2.822 mm 입니다.

Note 1 에서 0.1 mm 로 절상 하면, 2.9 mm 가 됩니다(기본절연). 그런데 transformer 는 강화절연 또는 이중 절연이므로 x2 를 하면 5.8 mm 이상이 최종 요구치가 됩니다.