

CEEform plugs & receptacles

CEEform plugs and receptacles is the MENNEKES trade mark for CEE plugs and receptacles conforming to the following standards :-

- IEC 309-1
- IEC 309-2
- EN 60309-1
- EN 60309-2
- DIN VDE 0623
- DIN EN 60309-1/ VDE 0623 Part 1
- DIN EN 60309-1/ VDE 0623 Part 20

Applications

CEEform plugs and receptacles can and, under certain circumstances, must be used in industry, on building sites, in commerce, in agriculture, in parks, in damp and wet environments, outdoors, on boats and yachts, on camp sites, for dockside power supply installations (marinas), on works premises where there is a fire hazard, at market and fairground booths and for trailers and mobile homes.

Using Ceeform plugs and receptacles will usually enable planners and builders of electrical installations to satisfy the "regulations for the construction of power current installations with rated voltages of up to 1000 V" DIN VDE 0100.

Enclosures and Inserts

The enclosure and inserts of the currently available CEEform plugs and receptacles are moulded from Amaplast, a high quality thermoplastic material which is virtually indestructible. The long service life of the inserts means there is no need to keep a stock of spares.

MENNEKES supplies an additional product group with enclosures moulded from high quality plastic Amalan for use in areas where chemicals or other aggressive substances make Amaplast unsuitable.

CEEform plugs and receptacles with aluminium alloy enclosures are available for use in environments exposed to flying sparks or high thermal or mechanical stress.

Amaplast

This material has the following outstanding characteristics

- good electrical installation

Application

CEE plugs and receptacles are rated with operating voltage up to 690V DC or AC, frequency up to 500Hz and rated currents up to 125A, including plugs and receptacles for extra low voltage systems which have become standard all over the world. Basically suited to indoor and outdoor applications in industry, they are used also used on building sites, farms, commercial premises, caravans, mobile homes, boats, yachts and households. CEE plugs and receptacles are polarized and non-reversible.

Ambient temperature

CEE plugs and receptacles are suitable for ambient temperatures of -25°C to +40°C. Please contact us if your application involves ambient temperature outside of this range.

DIN EN 60309 terminology

The terms use in this catalogue to designate CEEform plugs and receptacles are in accordance with DIN EN 60309 part 1 (VDE 0623 part 1), section 2, 06.93. The illustration below shows how the CEE plugs and receptacles are used (DIN EN 60309 Part 1: 06.93 – Fig 1).

Rated current is the current designated by the manufacturer as suitable for the equipment.

Insulation voltage is the voltage designated by the manufacturer as suitable for the equipment and is the basis for particulars of voltage tests, creepage and clearance in the air.

Rated operating voltage is the rated voltage of the power source with which the equipment is to be used

Chemical resistance of combination units and wall mounted receptacles

For the production of combination units and wall mounted receptacles, we normally use a high quality polycarbonate material which has excellent optical and electrical insulating properties. It also has a good resistance to mechanical and thermal stresses.

However, in contact with very aggressive chemical materials, oils, leaches or solvents, there is a possibility that this polycarbonate material could be adversely affected. Therefore, under these very aggressive conditions we recommend the use of Amalan and engineering thermoplastic material with high resistance to

- virtually unbreakable
- wear resistant
- abrasion resistant
- dimensionally stable
- self extinguishing
- heat resistant
- highly resistant to cold
- resistant to ageing, seawater, oil and gasoline.

Amelan

This plastic combines high grade mechanical, thermal and electrical properties with excellent dimensional stability and resistance to chemicals.

Contact Material Small Parts

The contact tubes and pins are made of brass: the screws, springs, etc. are made of rust proof material or coated steel.

Characteristics of CEEform plugs and receptacles

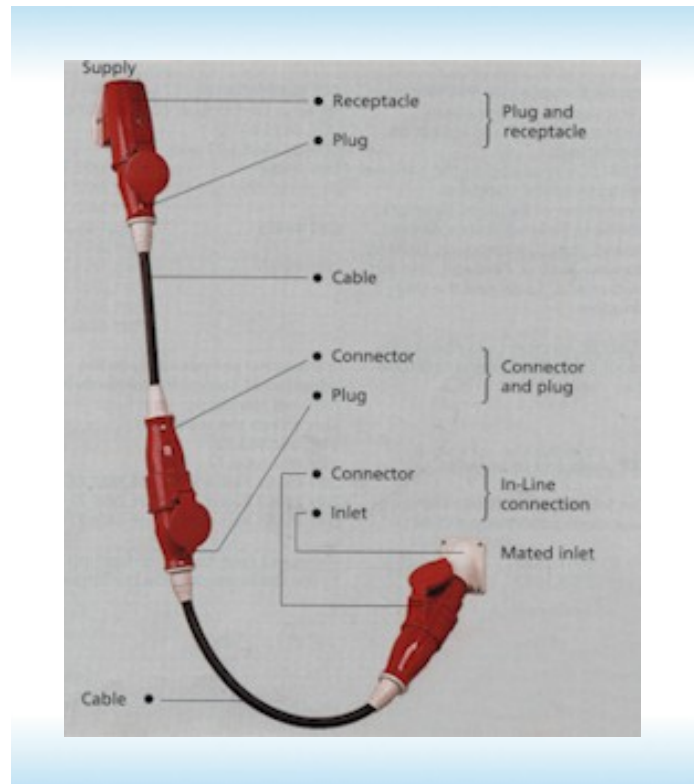
CEEform plugs and receptacles are distinguished by the following features which facilitate installation by utilising outstanding electrical and mechanical properties that keep maintenance costs to a minimum:

- Easy to install
- Very accessible wiring space
- Power screwdrivers can be used in installation
- Mostly fitted with posidrive screws (size 2)
- High contact pressure
- Low force required for insertion and withdrawal
- Low contact resistance, easy-to-grip plugs.

chemicals and detergents.

Cable Entries and Cable Glands

The product catalogue contains dimensional information on surface mounting accessories to include supply cable entries in PG (Panzer-Gewinde) sizes. As the European harmonisation programme progresses more and more MENNEKES products will be converted to include metric entries and it is therefore suggested that you contact your local MENNEKES subsidiary for information concerning products available in your country.



CEE plugs & receptacles for rated operating voltages in excess of 50V

Position of the ground contact

Plugs and receptacles with rated voltages above 50V must have a ground contact. To assure against incorrect insertion a nose on the plug fits into a keyway in the receptacle, ensuring that the ground contact pin or tube is correctly positioned in accordance with the required electrical standard.

The ground contact positions for the various frequencies and voltages are assigned a clockface position in accordance with Table 4 taken from the EN 60309-2:1992 (see below).

The diameter of the ground contact pin is larger than that of the phase contact pins, thus preventing any hazard arising from incorrect mating.

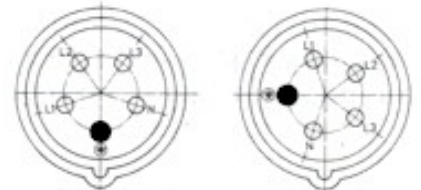
It must be impossible for the user to change the position (relative to the keyway) of the ground contact or of any neutral contacts.

It also must be impossible to install a plug insert in the casing of a receptacle or connector.

Position of ground contact tube with respect to major keyway for various voltages and frequencies, designated by clockface positions in accordance with table 104 taken from EN 60309-2:1992.

| Type | Frequency Hz | Rated operating voltage V | Position of ground contact ¹⁾ | |
|------|--------------|----------------------------|--|---------------------|
| | | | 16/20 A 32/30 A | 63/60 A 125/100A |
| 2P+E | 50 & 60 | 100 to 130 | 4 | 4 |
| | | 200 to 250 | 6 | 6 |
| | | 380 to 415 | 9 | 9 |
| | | 480 to 500 | 7 | 7 |
| | 60 | With isolating transformer | 12 | 12 |
| | | 277 | 5 | 5 |
| | 100 to 300 | above 50 | - | - |
| | | above 300 to 500 | 2 | - |
| | DC | above 50 to 250 | 3 | 3 |
| | | above 250 | 8 | 8 |
| 3P+E | 50 & 60 | 100 to 130 | 4 | 4 |
| | | 200 to 250 | 9 | 9 |
| | | 380 to 415 | 6 | 6 |
| | | 480 to 500 | 7 | 7 |
| | 60 | 600 to 690 | 5 | 5 |
| | | 440 to 460 ²⁾ | 11 | 11 |
| | 50 | 380 | 3 | - |
| | | 440 ³⁾ | 3 | - |
| | 100 to 300 | above 50 | 10 | - |
| | | above 300 to 500 | 2 | - |

Examples:



400V= 6 o'clock
230V= 9 o'clock
Front view of receptacle

1) The position of the ground contact is given as clockface number.

2) Mainly for marine installations.

3) Only for refrigerated containers (ISO standard).

Positions marked with a dash (-) are not standardized

| | | | | | |
|------------------|--|----------------------------------|--------|--------|--|
| 3P+N+E | 50 & 60 | 57/100 to 75/130 | 4 | 4 | |
| | | 120/208 to 144/250 | 9 | 9 | |
| | | 200/346 to 240/415 | 6 | 6 | |
| | | 277/480 to 288/500 | 7 | 7 | |
| | 60 | 347/600 to 400/690 | 5 | 5 | |
| | 50 | 250/400 to 265/460 ²⁾ | 11 | 11 | |
| | 60 | 220/380 | 3 | - | |
| | 100 to 300 | 250/440 ³⁾ | 3 | - | |
| | above 300 to 500 | above 50 above 50 | - 2 | - 2 | |
| All Types | All rated voltages and all frequencies not covered by other configurations | | 1 | 1 | |

CEE plugs & receptacles for rated voltages of up to 50V (low voltage)

Since no ground contact is required in plugs and receptacles of rated voltage up to 50V, two keyways instead of one are let into the collar. These are accordingly termed the major and minor keyways. The major keyway is always positioned at 6 o'clock. Depending on voltage and frequency values, the minor keyway is always in accordance with table 103 taken from EN 60309-2:1992.

The contact tubes of receptacles and connectors with rated voltages of up to 50V must be arranged as shown in EN 60309-2:1992, standards sheet 2-VIII (and in the following drawings).

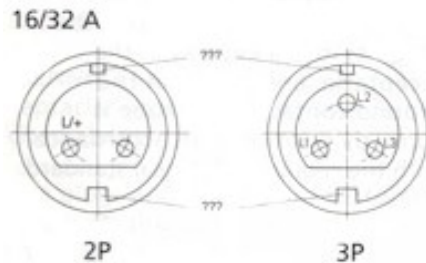


Diagram: The minor keyway at 12 o'clock in receptacles and connectors U=40 tot 50 V, 50 to 60Hz.

Position of minor keyway (major keyway 6 o'clock) for various voltages and frequencies using clockface positions in accordance with Table 103 from EN 60309-2: 1992.

| Rating operating voltage of plug or receptacle in V | Frequency Hz | Clockface position of keyway (major keyway = 6 o'clock) | Position 1, 8, 9 are reserved for future standards. For design reasons the positions 5, 6 and 7 are not available for use. |
|---|---------------|---|---|
| 20 to 25 | 50 and 60 | no minor keyway | |
| 40-50 | 50 and 60 | 12 | |
| | 100-200 | 4 | |
| 20 to 25 and 40 to 50 | 300 | 2 | |
| | 400 | 3 | |
| | above 400-500 | 11 | |
| | DC | 10 | |

Interlocks & breaking capacity

Plugs and receptacles without interlocks must have an adequate breaking capacity (i.e., it must be possible to insert and withdraw them in the manner specified and as often as specified. After testing they must exhibit no damage that would impair further use and the holes for the plug contacts must not exhibit any substantial sign of damage.

Receptacles and connectors that do not meet the test requirements for breaking capacity and service characteristics must be fitted with an interlock.

An interlock is a mechanical or electrical device which ensures that a plug cannot be inserted or withdrawn with the power switched on.

A distinction is made between interlocked plugs and receptacles with:

- mechanical interlocks,
- electrical interlocks.

In the case of receptacles and connectors $\geq 63/60$ it is a requirement of EN 60309-2 that a distinction must be made between products used with and without interlocks.

As MENNEKES plugs and receptacles possess an adequate breaking capacity, the standard $\geq 63/60A$ versions come with short contact tubes and no pilot contacts. In the 63A and 125A versions the short contact tubes meet the finger-touch requirements of VBG 4.

Receptacles and connectors $\geq 63/60A$ for electrical interlocking (standard order number + index P, e.g., 1454 P) are fitted with long contact tubes and pilot contact for leading and lagging. The interlock makes up for the lack of finger-touch safety.

Plugs and receptacles with mechanical interlocks

The mechanical interlock of a plug and receptacle with a rated operating voltage greater than 50V must conform to EN 60309-2:1992, standards. The mechanical switch of mechanically interlocked receptacles or connector must not be operational until the proper plug has been inserted.

The built in switches for mechanical interlocks on switched AC receptacles must have a breaking capacity conforming at the least to DIN VDE 0660 Part 107, utilisation category AC22. The breaking capacity must be suitable for the appliance connected.

switch is actuated by the pilot pin of the plug. The advantage of this solution is that the pilot tube itself is not live (PCS interlock).

Plugs & receptacles for isolating & switching purposes

DIN VDE 0100 Part 460 requires provision to be made for the isolation of any electrical circuit from the live conductors of the power supply. This also applies to any electrical equipment that has to be isolated from the power supply by means of a built-in or assigned switch. The terms 'isolate' and 'disconnect' are both used in this context. Electrical equipment usually has to be isolated from the main supply when mechanical or electrical maintenance is carried out.

According to DIN VDE 0100 Part 537 plugs and receptacles isolating all conductors are suitable for the disconnection of power for maintenance purposes if they are able to switch off the current load to the electrical equipment in question. A plug and receptacle connection is a simple way of satisfying the requirement for 'visible isolation'.

Shock hazard protection

Shock hazard protection must be assured in accordance with EN 60309-1:1992 Section 9 by designing plugs and receptacles in such a way that when engaged properly, no live parts are exposed to touch.

It must also be impossible to establish a connection of plugs and connectors while any of the plug contacts are exposed to touch.

Neutral contact tubes and pilot contacts of receptacles and connectors are deemed to be live parts.

Protection type

Plugs and receptacles are classified according to the degree of protection against the entry of moisture:

- No special protection = IPX0
- Splashproof = IPX4
- Watertight = IPX7

Information on the IP codes are to be found in IEC 529, EN 60529:1991, DIN VDE 0470 Part 1/11.92.

Plugs and receptacles with electrical interlocks

In the case of plugs and receptacles with a rated current \geq 63/60A and a rated voltage of more than 50V a built-in pilot contact can be used to switch off power to the receptacle and connector (cat. No. + Index 'P'). The requisite switch can either be built into the receptacle itself or the appropriate sub-circuit distribution board. In receptacles with an integrated auxiliary switch fitted behind the pilot tube, the

Having been properly installed, receptacles and connectors must provide the degree of protection designated by the rating when the plug is not inserted. In addition to this, when the plug or inlet is fully inserted in the receptacle or connector the lower degree of protection must be assured.

Plugs and receptacles with rated currents of 60/63A must be IP X4 (splashproof) or IP X7 (watertight). Plugs and receptacles with rated currents of 100/125A must be IP X7 (watertight).

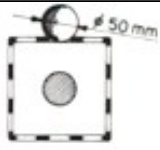
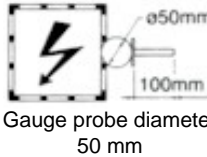
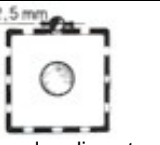
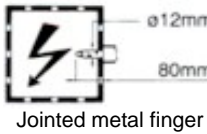
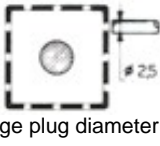
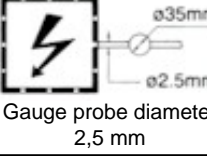
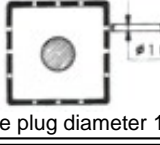
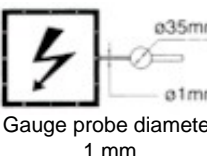
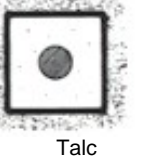

CEEform plugs & receptacles

Brief particulars of standards,
regulations & guidelines

IP protection types for enclosures (in accordance with EN 60529)

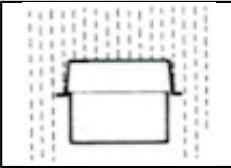
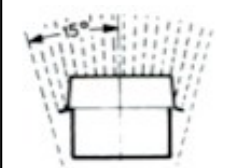
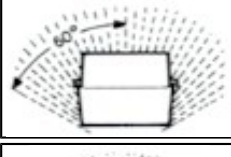
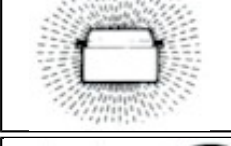
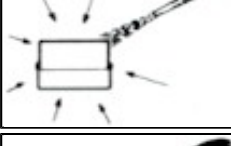
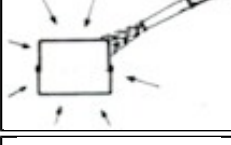
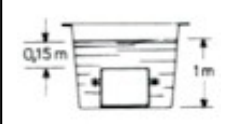
1st number of code

Protection against the ingress of foreign bodies and shock hazard protection

| Code | Description | | | |
|----------|---|--|----------------------------------|--|
| | Enclosure protected against ingress of: | Test | Protection against contact with: | Test |
| 0 | | | | |
| 1 | Solid body larger than 50mm |  Gauge plug diameter 50 mm | Back of hand |  Gauge probe diameter 50 mm |
| 2 | Solid body larger than 12,5mm |  Gauge plug diameter 12,5 mm | Finger |  Jointed metal finger |
| 3 | Solid body larger than 2,5mm |  Gauge plug diameter 2,5 mm | Tool |  Gauge probe diameter 2,5 mm |
| 4 | Solid body larger than 1mm |  Gauge plug diameter 1 mm | Wire |  Gauge probe diameter 1 mm |
| 5 | Dust in Harmful quantities |  Talc | | |
| 6 | Dust overall |  Talc | | |

2nd number of code

Protection against the ingress of moisture


| Code | Description | |
|----------|---|---|
| | Protection against adverse effects from: | Test |
| 0 | | |
| 1 | Drop of water falling vertically |  |
| 2 | Drop of water falling vertically on enclosure inclined by up to 15° |  |
| 3 | Water spray |  |
| 4 | Splash water |  |
| 5 | Water jet |  |
| 6 | Strong water jet |  |
| 7 | Temporary immersion |  |


If 125/100A receptacles are fastened to an enclosure or form a structural unit with it, the entire assembly can be IP X4.

For the watertight versions a bayonet system has been standardized in order to simplify use even under rough working conditions.

The following symbols must be used to denote the type of protection afforded.

No special protection = IP X0 or no symbol

Splashproof = IP X4 or 

Watertight = IP X7 or 

Retaining device

A retaining device is a mechanical device which, after a plug or connector has been inserted, holds it in position and prevents inadvertent withdrawal.

Plugs and receptacles must be equipped with retaining devices as shown in Table 109 taken from EN 60309 -:1992.

| Rated Current (A) | Receptacles and connectors | | | | Plugs and inlets | | |
|--------------------------|----------------------------------|-----------------------------|-----------------------------------|-----------------------|-------------------------------|-----------------------------------|---------------------|
| | Moisture protection | Retaining device | Standards sheet | | Retaining device | Standards sheet | |
| | | | Rated operating voltage over 50 V | up to 50V | | Rated operating voltage over 50 V | up to 50V |
| 16/20 & 32/30 | IP X0 (no special protection) | Locking clip or hinged lid | 2-I continuation 1 | 2-VIII continuation 1 | Nose or groove | 2-II continuation 1 | 2-IX continuation 1 |
| | IP X4 (splashproof) | Hinged lid | 2-I continuation 1 | 2-VIII continuation 1 | Nose or groove | 2-II continuation 1 | 2-IX continuation 1 |
| | IP X7 (watertight) | Bayonet system | 2-I continuation 2 | 2-VIII continuation 2 | Nose or groove & bayonet ring | 2-II continuation 2 | 2-IX continuation 2 |
| 63/60 | IP X4 (splashproof) | Hinged lid & bayonet system | 2-III continuation 1 | – | Nose or groove | 2-IV continuation 1 | – |
| | IP X7 (watertight) | Bayonet system | 2-III continuation 2 | – | Bayonet ring | 2-IV continuation 2 | – |
| 125/100 | IP X7 (watertight) ¹⁾ | Bayonet system | 2-III continuation 2 | – | Bayonet ring | 2-IV continuation 2 | – |

¹⁾ If 125/100 A receptacles are fastened on an enclosure of form a structural unit with it the entire assembly can be IPX4.

Markings and symbols in accordance with EN 60309-1:1992; section 7

The following information must be marked on plugs and receptacles:

Rated current in amperes

Rated operating voltage(s) or voltage range(s) in volts

Symbol denoting type of current if the plug or receptacle is not rated for both AC and DC or if it is rated for AC with frequencies other than 50 or 60 Hz or if voltage is different for AC and DC

Rating frequency if over 60 Hz

Name and trademark of manufacturer or dealer

Type reference or Part Number

Symbol denoting protection type, if any

Symbol indicating the position of the ground contact or keyway(s) if any

Optionally, insulating voltage may be indicated

The following symbols are used:

A - Ampere

V - Volt


Hz - Hertz

~ - Alternating current

≡ - Direct current















 - Ground

IP X0 or no symbol - no special protection

IPX4 or  - splashproof

Colour coding

If, in addition to the regulation markings, the rated operating voltage is also indicated by a colour coding, this must be in accordance with DIN EN 60309-1:1992, Table 2):

| Rated operating voltage | | Colour code | |
|-------------------------|--------|---|---|
| 20 to 25V | Purple |  |  |
| 40 to 50V | White |  |  |
| 100 to 130V | Yellow |  |  |
| 200 to 250V | Blue |  |  |
| 380 to 480V | Red |  |  |
| 500 to 690V | Black |  |  |
| over 60 to 500Hz | Green |  |  |

The enclosure of CEEform plugs and receptacles are in standard electric grey RAL 7035 and/or the colour indicating rated operating voltage in accordance with the coding given in EN 60309-1:1992.

The following illustration shows enclosures in basic electric grey and/or code colours on part (e.g. the lid) or

IP X7 or  - watertight

the whole of the enclosure.

These markings are easily visible of CEEform plugs and receptacles after installation and connection and when in service as prescribed by the manufacturer.

The marking indicating insulation voltage is on the insert and not visible after insulation and connection and when in service as prescribed by the manufacturer.

CEEform plugs & receptacles

Brief particulars of standards,
regulations & guidelines

Applicable law

Federal and state government and the various employers' liability insurance associations issue requirements pertaining to the safety and design of electrical equipment. As part of the information provided by this catalogue it seems appropriate to print the following extracts.

Future harmonisation with new EU legislation is likely to make current safety requirements more stringent rather than otherwise.

Second ordinance on the implementation of the Energy Management Act, status January 1, 1987

Excerpt:

Article 1

- The generally accepted rules of engineering practice are to be observed in the construction and upkeep of systems for the generation, transmission and supply of electricity. Departures from the generally accepted rules of engineering practice are only permitted if the same degree of safety is assured by other means. To the extent that European Community rulings require systems to conform to the state of safety engineering given in the community, the said state of safety engineering shall prevail.
- Adherence to the generally accepted rules of engineering practice or the state of safety engineering given in the European Community shall be assumed if the regulations of the Association of German Electrical Engineers (VDE) are observed. Adherence to the state of safety engineering given in the European Community shall also be assumed if the regulations of a comparable body in the European Community are observed which have been accorded recognition under Council of the European Communities guideline 73/23 EEC – low voltage guideline – dated February 19, 1973.

Excerpt:

- This shall in no way affect the applicability of any requirements of law which extend further.

Ordinance on the general terms and conditions for

Article 3

- "The employer must ensure that electrical plant and equipment is only installed, altered and maintained by a qualified electrician or under the supervision of a qualified electrician in accordance with the rules of electrical engineering practice. The employer must also ensure that the electrical plant and equipment is operated in accordance with the rules of electrical engineering practice.

The appendix to the instructions for the implementation of these regulation lists, among other things, the regulations VDE 0100, VDE 0101, VDE 0105, VDE 0620 and VDE 0623.

In connection with the Safety of Appliances Act a **"joint declaration"** was made on April 25, 1978 by the top representative bodies of trade and industry. The aim of the joint declaration is to prevent appliances with safety defects that have already been supplied to the trade from reaching the consumer. To this end, contracts on the supply of work equipment are to include basic provisions entitling the purchaser to require the manufacturer to, at his option, remedy the safety defect or replace or accept return of the work equipment.

The laws, ordinances and accident prevention regulations all make reference to the VDE regulations. When action is taken by public authorities or the employers' liability insurance association inspectors, they take full account of the VDE regulations.

Conscientious observation of the VDE regulations is accordingly imperative. When purchasing appliances of the kind featured in this catalogue trade, industry, electricians and users are well advised to check that their supplier can be depended on to pay due attention to adherence to VDE regulations.

Disclaimer

While correct to the best of our knowledge on December 1, 1997, this information is in no way binding.

References:

IEC Publications, EN standards and VDE regulations are available from

VDE-Verlag GmbH

Bismarckstrasse 33

electricity supply to customers at fixed rates (AVBEItV) dated June 21, 1979.

Excerpt:

Article 12

- All materials and equipment used must conform to the state of safety engineering given in the European Community. The mark of an officially accredited test centre (e.g., VDE symbol, GS symbol) indicates that these conditions have been fulfilled.

First ordinance on the Work Equipment Act dated June 11, 1979

Excerpt:

Article 9

- 1. Manufacturers or importers of electrical equipment which is work equipment or part thereof may only exhibit or mark such equipment if the electrical equipment conforms to the state of safety engineering given in the European Community.

European Community Low Voltage Guideline dated February 19, 1973 (EEC 73,23)

Excerpt:

Article 2:

- The member states they shall take all expedient measures to ensure that electrical equipment is only put on the market if – in conformity with the state of safety engineering given in the community – it is manufactured in such a way as not to jeopardise the safety of persons, livestock or property when properly installed, maintained and used in accordance with the prescriptions of the manufacturer.

Accident prevention regulation "Electrical Plant and Equipment" (VBG 4) dated April 1, 1979

Excerpt:

Article 2

- Sentence 1 "The rules of electrical engineering in the sense of this accident prevention regulation and the generally accepted rules of electrical engineering practice as provided in the VDE regulations to which the employers' liability insurance associations refer in their information bulletin."

Article 3

D-10625 BERLIN;

Laws, ordinances and EU guidelines (EEC, EC) are available from

Deutsches Informationszentrum

(DITR) im DIN

Burggrafenstrasse 6

D-10772 BERLIN

Power current systems-terminology and network forms

Terminology

Excerpt from DIN VDE 0100 part 200/11.93

Power current systems are electrical systems with equipment for the generation, conversion, storage, transmission, distribution and consumption of electrical energy with the aim of doing work – e.g., in the form of mechanical work, the production of heat or light or in electrochemical processes (A 1.1)

The **distribution network** consists of all lines and cables from the power generator to the load (A 1.2)

The **house connection** box is the interface between the distribution network and the load. Overcurrent protection devices, isolator blades, switches or other connecting and disconnecting devices can be fitted in the house connection box DIN VDE 0100 Part 732/11.90)

The **load** is defined as all electrical equipment connected downstream from the house connection box or, in the absence of the latter, downstream from the output terminals of the last distributor before the outlets (A.1.4).

Main circuits contain equipment for generation, conversion, distribution, switching and consumption of electrical energy (A 1.5.1)

Auxiliary circuits are for supplementary functions comprising, for example, control, signalling and measured circuits (A 1.5.2)

House installations are power current systems with rated voltage of up to 250V for private household or systems which resemble these in scope and nature (A 1.8)

Electrical equipment. All equipment used for the purpose of generation, conversion, transmission, distribution and application of electrical energy, e.g.,

- "The employer must ensure that electrical plant and equipment is only installed, altered and maintained by a qualified electrician or under the supervision of a qualified electrician in accordance with the rules of electrical engineering practice. The employer must also ensure that the electrical plant and equipment is operated in accordance with the rules of electrical engineering practice.

machinery, transformers, switching, measuring and protective devices, lines and cables and electrical appliances (2.7.1)

Mobile equipment is equipment that can easily be moved from one place to another while connected to the power supply (2.7.4)

CEEform plugs & receptacles

Brief particulars of standards,
regulations & guidelines

N = Neutral Conductor

PE = Protection-Earth

PEN = Protection-Earth-Neutral

T = Terre = Earth

I = Insulation

S = Separated (separated neutral & ground)

C = Combined (combined neutral & ground)

(images to come....)

Phase conductors – L1, L2, L3 – are conductors which connect the power sources with the loads but do not originate in the centre or start point (A 3.1)

The **neutral connector** – N – is a conductor connected to the centre or star point which is able to assist in the transmission of electrical energy (2.1.3)

The **protective ground** – PE – is a conductor providing protection against electric shock which is connected to any of the following parts: bodies forming part of electrical equipment; conductive objects which are not a part of the electrical equipment; main ground terminal; ground electrode; grounded point of power source or artificial start point (2.4.5).

The **PEN-conductor** is a conductor which combines the functions of the neutral and protective ground conductor (2.4.6)

Live part. Any conductor or conductive part which normally carries voltage including the neutral conductor but not the PEN conductor (2.3.1)

Network forms. Excerpt from DIN VDE 0100 Part 300/11.85.

Network forms are identified with the following abbreviations depending on their type (AC, DC), number of live conductors and ground connection:

First letter: - grounding of the power source (6.2)

T – Direct grounding at one point

I - Insulation of all live parts from ground or connection of one point to ground via an impedance.

Second letter: - grounding of the bodies of electrical installation

T - Body directly grounded irrespective of the grounding to one point of the power source

N - Body connected directly to the system ground (in AC systems the grounded point is normally the star point).

Further letters: - arrangement of the neutral conductor and the protective ground conductor in TN networks:

S - Separate neutral and protective ground conductors;

C - Neutral and protective ground in a single conductor

(PEN-conductor)

TN networks: In TN networks one point is grounded directly (system ground); the bodies of the electric installation are connected to the point by PE or PEN conductors.

The three types of TN networks are differentiated by their neutral and protective ground arrangements (6.2.1):

TN-S network - Separate neutral and protective ground conductors throughout the network.(fig.6)

TN-C network - Neutral and protective ground in one conductor throughout the network.(fig.7)

TN-C-S network - Neutral and protective ground in a single conductor (PEN conductor) in Part of the network. (fig. 8)

TT network - In a TT network one point is directly grounded (system ground); the bodies of the electrical insulation are connected to ground electrodes that are separate from the system ground. (fig.9)

IT network - The IT network has no direct connection between the live conductors and grounded parts; the bodies of electrical installation are grounded. (fig.10)