

# Voltages in 3phase a.c. distribution systems above 1000 V

System IEC 60038		Equipment IEC 60071-1		
$U_n$ kV rms	$U_s$ kV rms	$U_m$ kV rms	ACWV kV rms	LIWV kV peak
3	3.6	3.6	10	20 40
6	7.2	7.2	20	40 60
10	12	12	28	60 75 95
15	17.5	17.5	38	75 95
20	24	24	50	95 125 145
30	36	36	70	145 170

- $U_n$  nominal system voltage
- $U_s$  highest voltage of a system, needed for estimation of  $U_c$
- $U_m$  highest voltage for equipment
- ACWV standard rated short-duration (60 s) power frequency withstand voltage of an equipment or insulation configuration
- LIWV standard rated lightning impulse withstand voltage of an equipment or insulation configuration, needed to check lightning impulse protection level  $U_{pl}$  of MO surge arrester
- SIWV standard rated switching impulse withstand voltage of an equipment or insulation

The above table is an extract of the more complete table given in Application Note Annex 1.1 A3. For practical use in distribution systems the above table is sufficient. The columns  $U_s$  and LIWV give the needed figures for the calculation of the continuous operating voltage  $U_c$  and for the needed lightning impulse protection level  $U_{pl}$  of the MO surge arresters.

The following commonly used voltage ranges are given for completeness, see also Application Note Annex 1.1 A3.

### System voltages acc. IEC 60038: IEC standard voltages

- Distribution:  
voltage range between  $U_s = 3.6$  kV and  $U_s = 40.5$  kV
- Sub transmission:  
voltage range between  $U_s = 3.6$  kV and  $U_s = 145$  kV
- Transmission:  
voltage range between  $U_s = 170$  kV and  $U_s = 1200$  kV

### Voltages for equipment acc. IEC 60071-1: Insulation co-ordination

- Range I:  
voltage range between  $U_m = 3.6$  kV and  $U_m = 245$  kV
- Range II:  
voltage range between  $U_m = 300$  kV and  $U_m = 1200$  kV

The APPLICATION NOTES (AN) are intended to be used in conjunction with the

#### APPLICATION GUIDELINES

##### **Overvoltage protection**

Metal-oxide surge arresters in medium-voltage systems.

Each APPLICATION NOTE gives in a concentrated form additional and more detailed information for the selection and application of MO surge arresters in general or for a specific equipment.

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