

RNE678/165-03: 2004 Cable Type 165 Testing Specification

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BENCHMARK SUMMARY : RNE678/165-03 2004.....APPENDIX

1. General

This specification defines the pass/fail criteria for the testing of cable type 165, and references the relevant sections of BS EN 50117-1: 1997 where appropriate. The methods of BS EN 50117-6: 1997 are used as appropriate.

All details, where applicable, will be recorded on QMF17d: Cable Testing Result Sheet. When a cable fails any section, the details of the failure will be fully recorded.

High quality connectors are to be used to test the cable as required throughout this procedure, referencing the correct method of connection in the VHF/UHF Handbook.

2. Mechanical Specification

The mechanical specifications for the cable as follows:

Inner Conductor	:	To be copper
Diameter Of Inner Conductor	:	1.63 +/- 0.1mm
Outer Braid / Tape	:	No contact between dissimilar metals
External Diameter Of Sheath	:	10.1 +/-0.3mm
Bending Radius	:	75mm
Flexing Radius	:	150mm

3. Cable Measuring

Physically measure and cut 100m(+/-25cm), 30m(+/-6cm) and 3m(+/-3cm) from the cable to be tested using a tape measure. Once measured, put onto reels as required for the tests to be carried out.

4. Testing (Electrical)

Carry out the following tests with 100m of cable on the drum

4.1 Conductor Resistance

(Reference BS EN 50117-1: 1997 Section 11.1)

Calculate the DC resistance of the cable under test, at 20⁰ C, of both the inner and outer conductors.

Measure the volt drop across the inner and outer conductors and convert the reading to Ω /km.

Express the result to the standard temperature of 20⁰ C using BS EN 50117-1: 1997 Section 11.1.5 equation (7)

The DC resistance of the inner conductor should be < 10.5 Ω /km.

The DC resistance of the outer conductor should be < 12 Ω /km.

4.2 Regularity of Impedance

(Reference BS EN 50117-1: 1997 Section 11.9)

Using a TDR, enter the velocity ratio of the cable under test as specified by the manufacturer into the TDR, and observe the cable regularity of impedance.

Regularity of impedance should be < 1% throughout the test specimen.

4.3 Longitudinal Loss (Attenuation)

(Reference BS EN 50117-1: 1997 Section 11.8)

The attenuation of the cable under test should meet the following:

5 MHz	:	< 1.0 dB/100m
50 MHz	:	< 3.0 dB/100m
100 MHz	:	< 4.0 dB/100m
200 MHz	:	< 6.0 dB/100m
460 MHz	:	< 9.0 dB/100m
860 MHz	:	< 12.5 dB/100m
1000 MHz	:	< 13.5 dB/100m
1750 MHz	:	< 19.0 dB/100m
2150 MHz	:	< 22.0 dB/100m

4.4 Return Loss

(Reference BS EN 50117-1: 1997 Section 11.6)

The return loss of the cable under test should meet the following:

5 - 30 MHz	:	> 23 dB
30 - 470 MHz	:	> 23 dB
470 - 862 MHz	:	> 20 dB
862 - 2150 MHz	:	> 18 dB

In each frequency band, 3 peak return loss values up to 4dB lower than the stated specified limit are permissible.

Carry out the following tests with 30m of cable cut from the drum

4.5 Capacitance

Measure the capacitance of the cable under test using a capacitance meter and convert the reading to give pF/m.

4.6 Relative Propagation Velocity

(Reference BS EN 50117-1: 1997 Section 11.7)

Calculate the required values using BS EN 50117-1: 1997 Section 11.7.4 equation (15) & (17).

Express the final value using BS EN 50117-1: 1997 Section 11.7.5 equation (18).

4.7 Characteristic Impedance

(Reference BS EN 50117-1: 1997 Section 11.5)

Using the values obtained in section 4.6 above, and capacitance value obtained in section 4.5 above. Apply the values using BS EN 50117-1: 1997 Section 11.5.1.2 equation (9) to calculate the impedance of the cable under test.

The Characteristic Impedance should be $75\Omega \pm 3\Omega$.

Carry out the following tests using new cable from the drum

4.8 Static Bend Test

(Reference BS EN 50117-1: 1997 Section 10.2.4)

Using a 20m (minimum) piece of the cable under test, wrap a section 180° around a 150mm diameter mandrel - ensuring the cable touches all the required parts of the mandrel.

Using a TDR, ensure that the regularity of impedance is $< 1\%$.

After testing, there should be no cracks, or breaks in the dielectric, metallic elements or sheath.

4.9 Multiple Bending Test

(Reference BS EN 50117-1: 1997 Section 10.2.1)

Using a 10m (minimum) piece of the cable under test, bend a section 90° around the 150mm diameter mandrel, then straighten and bend again 3 times. Wind the same section of cable three turns around the same mandrel. Ensure the cable touches all the required parts of the mandrel for these tests.

Using a TDR, ensure that the regularity of impedance is $< 1\%$.

After testing, there should be no cracks, or breaks in the dielectric, metallic elements or sheath.

Carry out the following tests using a new 3m section of cable.

4.10 Screening Attenuation

(Reference BS EN 50117-1: 1997 Section 11.10)

Using the formula specified in BS EN 50117-1: 1997 Section 11.10.6 equation (31), the result +6dB of the cable under test should meet the following attenuation levels :

30 - 470 MHz	:	> 75 dB
470 - 1000 MHz	:	> 75 dB
1000 - 2150 MHz	:	> 65 dB

Carry out the following tests using 15m section of new cable

4.11 Flexing Test

(Reference BS EN 50117-1: 1997 Section 10.2.2)

Mark the middle 10m (minimum) of the cable under test as the test area, and pull the cable through the 300mm diameter pulleys backwards and forwards 5 times, with a force of 10 to 20 N, at a rate of not less than 1m/minute.

Using a TDR, ensure that the regularity of impedance is < 1%.

Re-check the screening attenuation on a 3m length of the 10m of cable tested using the set up in Section 4.10, and the formula specified in BS EN 50117-1: 1997 Section 11.10.6 equation (31), the result +6dB of the cable under test should meet the following attenuation levels:

30 - 470 MHz	:	> 65 dB
470 - 1000 MHz	:	> 65 dB
1000 - 2150 MHz	:	> 65 dB

After testing, there should be no cracks, or breaks in the dielectric, metallic elements or sheath.

4.12 Crush Resistance

(Reference BS EN 50117-1: 1997 Section 10.4)

Using a TDR and a torque wrench set to 13.6Nm, ensure the cable has no lateral movement and apply a crush load to the cable for 2 minutes.

Ensure that the regularity of impedance is < 1% and record any magnitude variations.

Benchmark Summary : RNE678/165-03 2004 Cable Type 165**STANDARD** : BS EN50117-1: 1997 *Coaxial Cables used in cabled distribution networks***Sections** : 10.2.1, 10.2.2, 10.2.4, 10.4, 11.1, 11.5, 11.6, 11.7, 11.8, 11.9, 11.10**MECHANICAL SPECIFICATION**

Inner Conductor	:	Copper
Diameter Of Inner Conductor	:	1.63mm +/- 0.1mm
Outer Braid/Tape	:	No Contact Between Dissimilar Metals
External Diameter over Sheath	:	10.1mm +/- 0.3mm
Bending Radius	:	75 mm
Flexing Radius	:	150 mm

ELECTRICAL SPECIFICATION

Nominal Impedance	:	75 Ω +/- 3 Ω
DC Resistance (20° C)	:	Inner < 10.5 Ω /km Outer < 12 Ω /km

Attenuation :

5 MHz	:	< 1.0 dB / 100 m
50 MHz	:	< 3.0 dB / 100 m
100 MHz	:	< 4.0 dB / 100 m
200 MHz	:	< 6.0 dB / 100 m
460 MHz	:	< 9.0 dB / 100 m
860 MHz	:	< 12.5 dB / 100 m
1000 MHz	:	< 13.5 dB / 100 m
1750 MHz	:	< 19.0 dB / 100 m
2150 MHz	:	< 22.0 dB / 100 m

Return Loss :

5 - 30 MHz	:	> 23 dB
30 - 470 MHz	:	> 23 dB
470 - 862 MHz	:	> 20 dB
862 - 2150 MHz	:	> 18 dB

Screening Attenuation :

30 - 470 MHz	:	> 75 dB
470 - 1000 MHz	:	> 75 dB
1000 - 2150 MHz	:	> 65 dB

Screening Attenuation following Flexing Test :

30 - 470 MHz	:	> 65 dB
470 - 1000 MHz	:	> 65 dB
1000 - 2150 MHz	:	> 65 dB

Flexing : Maintain minimum impedance regularity <1%, and screening performance**Static Bend Test :** Maintain minimum impedance regularity <1%**Crush Resistance :** Maintain impedance regularity <1%