Of the many thousands of standards published by STANSA, SANS 164 must be one of the most scrutinised and one which we're in daily contact. It is the South African Plugs and Socket outlet standard for use in households, offices and commercial buildings, the common-or-garden plug!

SANS 164 standards: a working group perspective

Information from Crabtree

Not many are aware that these standards are written by technical people with a view to ensuring that the products are safe to use and do not create hazards to the environment, particularly the close proximity within which they are used.

Our working group was formed as a result of the activities of Technical Sub committee 67C: Electrical Accessories, which is one of the 31 STANSA Electrical Standards Committees dealing with every component used in electrical distribution systems and electrical installations. The task was to review the standards of the various plugs and socket configurations in use in South Africa.

Members of this group were invited from industry. They were manufacturers, consultants and standards experts and regulators, all with different views and needs, so it is reasonable to assume that working group meetings are often heated, lengthy, and controversial; it is difficult to achieve consensus. In some cases a simple five-word paragraph can produce hours of discussions (arguments), days of tests and analysis and months of delays.

The National Standards for Plugs and Socket Outlets consists of a set of eight standards, adhering to the internationally accepted IEC 60884-1: Plugs and socket outlets for household and similar purposes – part 1: General rules.

Here is a brief summary of these standards with some background, what they cover and their application in our electrical installations.

Fig. 1: WG members: Standing: C. Lancaster, N. Bosch, G. Campetti (Convenor), F. Nkosi; Seated: H. Spies, C.Gerasis, P. Rogers.

SANS 60884-1: Plugs and socket outlets for household and similar purposes – part 1: General rules

This standard sets out all the electrical and physical requirements for plugs and socket outlets, but does not specify the shape and configuration of the product. This differs from country to country around the world – over 50 variations of contact configurations and entry designs, all of which are summarised in IEC 60083. Most countries have at least two: an earthed system – 3 pins (For class 1 equipment) and an unearthed system – 2 pins (For class 2 equipment). A further variation is in the operating voltage, so there are both 110 V (125 V) and 220 V (250 V) systems, and even systems for extra low-voltage below 50 V.

To cater for the detailed description of the plug and socket, each country has established "standard sheets" that define the configuration of contacts, outer shape and dimensions. However, irrespective of the standard sheets, all common characteristics comply with IEC 60884. South Africa adopted IEC 60884 in 1994 and has chosen to publish its data sheets in the SANS 164-X series of documents, describing a family of nine configurations.

Configurations

SANS 164-0: Plugs and socket outlets for household and similar purposes for use in South Africa – part 0: General, and safety requirements.

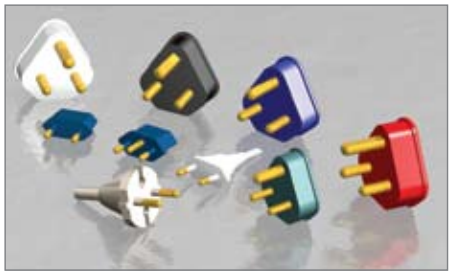

Fig. 2: SANS 164 - Family of plugs with 9 configurations

The general requirements link the entire 164 series to the 60884-1 document. It deals with several characteristics, common throughout the series, such as:

- Sockets are to be of the "increased protection" type, i.e. they must be fitted with safety shutters.
- There is a clause dealing with surge protection.

SANS 164-1: Plugs and socket outlets for household and similar purposes for use in South Africa – part 1: Conventional system, 16 A 250 V AC.

The most common plug and socket in use in South Africa originated from the old British system BS 546, with some small differences in pin lengths. It has been in use for the past 80 years, metricated in 1953 and revised in 1980.

Britain replaced this standard with the "flat pin" fused plug BS1363 in 1947.

With the adoption of IEC 60884, one of the most significant changes is the permissible use of hollow pins.

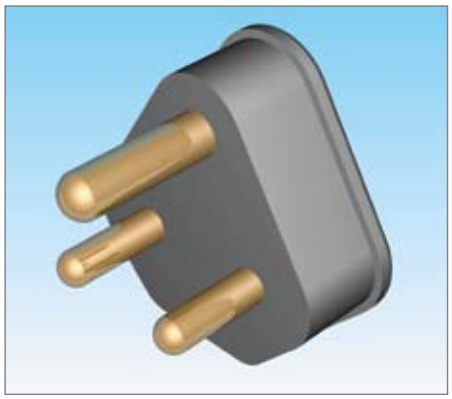

Fig. 3: SANS 164-1: 16A

SANS 164-2: Plugs and socket outlets for household and similar purposes for use in South Africa – part 2 : IEC System, 16 A 250 V AC.

In the 1980s, SA decided to introduce the IEC worldwide plug and socket system, based on IEC 60906:1986, which had been under development by the international community since 1966.

Arguably the safest system in the world, the socket outlet is used in SA because it accommodates cell phone chargers and two-pin Europlugs fitted to small power devices such as hair dryers etc.

The main feature of its design is that the socket is shuttered and has a 12 mm pocket which makes it impossible to touch a live pin during plug insertion.

SANS 164-2 also caters for a 16 A, two-pin system that is extensively used in adaptors and is intended for Class II appliances and power tools.

The standard allows the connection of an unearthed plug into an earthed socket but not vice versa. It is dangerous when an appliance that requires a protective earth is unearthed - under fault conditions, this could cause a fire or electrocution.

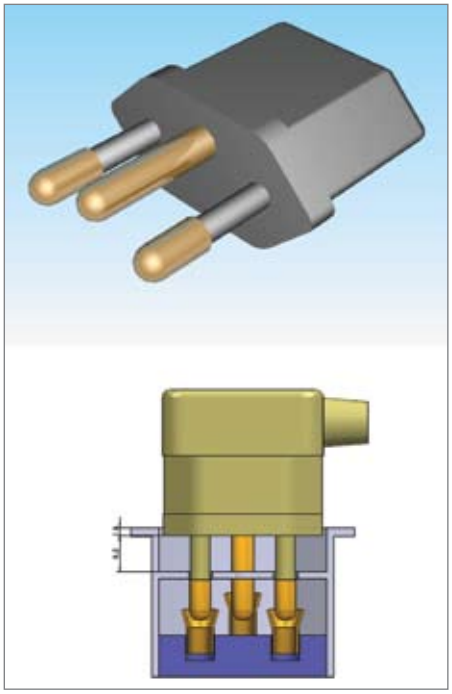

Fig. 4: SANS 164-2: 3 pin

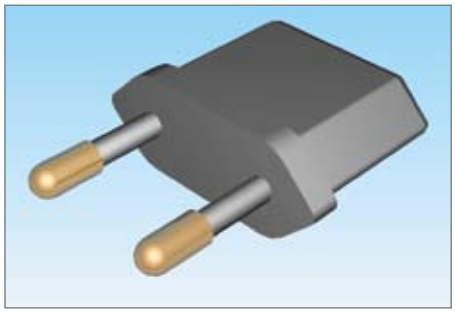

Fig. 5: SANS 164-2: 2 pin

SANS 164-3: Plugs and socket outlets for household and similar purposes for use in South Africa – part 3: Conventional System, 6 A 250 V AC.

The 6 A plug and socket has also been in use for the past 80 years, now used extensively for the connection of luminaires, in its non-rewireable form.

The 6 A, two-pin version was dropped five years ago, together with the two-pin "flat faced" socket that was commonly found on adaptors. As plug circuits are rated at 16 A and protected by a 20 A circuit breaker, this system fell out of favour for fixed installations.

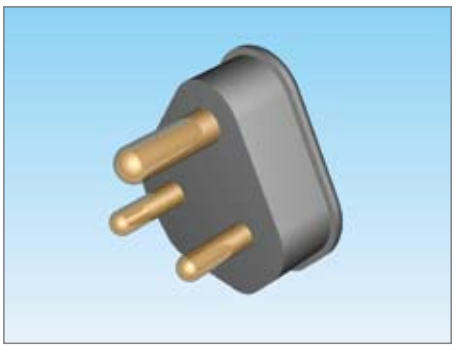

Fig. 6: SANS 164-3: 6A

SANS 164-4: Plugs and socket outlets for household and similar purposes for use in South Africa – part 4: Dedicated System, 6 A 250 V AC.

Dedicated systems are used for the connection of equipment such as computers to special power supplies that have uninterruptible or "clean power" characteristics, either from a special transformer or a battery/inverter system that takes over in the case of a power failure. This system was patented by a South African manufacturer and its use was authorized in terms of RCC certificates. In 2006 the national standard was published for the first time.

The dedicated earth pin has three possible types, determined by the rotational position of the flat portion: i.e

−53° = Black,
0° = Red
+53° = Blue.

Colour nomenclature is also an integral requirement.

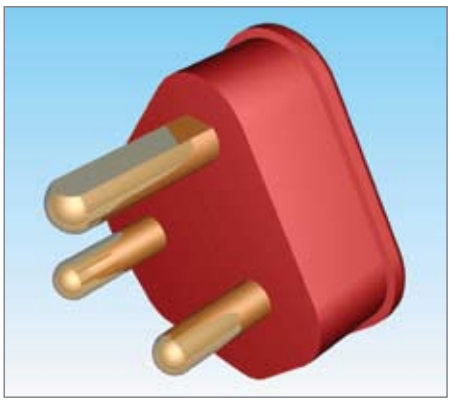

Fig. 7: SANS 164-4: Red 0°

The main advantage of this system is that the dedicated plugs cannot be interchanged (within the dedicated configurations) but may be inserted into the standard (non-dedicated) system – SANS 164-1.

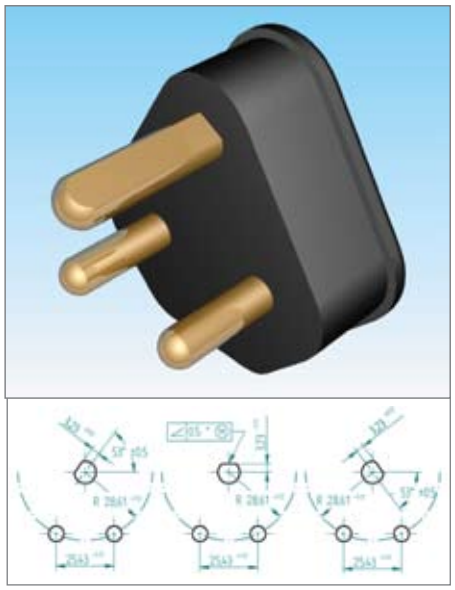

Fig. 8: SANS 164-4: Black -53°

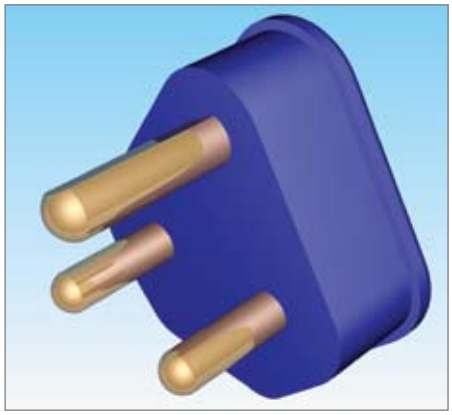

Fig. 9: SANS 164-4: Blue +53°

SANS 164-5: Plugs and socket outlets for household and similar purposes for use in South Africa – part 5: Two-pole, non-rewireable plugs, 2,5 A 250 V AC, with cord, for connection of class II equipment.

A 2,5 A plug of the Europlug design has smaller diameter contact pins than those in the 16 A (SANS 164-2) version and is extensively used in cell phone chargers. It is compatible with SANS 164-2 and SANS 164-6; both standards make provision for contact integrity between the two pin sizes.

However because of the compatibility of plugs of a higher current rating, a 2,5 A socket has not been allowed for obvious reasons.

The use of this plug is limited to a non-rewireable type.

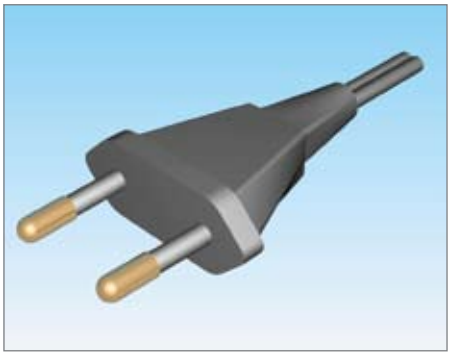

Fig. 10: SANS 164-5: 2 pin 2,5A

SANS 164-6: Plugs and socket outlets for household and similar purposes for use in South Africa – part 6: Two-pole systems, 16 A 250 V AC, for connection of class II equipment.

The Schuko system, which is common to many European countries, has been the subject of many heated debates to the point where the minister published a mandatory prohibition on the use of the earthed plug (VC8008: 1994). The main reason lies in the fact that many unearthed two-pin adaptors will accommodate an earthed plug, with potentially dangerous consequences.

A two-pin (earthed and unearthed) socket is allowed in adaptors and also in fixed installations.

The standard is taken from CEE 7/17 and the use of this plug is limited to a non-rewireable type.

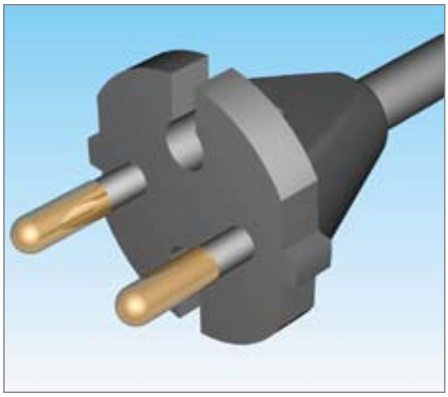

Fig. 11: SANS 164-6: 2 pin 16A

The future?

There are many who complain that we have far too many configurations in our relatively small country. Why not standardise on the British or German system, or Australia for that matter? The answer to this is not a simple one and although fragmented, here are some salient points:

- Our engineering founding fathers drew heavily from British standards, whose influence was common to many aspects of our society (legal system, education etc.); some for the better, others less so.
- Some degree of protection for the electrical manufacturing industry was established, by unique configurations, and is still common in many countries today.
- To change an established plug and socket outlet system is costly, takes a long time and its benefits are difficult to quantify. This has been proven in many countries, mainly in Europe, which has recently rejected the adoption of the IEC 60906 standard as a common system for the EU.
- South Africa has not been able to prevent the influx of other systems such as the Europlug and Schuko. These systems are used extensively in power tools, TV and entertainment products, computers and cell phone chargers. The cost of enforcing SANS 164-1 on the manufacturers of these products, for a market as small as ours by international standards, would be extremely high and simply unlikely to materialise.
- All plug and socket systems from anywhere in the world are safe if used in isolation. However, when systems are mixed some very dangerous combinations are possible. Therefore it is important to exercise caution in selecting systems that can be used safely together. This was one of the prime purposes of the working group.

Since 1994 we have enjoyed a steady growth in tourism, and are expecting unprecedented numbers in 2010 during the Soccer world cup. We now have a plug and socket outlet system that will safely cater for a large number of the 250 V countries.

In conclusion, our installation protection is based on a low resistance earth conductor distributed throughout the installation, an earthed neutral at the incomer and sensitive earth leakage protection for the socket outlets and as much of the installation as possible, our plug and socket outlet standards reflect this ethic to our benefit and safety.

Contact Gian Campetti, Crabtree Electrical Accessories SA, Tel 011 874-7600, gcampetti@crabtree.co.za Δ