

Contents	Page
Foreword	6
1 Scope	8
2 Normative references	8
3 Terms and definitions.....	9
4 General requirements regarding earthing arrangements.....	15
4.1 Earthing arrangement functions.....	15
4.2 Planning and erection of earthing arrangements.....	15
5 Selection of earthing arrangements.....	16
5.1 General information, requirements and selection criteria	16
5.2 Types of earth electrodes	16
6 Execution of earthing arrangements	17
6.1 General	17
6.2 Ring earth electrode.....	17
6.3 Vertical earth electrode/earth rod.....	24
6.4 Radial earth electrode	28
6.5 Foundation earth electrode	29
6.5.1 General	29
6.5.2 Foundation earth electrode in the case of unreinforced foundations	31
6.5.3 Foundation earth electrode in the case of fibre-reinforced concrete	32
6.6 Earthing arrangement in the case of foundations with carbon-fibre reinforcement	32
6.7 Combining earth electrodes.....	33
6.8 Special designs	33
6.8.1 Earthing arrangements in the case of pad foundations.....	33
6.8.2 Earthing arrangements in the case of structures with partial basement	37
6.8.3 Earthing arrangements in the case of multiple mains connections.....	40
6.8.4 Charging equipment within the area influenced by the building's earthing arrangement.....	44
7 Requirements for a common bonding network (CBN).....	46
7.1 General	46
7.2 Common bonding network without suitable conductive parts of the reinforcement	48
7.3 Conditions for when a common bonding network is deemed not necessary	48
8 Terminals.....	49
9 Electrically conductive connections.....	50
10 Selection of materials and components.....	51
10.1 General	51
10.2 Ring earth electrode or radial earth electrode.....	52
10.3 Vertical earth electrode/earth rod.....	52
10.4 Foundation earth electrode	52
10.5 Common equipotential bonding conductor	52
10.6 Earthing conductor	52
10.7 Terminals.....	53
11 Checking compliance and documentation	53
11.1 General.....	53
11.2 Documentation.....	53
11.3 Resistance measurement.....	54
Annex A (informative) Supplementary information on the functions of an earthing arrangement.....	55
A.1 Earthing arrangement	55

A.2 Common bonding network.....	56
Annex B (informative) “Basic consideration for planning an earthing arrangement” form	57
Annex C (informative) Form for the documentation of an earthing arrangement.....	61
Annex D (informative) Decision guidance on the selection, planning and execution of the earthing arrangement.....	67
Annex E (informative) Additional information on foundations with enhanced earthing contact resistance.....	68
Annex F (informative) Information on the typical values of the soil resistivity.....	69
Annex G (informative) Resistances to earth of various earth electrodes	71
Bibliography	73

Figures

Figure 1 — Ring earth electrode in the case of a foundation with enhanced earthing contact resistance	19
Figure 2 — Spatial arrangement of the ring earth electrode and common bonding network.....	20
Figure 3 — Ring earth electrode and common bonding network in the case of thermal insulation (perimeter insulation) on the bottom side or the side walls of the foundation.....	22
Figure 4 — Ring earth electrode and common bonding network in the case of waterproof concrete (“white tank”) in a reinforced foundation	23
Figure 5 — Ring earth electrode and common bonding network in the case of bituminous waterproofing (“black tank”) in a reinforced foundation	24
Figure 6 — Vertical earth electrode/earth rod without common bonding network in the case of a foundation with enhanced earthing contact resistance and a building footprint $\leq 200 \text{ m}^2$.....	27
Figure 7 — Vertical earth electrode/earth rod with common bonding network in the case of a foundation with enhanced earthing contact resistance and a footprint of the foundation $\leq 200 \text{ m}^2$.....	27
Figure 8 — Equal arrangement of vertical earth electrodes/earth rods in the case of foundations with footprints $> 200 \text{ m}^2$ (Table 1)	28
Figure 9 — Arrangement of the foundation earth electrode	31
Figure 10 — Foundation earth electrode in unreinforced foundation.....	32
Figure 11 — Combination of earth electrodes.....	33
Figure 12 — Connection of pad foundations to an earthing arrangement with vertical earth electrodes/earth rods.....	34
Figure 13 — Connection of pad foundations to an earthing arrangement in the form of a ring earth electrode.....	35
Figure 14 — Connection of pad foundations.....	37
Figure 15 — Earthing arrangement in the case of buildings with partial basements, consisting of a meshed ring earth electrode and common bonding network	38

Figure 16 — Building with partial basement and without an earthing arrangement in the adjoining building	39
Figure 17 — Building with partial basement with an earthing arrangement in the adjoining building.....	40
Figure 18 — Arrangement of a ring earth electrode in the case of a building with several mains connections and a common earthing arrangement.....	41
Figure 19 — Arrangement of a ring earth electrode in terraced/semi-detached houses.....	42
Figure 20 — Arrangement of vertical earth electrodes/earth rods/radial earth electrodes in terraced/semi-detached houses.....	43
Figure 21 — Bridging of expansion joints with terminals (fixed earthing terminals) and flexible earthing conductors inside of structures.....	44
Figure 22 — Designs of earthing arrangements in the case of charging equipment	45
Figure 23 — Representation of a low-ohmic and low-impedance common bonding network	47
Figure 24 — Demarcation of the scope of DIN 18014	48
Figure 25 — Examples for additional terminals, if required.....	50
Figure D.1 — Decision guidance on the implementation of the earthing arrangement	67
Figure F.1 — Fluctuations of the soil resistivity ρ_E as a percentage depending on the time of year (without influence from precipitation).....	69
Figure F.2 — Impact of the length l of the extended surface earth electrode (m) on the resistance to earth (R_A)	69

Tables

Table 1 — Minimum number of vertical earth electrodes/earth rods depending on the footprint of the foundation	25
Table 2 — Minimum number of radial earth electrodes depending on the footprint of the foundation.....	28
Table B.1 — Basic consideration for planning an earthing arrangement in accordance with DIN 18014 (page 1)	57
Table C.1 — Documentation of an earthing arrangement in accordance with DIN 18014 (page 1).....	61
Table C.2 — Documentation of an earthing arrangement in accordance with DIN 18014 (page 2).....	65
Table F.1 — Soil resistivity for frequencies of technical alternating currents (range of values measured more frequently) based on source: DIN EN 50522 (VDE 0101-2):2011-11, Annex J, Clause J.1.....	70
Table G.1 — Typical values for resistances to earth of various building footprints in the case of different soil resistivities — for ring earth electrodes in accordance with 6.2 and foundation earth electrodes in accordance with 6.5.....	71

Table G.2 — Typical values for resistances to earth of various building footprints in the case of different soil resistivities — vertical earth electrodes/earth rods in accordance with 6.3 71

Table G.3 — Typical values for resistances to earth of earthing arrangements for various building footprints in the case of different soil resistivities — radial earth electrodes in accordance with 6.4 72