अनिवार्य आवश्यकताएँ संख्या TECXXXXXXXXX

Essential Requirements No. TECXXXXXXXXX

LAN Cable

Issued under MTCTE by:

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भारत सरकार

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Government of India

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Essential Requirements for: **LAN Cable**

Certification Scheme: SCS Product Fee Group: C

This ER covers all types of LAN Cables used for different network applications in Indoor & Outdoor.

This product has the following variants:

1. LAN Cable –Indoor-UTP
2. LAN Cable –Indoor- STP
3. LAN Cable –Outdoor-UTP
4. LAN Cable –Outdoor-STP

1. Variant 1: **LAN Cable –Indoor-UTP**

1.1 Parameters Linked with Product Variant:

S.No.	Parameter Name	Standard Name (Name of Standard RFC/ Functional Test)
Horizontal & Channel Mechanical Performance		
1.1.1	Insulated Conductor	Clause 5.3.1 of ANSI/TIA-568.2-E, Test No. 1
1.1.2	Pair assembly	Clause 5.3.2 of ANSI/TIA-568.2-E,
1.1.3	Insulated Conductor Color Code	Clause 5.3.3 of ANSI/TIA-568.2-E,
1.1.4	Cable Diameter	Clause 5.3.4 of ANSI/TIA-568.2-E,
1.1.5	Breaking Strength	Clause 5.3.5 of ANSI/TIA-568.2-E, Test No. 3
1.1.6	Cold bend radius	Clause 5.3.6 of ANSI/TIA-568.2-E, Test No. 4
1.1.7	Performance marking	Clause 5.3.7 of ANSI/TIA-568.2-E,
1.1.8	Core Wrap	Clause 5.3.8 of ANSI/TIA-568.2-E,
Horizontal Cable Transmission Performance		
1.1.9	Insertion loss	ANSI/TIA- 568.2-E, Annex-2
1.1.10	Return loss	ANSI/TIA- 568.2-E, Annex-2

1.1.11	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
1.1.12	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
1.1.13	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-2
1.1.14	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-2
Channel Transmission Performance		
1.1.15	Insertion loss	ANSI/TIA- 568.2-E, Annex-3
1.1.16	Return loss	ANSI/TIA- 568.2-E, Annex-3
1.1.17	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
1.1.18	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
1.1.19	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-3
1.1.20	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-3

2. Variant 2: **LAN Cable –Indoor-STP**

2.1 Parameters Linked with Product Variant:

S.No.	Parameter Name	Standard Name (Name of Standard RFC/ Functional Test)
Horizontal & Channel Mechanical Performance		
2.1.1	Insulated Conductor	Clause 5.3.1 of ANSI/TIA-568.2-E, Test No. 1
2.1.2	Pair assembly	Clause 5.3.2 of ANSI/TIA-568.2-E,
2.1.3	Insulated Conductor Color Code	Clause 5.3.3 of ANSI/TIA-568.2-E,
2.1.4	Cable Diameter	Clause 5.3.4 of ANSI/TIA-568.2-E,
2.1.5	Breaking Strength	Clause 5.3.5 of ANSI/TIA-568.2-E, Test No. 3
2.1.6	Cold bend radius	Clause 5.3.6 of ANSI/TIA-568.2-E, Test No. 4
2.1.7	Performance marking	Clause 5.3.7 of ANSI/TIA-568.2-E,
2.1.8	Core Wrap	Clause 5.3.8 of ANSI/TIA-568.2-E,
2.1.9	Core Shield	Clause 5.3.9 of ANSI/TIA-568.2-E,
2.1.10	Dielectric Strength	Clause 5.3.10 of ANSI/TIA-568.2-E,

Horizontal Cable Transmission Performance		
2.1.11	Insertion loss	ANSI/TIA- 568.2-E, Annex-2
2.1.12	Return loss	ANSI/TIA- 568.2-E, Annex-2
2.1.13	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
2.1.14	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
2.1.15	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-2
2.1.16	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-2
Channel Transmission Performance		
2.1.17	Insertion loss	ANSI/TIA- 568.2-E, Annex-3
2.1.18	Return loss	ANSI/TIA- 568.2-E, Annex-3
2.1.19	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
2.1.20	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
2.1.21	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-3
2.1.22	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-3

3. Variant 3: **LAN Cable –Outdoor-UTP**

3.1 Parameters Linked with Product Variant:

S.No.	Parameter Name	Standard Name (Name of Standard RFC/ Functional Test)
Horizontal & Channel Mechanical Performance		
3.1.1	Insulated Conductor	Clause 5.3.1 of ANSI/TIA-568.2-E, Test No. 1
3.1.2	Pair assembly	Clause 5.3.2 of ANSI/TIA-568.2-E,
3.1.3	Insulated Conductor Color Code	Clause 5.3.3 of ANSI/TIA-568.2-E,
3.1.4	Cable Diameter	Clause 5.3.4 of ANSI/TIA-568.2-E,
3.1.5	Breaking Strength	Clause 5.3.5 of ANSI/TIA-568.2-E, Test No. 3
3.1.6	Cold bend radius	Clause 5.3.6 of ANSI/TIA-568.2-E, Test No. 4
3.1.7	Performance marking	Clause 5.3.7 of ANSI/TIA-568.2-E,

3.1.8	Core Wrap	Clause 5.3.8 of ANSI/TIA-568.2-E,
Horizontal Cable Transmission Performance		
3.1.9	Insertion loss	ANSI/TIA- 568.2-E , Annex-2
3.1.10	Return loss	ANSI/TIA- 568.2-E, Annex-2
3.1.11	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
3.1.12	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
3.1.13	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-2
3.1.14	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-2
Channel Transmission Performance		
3.1.15	Insertion loss	ANSI/TIA- 568.2-E, Annex-3
3.1.16	Return loss	ANSI/TIA- 568.2-E, Annex-3
3.1.17	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
3.1.18	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
3.1.19	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-3
3.1.20	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-3

4. Variant 4: **LAN Cable –Outdoor- STP**

4.1 Parameters Linked with Product Variant:

S.No.	Parameter Name	Standard Name (Name of Standard RFC/ Functional Test)
Horizontal & Channel Mechanical Performance		
4.1.1	Insulated Conductor	Clause 5.3.1 of ANSI/TIA-568.2-E, Test No. 1
4.1.2	Pair assembly	Clause 5.3.2 of ANSI/TIA-568.2-E,
4.1.3	Insulated Conductor Color Code	Clause 5.3.3 of ANSI/TIA-568.2-E,
4.1.4	Cable Diameter	Clause 5.3.4 of ANSI/TIA-568.2-E,
4.1.5	Breaking Strength	Clause 5.3.5 of ANSI/TIA-568.2-E, Test No. 3
4.1.6	Cold bend radius	Clause 5.3.6 of ANSI/TIA-568.2-E, Test No. 4
4.1.7	Performance marking	Clause 5.3.7 of ANSI/TIA-568.2-E,

4.1.8	Core Wrap	Clause 5.3.8 of ANSI/TIA-568.2-E,
4.1.9	Core Shield	Clause 5.3.9 of ANSI/TIA-568.2-E,
4.1.10	Dielectric Strength	Clause 5.3.10 of ANSI/TIA-568.2-E,
Horizontal Cable Transmission Performance		
4.1.11	Insertion loss	ANSI/TIA- 568.2-E, Annex-2
4.1.12	Return loss	ANSI/TIA- 568.2-E, Annex-2
4.1.13	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
4.1.14	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-2
4.1.15	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-2
4.1.16	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-2
Channel Transmission Performance		
4.1.17	Insertion loss	ANSI/TIA- 568.2-E, Annex-3
4.1.18	Return loss	ANSI/TIA- 568.2-E, Annex-3
4.1.19	Near-End Crosstalk (NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
4.1.20	Power Sum Near-End Crosstalk (PS NEXT) loss	ANSI/TIA- 568.2-E, Annex-3
4.1.21	Attenuation-to-Crosstalk Ratio, Far-end (ACRF)	ANSI/TIA- 568.2-E, Annex-3
4.1.22	Power Sum Attenuation-to-Crosstalk Ratio, Far-end (PSACRF)	ANSI/TIA- 568.2-E, Annex-3

Horizontal Cable Spec -Annex-2

Horizontal Cable
Spec-Annex-2.xls

Channel Spec -Annex-3

Channel
Spec-Annex-3.xls

Test No.1

Horizontal Electrical Testing of LAN Indoor Cable

Purpose:
This procedure describes the method for testing electrical performance of the cable at both low and high frequency.

Scope:
Horizontal Electrical testing through Computerized Automatic Cable Measuring System (Cable Analyzer)

Tools Used:
Wire Stripper

Safety Requirements / PPE:
Safety Shoes
Ear plugs (recommended)

Test Procedure:

- Arrange the cable to be tested near testing equipment.
- Remove Outer sheath of cable about 5cm from both the ends and remove insulation 3mm.
- Insert Conductors with insulation in self-stripping connectors of equipment for both ends. Ensure that color sequence is same for far end and near end.
- Now power on analyzer and start system Software from PC .Login by password ‘Test’ and press ‘TEST’ button.
- Fill out all required information such as box number, Length, etc, Select Specification file against which testing to be performed and according to cable type CAT5E, CAT6, CAT7, CAT7A & CAT8 etc.
- At a time we can Test only One Cable, In a single Connection we can test LH, HF & TCL.
- Push Start button to continue and follow instructions on screen.
- After completion of testing Test Result will be displayed as ‘PASS/FAIL’.
- Result will be saved in Computer with unique file name.
- Similarly as per requirement we can do TCL/TCTL testing also.

Test No.2

Channel Electrical Testing of LAN Indoor Cable

Purpose:
This procedure describes the method for testing electrical performance of the cable at High Frequency for Channel Performance

Scope:
Channel Electrical testing through Cable Measuring System (Cable Analyzer)

Equipment used:

DSX Cable Analyzer (Model: DSX-5000 and DSX-8000), Wire Stripper.

Test Procedure:

- Arranging 90 meter length of Horizontal Cable with 5 mtrs of Patch Cords at both end of Horizontal Cable and keep near Test Equipment's with appropriate condition.
- Remove outer sheath of cable about 5cm from both ends.
- Take the RJ 45 Connector and Keystone Jacks as per requirements.
- Insert the wires as per required standard connection sequence Type A or type B

Test Record:
Record the results as Test Reports in FLW File Format.

Test No.3

Tensile Strength & Elongation Test of Jacket Materials of Indoor LAN Cable.

Purpose:
To define the standardized procedure for operating the Universal Testing Machine (UTM) to perform tensile, compression, and elongation tests, ensuring accurate and reliable material testing results.

Scope:
This instruction applies to all personnel involved in material testing using the UTM in the quality control, R&D, or production departments. It covers preparation, operation, and post-test activities for metallic and non-metallic materials.

Records:
Test results and inspection reports

Tools, Gages, Fixtures:
Universal Testing Machine (UTM)
Computer system with testing software
Extensometer (if applicable)
Vernier caliper / micrometer
Standard test specimens (as per ASTM/ISO standards)
Grips and fixtures (tensile, compression, Elongation)

Safety Requirements / PPE:
Always wear PPE (gloves, goggles).
Do not touch moving parts during operation.
Stop the machine immediately in case of unusual noise or malfunction.
Ensure emergency stop button is functional and accessible.

Test Procedure:

Pre-Operation Checks:
- Ensure the UTM is calibrated and within valid calibration date.
- Check machine cleanliness and remove any previous test debris.
- Verify proper functioning of load cell and display system.
- Select appropriate grips/fixtures based on test type.

Specimen Preparation:
- Verify specimen dimensions as per relevant standards (ASTM/ISO).

- Measure and record dimensions (length, diameter, thickness).
- Ensure specimen surface is clean and free from defects.

Machine Setup:
- Switch on the UTM and computer system.
- Open testing software and select the required test method.
- Input specimen details (material type, dimensions, test parameters).
- Install appropriate grips and secure them properly.

Mounting the Specimen:
- Place specimen centrally between grips.
- Tighten grips firmly to avoid slippage.
- Attach extensometer if required.

Test Execution:
- Set test speed and load parameters as per standard.
- Start the test via software control.
- Monitor the test continuously for abnormalities.
- Allow the test to continue until specimen failure or completion criteria.

Recording Results:
- Observe and record maximum load, elongation, and other parameters.
- Save test data in the system.
- Print or export test report if required.

Test No.4

Cold Bend Test on Indoor LAN Cable.

Purpose:
To evaluate material performance under low temperature conditions.

Scope:
Applicable to all personnel performing low-temperature testing in QC, R&D, and production areas.

Records:
Test results and inspection reports

Tools, Gages, Fixtures:
Cold Chamber / Deep Freezer
Temperature controller/display
Thermometer / data logger
Sample trays/racks
Timer
Insulated gloves

Safety Requirements / PPE:
Always wear PPE (gloves, goggles).
Do not touch move parts during operation.
Stop the machine immediately in case of unusual noise or malfunction.
Ensure emergency stop button is functional and accessible.

Test Procedure: **As per UL 2556**
Ensure chamber is clean, calibrated, and functioning properly.
Set required low temperature as per specification.
Allow chamber to reach and stabilize at set temperature.
Place samples evenly inside the chamber.
Close the door tightly to maintain temperature.
Monitor temperature during the test duration.
After completion, remove samples using insulated gloves.
Record observations and switch off/maintain chamber as require

ANNEXURE - I

Comments on draft for new Standard for Essential Requirements (ER) of "**LAN Cable**"

Name of Manufacturer/Stakeholder:

Organization:

Contact details:

TABLE-A: Inputs/ Comments on the technical test parameters for the **LAN Cable**

Clause No./ Sr. No.	**Technical Parameter Name Description**	**Comments**	**Justification/ Remarks**

The comments by stakeholders may preferably be submitted online or alternatively via email to: **adic1.tec@gov.in** and **diri.tec@nic.in** within specified due date.