

### Exemplary calculation

What voltage can be used, if the creepage, the installation category and the degree of pollution are known:

Creepage	1.2 mm		3.0 mm		8.0 mm	
Installation category	II		II		II	
Degree of pollution	2		2		2	
CTI-Value	< 400	> 400	< 400	> 400	< 400	> 400
Isolation group	III a/b	II	III a/b	II	III a/b	II
Rated voltage	50 V	160 V	250V	400 V	800 V	1,000 V
Nominal voltage of supply system	50 V	150 V	220 V	380 V	720 V	1,000 V

### How to identify the maximum voltage

1. Define the installation category
2. Define the degree of pollution expected
3. Select the rated impulse withstand voltage in kV from table 00.02
4. Select the voltage phase to earth derived from rated system voltages from table 00.01
5. Select the rated voltage from table 00.04
6. Define the number of phases and whether table 00.03 a or table 00.03 b is relevant for the application
7. Select the nominal voltage of supply system from table 00.03 a or 00.03 b
8. Select the lower voltage from point 4 and 7

Table 00.01

Voltages phase-to-earth derived from rated system voltages up to $U_{r.m.s.}$ and $U_-$	Rated impulse withstand voltages in kV for installation category (Voltage form: 1.2/50 $\mu$ s according to DIN IEC 60 060-1)			
	I	II	III	IV
50	0.33	0.50	0.80	1.5
100	0.50	0.80	1.5	2.5
150	0.80	1.5	2.5	4.0
300	1.5	2.5	4.0	6.0
600	2.5	4.0	6.0	8.0
1000	4.0	6.0	8.0	12.0

Table 00.02

Rated impulse withstand voltage in kV	Minimum clearances in mm up to 2000 m above sea level <sup>1)</sup>			
	Case A (Inhomogeneous field <sup>3)</sup> )		Case B (Homogeneous field <sup>2)</sup> )	
	Pollution degree		Pollution degree	
	1	2	1	2
0.33	0.01	0.2	0.01	0.2
0.50	0.04		0.04	
0.80	0.1		0.1	
1.5	0.5	0.5	0.3	0.3
2.5	1.5	1.5	0.6	0.6
4.0	3	3	1.2	1.2
6.0	5.5	5.5	2	2
8.0	8	8	3	3

<sup>1)</sup> For higher altitudes see table 2b from DIN VDE 0110 for multiplying factors.

<sup>2)</sup> Verification by an impulse voltage test is required if the clearance is less than the value specified for case A.

<sup>3)</sup> Point to plane.

Table 00.03 a. Single phase, three or two wire AC or DC systems

Nominal voltage of supply system <sup>1)</sup>	Rated voltage in V	
	Phase-to-phase All systems (between conductors of different polarity for U <sub>-</sub> )	Phase-to-earth
$U_{r.m.s.}$ or $U_-$ in V	$U_{r.m.s.}$ or $U_-$	$U_{r.m.s.}$ or $U_-$
12.5	12.5	—
24	25	—
25	—	—
30	32	—
42	—	—
48	50	—
50 <sup>2)</sup>	—	—
60	63	—
60/30	63	32
100 <sup>2)</sup>	100	—
110	125	—
120	—	—
150 <sup>2)</sup>	160	—
220	250	—
220/110	250	125
240/120	—	—
300 <sup>2)</sup>	320	—
440/220	500	250
600 <sup>2)</sup>	630	—
480/960	1000	500
1000 <sup>2)</sup>	1000	—

Table 00.03 b. Three phase, four or three wire AC systems

Nominal voltage of supply system <sup>1)</sup>	Rated voltage in V		
	Phase-to-phase	Phase-to-earth	
$U_{r.m.s.}$ in V	$U_{r.m.s.}$	$U_{r.m.s.}$	$U_{r.m.s.}$
60	63	32	63
110	125	80	125
120	—	—	—
127	—	—	—
150 <sup>2)</sup>	160	—	160
208	200	125	200
220	—	—	—
230	250	160	250
240	—	—	—
300 <sup>2)</sup>	320	—	320
380	—	—	—
400	400	250	400
415	—	—	—
440	500	250	500
480	500	320	500
500	—	—	—
575	630	400	630
600 <sup>2)</sup>	630	—	630
660	630	400	630
690	—	—	—
720	800	500	800
830	—	—	—
960	1000	630	1000
1000 <sup>2)</sup>	1000	—	1000

<sup>1)</sup> This voltage can be the same as the rated voltage of the equipment.

<sup>2)</sup> These values correspond to the values of table 00.01.

In countries where both star and delta, earthed and unearthed supply systems are used the values for delta systems only should be used. Systems earthed across impedances are treated as unearthed systems.

Table 00.04

Rated voltage (V) $U_{r.m.s.}$ or $U_-$	12.5	25	32	50	63	80	100	125	160	200	250	320	400	500	630	800	1000
Minimum creepage distance (mm)																	
Degree of pollution 1:																	
CTI group II + III a/b	0.09	0.125	0.14	0.18	0.2	0.22	0.25	0.28	0.32	0.42	0.56	0.75	1	1.3	1.8	2.4	3.2
Degree of pollution 2:																	
CTI group III a/b	0.42	0.5	0.53	1.2	1.25	1.3	1.4	1.5	1.6	2	2.5	3.2	4	5	6.3	8	10
CTI group II	0.42	0.5	0.53	0.85	0.9	0.95	1	1.05	1.1	1.4	1.8	2.2	2.8	3.5	4.5	5.6	7.1