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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 4011-2013

Replacing GB/T 4011-1983

1.2/4.4 mm composite coaxial cable for telecommunication use

1.2/4.4 mm 同轴综合通信电缆

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Table of Contents

1 Scope

The standard fixes the types, specifications, electrical performance, delivery length, acceptance rules, test methods, and marking and packaging of 1.2/4.4 mm composite coaxial cable for telecommunication use.

It applies to the manufacture, acceptance and use of 1.2/4.4 mm composite coaxial cable for telecommunication use.

The cable specified in the standard is intended for analogue trunk communication systems of 22 MHz and below or digital communication systems of 34 Mbit/s and below; the high-frequency quads and high-frequency twisted pairs are for analogue communication systems of 156 kHz and below, and the low-frequency quads and low-frequency twisted pairs are for audio-frequency communication systems.

2 Normative references

The documents listed are indispensable for the application of the standard; for dated references only the edition cited applies, and for undated references the latest edition, including all amendments, applies.

The list comprises GB/T 2952.1 to GB/T 2952.3-2008 on cable outer coverings, GB/T 3048.4-2007, GB/T 3048.5-2007 and GB/T 3048.8-2007 on electrical test methods for wires and cables, GB/T 3953-2009 on round copper wire for electrical purposes, GB/T 4103.13-2000 on the determination of aluminium in lead and lead alloys, GB/T 4909.2-2009 on dimensional measurement of bare wires, GB/T 5441.2-1985 to GB/T 5441.9-1985 on test methods for telecommunication cables, JB/T 8137 (all parts) on cable delivery drums, and YD/T 760-1995 on polyolefin insulating compounds for indoor telecommunication cables.

3 Product types

The cable types are given in Table 1. The table has three columns, type designation, name and principal use, and lists eighteen designations: HOL02, HOL03, HOL22, HOL23, HOL32, HOL33, HOQ, HOQ02, HOQ03, HOQ22, HOQ23, HOQ33, HOQ41, HOQ42 and HOQ43, the last two of which are marked as types no longer recommended. The names combine an aluminium sheath or a lead sheath with a polyvinyl chloride or polyethylene outer covering and, where present, steel tape armour, fine round steel wire armour or coarse round steel wire armour with an outer fibrous covering. The stated uses are fixed installation on land, aerially, in ducts and tunnels and with the possibility of direct burial; the same uses in electrified railway areas and areas subject to strong electrical interference; and fixed installation on land for water crossings. A note records that cables with other types of outer covering can be supplied by agreement.

The cable is designated by its type, its specification and the number of the standard. The worked example given is an aluminium-sheathed, polyvinyl chloride sheathed small composite coaxial cable containing 4 coaxial pairs, 4 high-frequency quads, 9 low-frequency quads, 4 signal quads and 5 signal wires.

4 Specifications

The specifications of the cable have to conform to Table 2 and Table 3.

Table 2 lists ten numbered cable make-ups and gives, for each, the number of elements of five kinds: coaxial pairs of 1.2/4.4 mm, high-frequency quads of four conductors of 0.9 mm, high-frequency twisted pairs of two conductors of 0.7 mm, and low-frequency quads of four conductors of 0.6 mm and of four conductors of 0.9 mm. Across the ten make-ups the number of coaxial pairs is 4, 6 or 8, and a dash marks each element not present in a given

make-up.

Table 3 continues the same ten numbered make-ups with the remaining elements: low-frequency twisted pairs of two conductors of 0.7 mm and of 0.6 mm, signal quads of four conductors of 0.7 mm, signal twisted pairs of two conductors of 0.6 mm, and signal wires of one conductor of 0.9 mm and of one conductor of 0.6 mm. A note records that cables of other specifications can be produced by agreement between supplier and purchaser.

5 Coaxial pair

The inner conductor is a round copper wire of 1.2 mm nominal diameter, and the conductor has to conform to GB/T 3953-2009.

The insulation uses foamed or foam-skin polyolefin and has to conform to YD/T 760-1995.

The outer conductor is formed by longitudinally applying a soft copper tape of 0.15 mm nominal thickness; its nominal diameter is 4.4 mm.

Two layers of tinned steel tape of 0.1 mm nominal thickness are applied over the outer conductor in the reverse lay direction, the inner layer with a gap and the outer layer overlapped; over the steel tapes a further overlapped polyethylene tape of 0.2 mm to 0.3 mm thickness is applied.

The performance of the coaxial pair has to conform to Table 4. The table has five columns, item number, item, unit, requirement and conversion formula, and sets: a direct-current resistance of the inner conductor at 20 °C of not more than 16.0 ohm/km; a characteristic impedance at 1 MHz with a nominal value of 75 ohm and a deviation of +/- 0.75 ohm, the mean values at the individual frequency points being given in Annex A; a terminal impedance at 1 MHz with a nominal value of 75 ohm and deviations of +/- 0.75 ohm for systems from 0.06 MHz to 6 MHz and +/- 0.50 ohm for systems from 0.3 MHz to 22 MHz, with limits on the difference between the A and B end impedances; limits on impedance non-uniformity, expressed both as a ratio in parts per thousand and as a return loss in dB, separately for the two system bands and for the evaluation value of the three largest non-uniformities, with a footnote allowing a relaxation of one part per thousand for steel-wire-armoured cables; and the attenuation coefficient at 20 °C in dB/km, given at ten frequency points from 0.06 MHz to 22.0 MHz, the lowest being 1.54 +/- 0.1 at 0.06 MHz and the highest 24.80 +/- 0.2 at 22.0 MHz, with a footnote stating that the nominal attenuation values represent the general trend as a function of frequency and that above 4 MHz the manufacturer has to give a formula.

6 High-frequency quad

The conducting cores are soft copper wires of 0.9 mm nominal diameter conforming to GB/T 3953-2009.

The insulation is foamed polyethylene conforming to YD/T 760-1995.

Four insulated cores coloured red, green, white and blue are stranded into a quad; the colour arrangement at the A end is shown in Figure 1, the white and red cores forming the low-frequency working pair and the green and blue cores the high-frequency working pair.

The lay length has to be not more than 300 mm, all high-frequency quads in the same cable have to have different lay lengths, and polyethylene threads of different colours are wound on in an open helix.

The electrical performance of the high-frequency quad has to conform to Table 5, which sets a direct-current resistance of each core at 20 °C of not more than 28.5 ohm/km, a ratio of the working-pair direct-current resistance difference to the loop resistance of 1.0, a working capacitance from 0.8 kHz to 1 kHz with nominal values of 24.4 nF/km for type I and 23.0 nF/km for type II and deviations of +/- 1.6 and +/- 1.5 respectively, and an attenuation coefficient at 13 °C and 156 kHz of not more than 2.65 dB/km for both types with a deviation of +/- 0.20.

7 High-frequency twisted pair

The conducting cores are soft copper wires of 0.7 mm nominal diameter conforming to GB/T 3953-2009.

The insulation is solid polyethylene conforming to YD/T 760-1995.

Two insulated cores of different colours are twisted into a pair with a lay length of not more than 150 mm, and all high-frequency twisted pairs in the same cable have to have different lay lengths.

The electrical performance has to conform to Table 6, which sets a direct-current resistance of each core at 20 °C of not more than 48 ohm/km, a ratio of the working-pair direct-current resistance difference to the loop resistance of 1.0, a working capacitance at 0.8 kHz with a nominal value of 44 nF/km and a deviation of +/- 3, and an attenuation coefficient at 20 °C and 123 kHz of not more than 5.0 dB/km.

8 Low-frequency quad

The conducting cores are soft copper wires of 0.9 mm nominal diameter conforming to GB/T 3953-2009, with foamed polyethylene insulation conforming to YD/T 760-1995.

Alternatively the conducting cores are soft copper wires of 0.6 mm nominal diameter conforming to GB/T 3953-2009, with solid polyethylene insulation conforming to YD/T 760-1995.

Four insulated cores coloured red, green, white and blue are stranded into a quad, with the colour arrangement at the A end shown in Figure 1, the white and red cores forming the