

Dimensioning of creepage distances

The minimum surface insulation distance (creepage distance), i.e. "the shortest distance along the surface of the insulation material between two conducting parts" [IE 60664-1 development 1.3.3] for connectors is prescribed by standard **EN 61984** in **Table 6**. It is determined according to rated voltage, degree of pollution and insulating material group. The rated voltage providing access to Table 6 (rationalised voltage of the feed system) is determined in Table 3a of IEC 60664-1 for single phase two or three wire a.c. or three wire a.c. or d.c. systems or Table 3b for three-phase three or four wire a.c. systems. Usually for three-phase systems with 230V/400V rated voltage, the conventional line-to-line insulation voltage is 400V and the line-to-earth for TT or TN systems is 250V. For three-phase systems with 400V or 500V rated voltage the conventional line-to-line insulation voltage is respectively 400V and 500V.

The degree of pollution must be specified according to standard IEC 60664-1. It strongly influences the rated insulation voltage of a connector. Therefore, the rated insulation voltage of a connector should be reconsidered time by time for each degree of pollution.

TABLE 3a

Single phase two or three wire a.c. or d.c. systems (IEC 60664-1 Edition 1.0 - 1992-10)

Nominal voltage of the supply system ^{*)} V	Voltages rationalised for Table 4 for insulation	
	line-to-line ¹⁾	line-to-earth ¹⁾
	A	B
12.5	12.5	-
24	25	-
25	25	-
30	32	-
42	50	-
48	50	-
50 ^{**)}	50	-
60	63	-
30-60	63	32
100 ^{**)}	100	-
110	125	-
120	125	-
150 ^{**)}	160	-
220	250	-
110-220	250	125
120-240	250	125
300 ^{**)}	320	-
220-440	500	250
600 ^{**)}	630	-
480-960	1000	500
1000 ^{**)}	1000	-

TABLE 3b

Three-phase three or four wire a.c. systems (IEC 60664-1 Edition 1.0 - 1992-10)

Nominal voltage of the supply system ^{*)} V	Voltages rationalised for Table 4 for insulation		
	line-to-line ¹⁾	line-to-earth ¹⁾	
	A	C	D
63	63	32	63
110	125	80	125
120	125	80	125
127	125	80	125
150 ^{**)}	160	-	160
208	200	125	200
220	250	160	250
230	250	160	250
240	250	160	250
300 ^{**)}	320	-	320
380	400	250	400
400	400	250	400
415	400	250	400
440	500	250	500
480	500	320	500
500	500	320	500
575	630	400	630
600 ^{**)}	630	-	630
660	630	400	630
690	630	400	630
720	800	500	800
830	800	500	800
960	1000	630	1000
1000 ^{**)}	1000	-	1000

Legenda:

- A** = All systems.
B = Single phase three-wire systems with mid-point earthed.
C = Three-phase four-wire systems [secondary winding of a star distribution transformer] neutral-earthed²⁾.
D = Three-phase three-wire systems [secondary winding of a delta distribution transformer], unearthed¹⁾ or corner-earthed.

- 1) The phase-earth insulation for unearthed or impedance-earthed lines is equal to that between phases, because the operating voltage of any phase can, in practice, approach full voltage between the phases [line voltage]. This is because the actual voltage to earth is determined by the insulation resistance and by the capacitive reactance of each phase to earth. Consequently, a low (but acceptable) insulation resistance of a phase can, in effect, earth it and increase voltage to earth of the other two phases at full voltage between the phases [line voltage].
2) For equipment for use on both three-phase three-wire and three-phase four wire supplies, earthed or unearthed, use only the values for three-wire systems.

^{*)} Assuming a rated voltage of the equipment.

^{**)} These values correspond to the values given in Table 1.

With this voltage value, the pollution degree and the materials group the minimum creepage distance can be determined using **Table 6**.

TABLE 6

Minimum creepage distances (EN 61984 Edition 1.0 - 2001-11)

Rated voltage r.m.s. value a.c or d.c. V	Minimum creepage distances (mm)									
	Pollution degree									
	1	2			3			4		
see note ^{b)}	Material group			Material group			Material group			
	I ^{a)}	II	III	I	II	III ^{c)}	I	II	III ^{c)}	
63	0.2	0.63	0.9	1.25	1.6	1.8	2	2.1	2.6	3.4
80	0.22	0.67	0.95	1.3	1.7	1.9	2.1	2.2	2.8	3.6
100	0.25	0.71	1	1.4	1.8	2	2.2	2.4	3	3.8
125	0.28	0.75	1.05	1.5	1.9	2.1	2.4	2.5	3.2	4
160	0.32	0.8	1.1	1.6	2	2.2	2.5	3.2	4	5
200	0.42	1	1.4	2	2.5	2.8	3.2	4	5	6.3
250	0.56	1.25	1.8	2.5	3	3.5	4	5	6.3	7.5
320	0.75	1.6	2.2	3.2	4	4.5	5	6	7.3	8.6
400	1	2	2.8	4	4.5	5.3	6	7	8.5	10
500	1.3	2.5	3.6	5	6	7	8	9	11	13
630	1.8	3.2	4.5	6.3	8	9	10	11.1	13.6	16.1
800	2.4	4	5.6	8	9	10.5	12	13.8	17	20.2
1000	3.2	5	7.1	10	12	14	16	17	21	25

NOTE 1: The values for voltages ≤ 50V are supplied in IEC 60664-1, Table 4.

NOTE 2: The values in bold are reduced compared to those of Table 4 IEC 60664-1, in compliance with 2.4 of IEC 60664-1.

a) Materials group I or materials group II, III, where the possibility of tracking is reduced in conformance with the conditions of paragraph 3.2 of IEC 60664-1.

b) Materials group I, II, IIIa, IIIb

c) Materials group IIIb is not recommended for application with pollution degree 3 above 630V and with pollution degree 4.